More flexible approaches are needed to improve cardiac rehabilitation

Funding New Zealand’s public healthcare system: time for an honest appraisal and public debate

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<thead>
<tr>
<th>New Zealand subscription rates</th>
<th>Overseas subscription rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals*</td>
<td>Individual</td>
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<td>$298</td>
<td>$415</td>
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<tr>
<td>Institutions</td>
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EDITORIAL
7
More flexible approaches are needed to improve cardiac rehabilitation
Ralph AH Stewart

10
Funding New Zealand's public healthcare system: time for an honest appraisal and public debate
Lyndon Keene, Philip Bagshaw, M Gary Nicholls, Bill Rosenberg, Christopher M Frampton, Ian Powell

ARTICLES
21
Dispensing data captures individual-level use of aspirin for cardiovascular disease prevention, despite availability over-the-counter
Vanessa Selak, Yulong Gu, Natasha Rafter, Sue Crengle, Andrew Kerr, Chris Bullen

29
Antimicrobial stewardship using pharmacy data for the nurse-led school-based clinics in Counties Manukau District Health Board for management of group A streptococcal pharyngitis and skin infection
Jia-Yun Catherine Tsai, Philippa Anderson, Laura Broome, Tracy McKee, Diana Lennon

39
Pharmacological therapy following acute coronary syndromes in patients with atrial fibrillation: how do we balance ischaemic risk with bleeding risk?
Aimee L Fake, Scott A Harding, Philip P Matsis, Peter D Larsen

50
A national survey of cardiac rehabilitation services in New Zealand: 2015
Geoff Kira, Fiona Doolan-Noble, Grace Humphreys, Gina Williams, Helen O’Shaughnessy, Gerry Devlin

59
Medical students: where have they come from; where are they going?
Phillippa Poole, Tom Stoner, Antonia Verstappen, Warwick Bagg

VIEWPOINT
68
Cardiac rehabilitation in New Zealand—moving forward
Jocelyne Benatar, Fiona Doolan-Noble, Andrew McLachlan

75
The complexities of designing therapy for Māori living with stroke-related communication disorders
Karen M Brewer, Clare M McCann, Matire LN Harwood

CLINICAL CORRESPONDENCE
83
A 'Rottie' appendix
Jonathan Paulin, Omid Yassaie

84
Losartan and amlodipine overdose—Case Report of a patient with anuric renal failure prior to the onset of hypotension
Fiona Croft, Emma Brunette-Lawrey

LETTERS
87
Allied health professionals’ perspectives of working with dysphagia in a rural paediatric team
Aimee Burgess, Suzanne Purdy, Bianca Jackson
CONTENTS

90
Flexible sigmoidoscopy and bowel cancer screening: reply to Professor Cox
Paul Frankish, Michael Hulme-Moir, Russell Walmsley

92
Menevit—the data never seen
Lance Gravatt

93
Radical cystectomies: a case for prolonged thrombo-prophylaxis
Don Ponnampetuma, Manmeet Saluja, Angela Ballinger, Kevin Bax

95
Defence of the Living Dead: zombies as vectors for transmitting positive health messages
Rajan Ragupathy

98
Clinical insignificance of alcohol in salbutamol metered-dose inhalers—it's time to stop flogging the horse
Felix SF Ram, Elissa M McDonald

OBITUARIES

100
Clemens Franzmayr

102
Alexander Keith Jeffery

104
Peter Mann Meffan

METHUSELAGH

106

100 YEARS AGO

107
A few notes on a case of complicated fracture of the femur of unusual type
June, 1916

NOTICE

109
University of Otago, Otago Medical School Freemasons Postgraduate Fellowships in Paediatrics and Child Health for 2017
Funding New Zealand’s public healthcare system: time for an honest appraisal and public debate
Lyndon Keene, Philip Bagshaw, M Gary Nicholls, Bill Rosenberg, Christopher M Frampton, Ian Powell
Contrary to claims made by successive New Zealand Governments that current trends in public health spending are unsustainable, government data show the country can afford to spend more on health. There are compelling health and economic grounds for doing so. If our growing health care needs are not met, they still have to be borne by the economy. Investment in health can mitigate those costs, improve the country’s productivity and improve the quality of life.

Dispensing data captures individual-level use of aspirin for cardiovascular disease prevention, despite availability over-the-counter
Vanessa Selak, Yulong Gu, Natasha Rafter, Sue Crengle, Andrew Kerr, Chris Bullen
The use of ‘triple therapy’ (aspirin/antiplatelet, blood pressure-lowering and statin medication) is monitored as a national quality indicator in New Zealand among people who have had a cardiovascular event (e.g., heart attack or stroke), for whom all three medications are recommended. Monitoring is undertaken using national pharmaceutical dispensing data, but because aspirin is available over-the-counter (i.e., without being prescribed by a doctor and dispensed by a pharmacist), dispensing data may underestimate aspirin use. We compared aspirin medication use measured by self-report and dispensing data among New Zealand patients for whom ‘triple therapy’ was recommended by their general practitioner, and found that the level of agreement between these two measures was comparable to that for blood pressure-lowering and statin medication, which are not available over-the-counter. We conclude that in New Zealand, aspirin dispensing is a valid source of data for the use of this medication among patients with cardiovascular indications, despite its availability over-the-counter.

Antimicrobial stewardship using pharmacy data for the nurse-led school-based clinics in Counties Manukau District Health Board for management of group A streptococcal pharyngitis and skin infection
Jia-Yun Catherine Tsai, Philippa Anderson, Laura Broome, Tracy McKee, Diana Lennon
Antimicrobial dispensing data sampled from pharmacies participating in the programme show that the antimicrobial prescribing pattern is conservative and well complies with the operating guidelines. There was very limited use of second-line antimicrobials for recurrent pharyngitis, and repeating exposure per person is uncommon. This audit provides affirmation that antimicrobials are used in an efficient and judicious way in the programme.

Pharmacological therapy following acute coronary syndromes in patients with atrial fibrillation: how do we balance ischaemic risk with bleeding risk?
Aimee L Fake, Scott A Harding, Philip P Matsis, Peter D Larsen
If a patient has atrial fibrillation (an irregular heart beat) they are at increased risk of stroke and an oral anticoagulant (OAC) is the mainstay preventative treatment. If a person suffers an acute coronary syndrome (ACS) or heart attack, dual anti-platelet therapy (DAPT), two blood thinners, is the standard of care. When a patient has both atrial fibrillation and ACS, giving all three drugs (OAC and DAPT) carries increased bleeding risk and optimal therapy for these patients is unknown. This paper looked at current practice at Wellington Hospital and found that treatment was not associated with bleeding or stroke risk, and that DAPT was the treatment regimen of choice.
A national survey of cardiac rehabilitation services in New Zealand: 2015
Geoff Kira, Fiona Doolan-Noble, Grace Humphreys, Gina Williams, Helen O’Shaughnessy, Gerry Devlin

Cardiac rehabilitation is a suite of interventions that promote recovery from a heart event. A survey of all cardiac rehabilitation services in New Zealand was undertaken in 2015. Many units did not meet the guidelines standards set out in the 2002 New Zealand Cardiac Rehabilitation Best Practice guidelines. It is unknown what effect this has on patient outcomes because there is no standardised process of collecting patient-specific outcome indicator data, for example smoking cessation, for comparison between services. We conclude it is crucial that a national database of cardiac rehabilitation be established to support improved cardiac rehabilitation services.

Medical students: where have they come from; where are they going?
Phillippa Poole, Tom Stoner, Antonia Verstappen, Warwick Bagg

Shortages of doctors in regional and rural (RR) areas in New Zealand continue. This study explored the relationship between geographic background and intended location of future practice of University of Auckland medical students over the past decade. Over a fifth of medical students were from RR backgrounds, with most admitted to medical school through a designated rural entry pathway. These RR students were nearly three times more likely than urban students to intend to work in an RR area, but nearly half had switched towards an urban career intention by graduation. Of all students intending an RR career, the number of urban students exceeded the number of RR background students. Next steps are to better understand factors which consolidate RR career choices in both groups.

Cardiac rehabilitation in New Zealand—moving forward
Jocelyne Benatar, Fiona Doolan-Noble, Andrew McLachlan

To reduce the risk of another heart attack or of death, patients need to focus on becoming smoke free, exercising, taking the right combination of drugs for life, managing depression and anxiety and eating healthily. The challenge is that hospital stays are short (average 2-3 days) and patients are increasingly complex (often older, have kidney disease, obesity, diabetes). Primary health care providers have neither the time nor resource to comprehensively manage patients in the immediate period post discharge when patients are often still unstable. Modern cardiac rehabilitation is cost effective vehicle and improves patient outcomes, but programs need to be standardised and adequately resourced. The challenge for cardiac rehabilitation is to be flexible to address patient's needs and increasingly complex medical issues. Access to prescribed exercise programs and individualised sessions, for example nurse specialist clinics, needs to be increased nationwide.
More flexible approaches are needed to improve cardiac rehabilitation
Ralph AH Stewart

This issue of the New Zealand Medical Journal includes two papers which address the challenges of improving cardiac rehabilitation following an acute coronary event. In a national audit of cardiac rehabilitation services, Kira and colleagues describe large variations in what is provided between District Health Boards, and the lack of standard criteria which would allow reliable evaluation of their performance. In a separate ‘Viewpoint’, Benatar and colleagues describe evidence for the benefits of cardiac rehabilitation, argue strongly for improving its delivery, and make suggestions on how this could be done. Both papers conclude that nationally-agreed key performance indicators would provide more reliable information, and would help to focus attention and resources to improve the uptake and delivery of cardiac rehabilitation.

The traditional approach to cardiac rehabilitation addresses multiple aspects of cardiovascular and general health, including disease education and management, exercise training, smoking cessation, dietary advice, weight management, and psycho-social support, during once or twice weekly visits over 6 to 12 weeks. This comprehensive and time intensive approach was first used more than 40 years ago, when morbidity and mortality after myocardial infarction were high, and ‘rehabilitation’ was more obviously needed after a major event, followed by weeks of rest and time off work. Despite evidence for benefit, incremental changes in format and delivery over time, and ‘class 1 recommendations’ in national and international clinical practice guidelines, fewer than half of patients internationally attend cardiac rehabilitation, and the majority do not complete the program.

Most district health boards provide cardiac rehabilitation, but many services would not meet international standards for a comprehensive program as recommended in clinical practice guidelines. This ‘failure’ may reflect a belief that the traditional model of cardiac rehabilitation has adapted too slowly to the enormous changes in the management and outcomes of acute coronary syndromes, so it is now less relevant to the needs of patients. With early reperfusion therapy, invasive angiography and stenting, multiple evidence-based medications, short hospital stays, less disability, and more reliable risk assessment, most patients are quickly able to return to work and other normal activities of daily living. While the consequences of an acute myocardial infarction can be significant, for most the primary focus is no longer ‘rehabilitation’. In contrast, secondary prevention, which includes understanding the need for long-term adherence to medications, regular moderate intensity exercise, a healthy diet and no smoking (which in combination dramatically lower cardiovascular risk), are relevant to all patients.

The decision by most patients not to attend or complete a cardiac rehabilitation program should give a strong message. Is it because it does not meet individual needs or is not a priority, or because most patients do not like the idea? Rather than simply trying harder to persuade reluctant patients to engage, it may be better to focus on finding alternative strategies to achieve the same goals, which are more positively received. There is an extraordinarily diversity between cardiac patients in background, social circumstances, economic status, ethnicity, culture, health literacy, health behaviors and psychological well-being, as well as the impact of the cardiac
event, so it is not surprising that a standard approach will not suit all, or even most people. A particular concern is that attendance is often lowest in groups with the highest risk of adverse outcomes, including Māori, Pacific Peoples, other ethnic minorities, and individuals with greater socio-economic disadvantage.

These considerations suggest more flexible, individualised approaches are needed which are also culturally appropriate. As suggested by Benatar, risk assessment could identify patients most likely to benefit from more comprehensive rehabilitation or a supervised exercise program. One approach, which may be more acceptable to patients who currently decline ‘rehabilitation’, is to offer all patients an early follow-up appointment or visit by a cardiac specialist nurse. Assessment would consider cardiac symptoms, medication tolerance and dose adjustment, but also be long enough to identify concerns with return to normal activities, and to consider depression, psycho-social stress, and lifestyle risk factors traditionally addressed during a more comprehensive program. Information and support can be provided, and a plan made on next steps, appropriate to individual choice and circumstances. This could include a decision to participate in a more comprehensive program, a home-based approach such as heart guide aotearoa, referral to culturally appropriate support or a Phase 3 provider. The patient’s general practitioner would be contacted to highlight concerns and to ensure appropriate follow-up. Secondary prevention, which includes the need for long-term adherence to evidence-based medications and a healthy lifestyle, would, in general, be best managed in primary care.

How should performance be assessed in a way which encourages more flexible, personalised and effective approaches? Process indicators such as “Did the patient attend cardiac rehab?” are easy to capture, and could focus attention on the many patients who currently get no ‘rehab’. However, process is not quality, and it is the quality of engagement between the patient and clinical team which is probably most important. Outcome indicators, such as the proportion of patients taking secondary prevention medications at 1 year, or adverse clinical events, better reflect the goals of secondary prevention, and the complementary roles of primary and secondary care, and could encourage novel approaches. Patient-centred outcomes, such as psychosocial well-being and life style risk factors, are also important, but are hard to capture reliably for all patients.

The general principles of cardiac rehabilitation are relevant to other common cardiac conditions, including atrial fibrillation, heart failure and cardiac devices, where medical treatments are often complex, and long-term medication adherence and lifestyle changes important. There are significant challenges, but also large potential benefits to patients and the health system of finding novel approaches which more successfully engage patients in the challenges of living with heart disease.

Author information:
Ralph AH Stewart, Consultant Cardiologist, Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, New Zealand.

Corresponding author:
Ralph AH Stewart, Consultant Cardiologist, Green Lane Cardiovascular Service, Auckland City Hospital, Private Bag 92024, Auckland 1030, New Zealand.
rstewart@adhb.govt.nz

URL:
REFERENCES:


Funding New Zealand’s public healthcare system: time for an honest appraisal and public debate

Lyndon Keene, Philip Bagshaw, M Gary Nicholls, Bill Rosenberg, Christopher M Frampton, Ian Powell

ABSTRACT
Successive New Zealand governments have claimed that the cost of funding the country’s public healthcare services is excessive and unsustainable. We contest that these claims are based on a misrepresentation of healthcare spending. Using data from the New Zealand Treasury and the Organisation for Economic Cooperation and Development (OECD), we show how government spending as a whole is low compared with most other OECD countries and is falling as a proportion of GDP. New Zealand has a modest level of health spending overall, but government health spending is also falling as a proportion of GDP. Together, the data indicate the New Zealand Government can afford to spend more on healthcare. We identify compelling reasons why it should do so, including forecast growing health need, signs of increasing unmet need, and the fact that if health needs are not met the costs still have to be borne by the economy. The evidence further suggests it is economically and socially beneficial to meet health needs through a public health system. An honest appraisal and public debate is needed to determine more appropriate levels of healthcare spending.

The New Zealand Social Security Act, passed in 1938, was intended to ensure that there should be universal access to comprehensive healthcare services funded through a taxation system. This was a laudable aim and a leader in the western world, but healthcare costs have risen with time as a result of many factors. They include increasing availability of new and often expensive treatments, an increasing total and aging population, and a widening income gap, which has since the 1980s left an increased and sizeable percentage of the population in poverty, whether measured in absolute or relative income terms.\textsuperscript{1,2,3,4} At the same time, there have been repeated claims by governments and their agencies that the cost of funding New Zealand’s public healthcare services has become unsustainable.\textsuperscript{5,6,7,8} Such claims do not bear scrutiny, however, and the situation calls for urgent public debate as to how much should be spent on the public health system, based on the full facts.

In this article we document the level and growth of healthcare expenditure in New Zealand whilst providing a perspective on the relationship between healthcare spending and the overall economy. We emphasise that successive governments and their agencies in New Zealand have tended to misrepresent vital aspects of spending on healthcare and have implemented expensive and unsuccessful changes in the organisation of healthcare.

Healthcare funding in New Zealand

Claims that funding of healthcare in New Zealand is excessive and increasing at an alarming rate are not new.\textsuperscript{9,10} Such claims underpinned the disastrous ‘health reforms’ of the early 1990s. Whereas Treasury maintained at the time that spending on public health was high and rising, economist Professor Michael Cooper noted that total health spending remained around 7%
of gross domestic product (GDP). He also found real health funding per capita had actually declined within the public sector between 1980 and 1992, despite medical advances and rising public expectations.\textsuperscript{11,12} Economist Brian Easton likewise disputed Treasury figures, stating:

\textquotedblright The mistake (figures claiming that real public spending on healthcare were rising) arose in a Treasury paper which deflated the nominal spending with the wrong price index, failing to compare apples with apples, and then using a period which maximised the size of the error.\textsuperscript{13} \textit{\textsuperscript{\textdegree}}

In fact a Treasury Working Paper found health expenditure as a proportion of GDP rose steadily from the 1950s to about 1980, but then showed no consistent trend—upwards or downwards.\textsuperscript{14}

Subsequent to the ‘health reforms’ of the 1990s, claims of unsustainable healthcare spending have continued. For example, a Ministerial Review Group reported in 2009:

\textit{As a country we do not have the resources to continue spending increasing amounts on the public health and disability system at the rate at which we have}.\textsuperscript{15}

In 2014, \textit{The Press} in Christchurch opined: “New Zealand is on the brink of a healthcare funding crisis that is threatening to bankrupt the Government”.\textsuperscript{15} This perspective has been promoted by various organisations, including the New Zealand Institute of Economic Research (NZIER), and the Health Funds Association, which have advocated changes to the public healthcare system and greater use of the private sector. As was the case before the ‘reforms’ of the 1990s, this oft-repeated perspective is not supported by the evidence.

\textbf{Figure 1} is a version of a Treasury graph suggesting health expenditure is excessive and growing alarmingly as a proportion of both government spending and the economy. Superficially, the graph might be taken to support these claims. However, the graph is misleading as it presents two variables (health spending and GDP) of highly disparate size on the same percentage scale, which has the effect of significantly exaggerating the apparent importance of health spending compared to GDP.

This graph has been widely used without qualification or explanation by government agencies, including the Ministry of Health as well as the media. It has also been used by the private health sector to support their case for privatisation.

To put GDP and health expenditure into perspective, GDP is forecast to be approximately $240 billion in 2015, while Vote Health’s operating budget is approximately $14.8 billion, so in absolute terms a 1% increase in GDP is many times greater than a 1% increase in government expenditure.\textsuperscript{16}
health expenditure. To put it another way, it would take a one-sixth (16%) increase in the Vote Health operating budget to consume another 1% of GDP. The situation in New Zealand has parallels in Australia where economist Professor Jeff Richardson stated: “The unsustainability myth is created by focusing on percentages and not on the absolute level of resources available” and fear that the rising share of GDP spent on health will harm the economy or our standard of living “is probably a result of bad arithmetic.”

In New Zealand between 2009/10 and 2014/15, Vote Health’s nominal operational expenditure increased by $2 billion, and core government spending as a whole increased by $8.8 billion, whereas nominal GDP increased by $45.2 billion (from $195.4 billion to $240.6 billion).

A more accurate way of illustrating health (and other government) spending trends is to map core government expenditure relative to GDP, as shown in Figure 2, using Treasury figures. This shows a modest increase in health expenditure as a proportion of GDP from 2000 (along with a similar rise in total government spending) until recent years where the trends have reversed, as discussed further below. The trends shown in Figure 2 are in contrast to the impression of an unsustainable rise in government health spending given in Figure 1.

**Government health funding is falling as a proportion of GDP**

Vote Health’s operational budgets have been falling as a proportion of GDP over recent years—an intentional policy move flagged by Treasury in a document dated June 2012. Treasury data, including recent GDP adjustments, show Vote Health’s total operational expenditure has decreased as a proportion of GDP from 6.32% in 2009/10 to 5.95% in 2014/15 (Table 1).

If GDP rises at a faster rate than health spending, then health spending as a proportion of GDP will fall, even if there is no change in health spending. In this case, the drop in health funding as a proportion
of GDP reflects significant funding shortfalls in Vote Health’s operational funding since 2009/10. Data are not available to enable an accurate assessment of how much money has been saved over those years through genuine efficiencies and how much has been ‘saved’ through service cuts and increases in user charges. With that qualification, analyses of Budget data from 2009/10 show Vote Health allocations have fallen short of what is needed each year to cover the stated costs of announced new services (taking into account stated savings), increasing costs (Consumer Price Index and average wage increases), and the Ministry of Health’s cost-weighted index for population growth and ageing. The assessed annual shortfalls between 2009/10 and 2014/15 have accumulated to an estimated $0.8 billion. The estimated funding shortfall for 2015/16 would make that more than $1 billion.

Similarly, core government expenditure has been falling in recent years, having peaked in 2011 (Figure 2). The intention, according to Finance Minister Bill English, is to see it drop to 25% within the next 6 to 7 years. In line with those policy priorities, the Government’s trajectory is one of continuing cuts in health spending. Total real government health spending is forecast to drop by approximately 4% each year, taking into account forecast inflation and the Ministry of Health’s cost-weighted index for population growth and the effects of ageing. The extent to which that forecast funding is adjusted upwards depends on how much is allocated to Vote Health from the Government’s general budget operating allowance. However, in the past, the additions to Vote Health from the operating allowance have not been enough to keep up with rising costs, population growth and new programmes. In preparing the 2013 Budget, Treasury warned that such large cuts will require major changes to the health sector. The continued under-reourcing of our health services, then, is not owing to unaffordability; it is a policy decision to reduce government expenditure overall and introduce tax cuts.

New Zealand government spending is low internationally

A common defence for constraining health spending is that government finances are finite and more money on health means less money is available for other government services. However, like core government expenditure, general government expenditure (including all central and local government spending) has been falling as a proportion of GDP in recent years. It was 40.1% of GDP in 2013, down from 47.4% in 2010, ranking New Zealand 26th out of 32 OECD countries. The OECD average for general government expenditure in 2013 was 45.2% of GDP. In other words, New Zealand’s general government spending as a proportion of GDP fell short of the OECD average by 5.1 percentage points, or $11 billion, based on New Zealand’s GDP for

Table 1: Vote Health operational expenditure as a proportion of GDP.

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<th>Year</th>
<th>2009/10</th>
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<th>2011/12</th>
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<th>2013/14</th>
<th>2014/15</th>
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<td>Vote Health operational expenditure ($m)*</td>
<td>12,348</td>
<td>12,797</td>
<td>13,267</td>
<td>13,561</td>
<td>14,001</td>
<td>14,313</td>
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<td>Nominal GDP for the year to June ($m)²</td>
<td>195,399</td>
<td>203,791</td>
<td>212,307</td>
<td>216,585</td>
<td>234,027</td>
<td>240,571</td>
</tr>
<tr>
<td>% of GDP</td>
<td>6.32%</td>
<td>6.28%</td>
<td>6.25%</td>
<td>6.26%</td>
<td>5.98%</td>
<td>5.95%</td>
</tr>
</tbody>
</table>

Sources:
* Actual operational expenditure (estimated actual expenditure for 2014/15), including multi-category expenses and “other” non-departmental expenses—ie, contributions to international health organisations, legal expenses and provider development. $49 million has been subtracted from the funding allocations for 2012/13 onwards to account for estimated health provider superannuation contributions such as to Kiwisaver, previously paid for by the State Services Commission.
2013. The figures indicate that, with different fiscal policies, the New Zealand Government could afford not only to spend more on health but also on other areas of government while remaining at or below average government spending in the OECD.

Economies are flexible and constantly changing
It is important to also recognise that health is not the only sector that has grown relative to the rest of the economy. National economies are highly flexible and the composition of spending can vary significantly over time and between countries. In the early 1970s, New Zealand's economy was heavily reliant on manufacturing, as was the rest of the industrialised world. Manufacturing made up 26% of GDP; it is now 12% of GDP. New Zealand has instead become a more service-oriented economy, mirroring trends in the rest of the OECD. The increase in the proportion of the economy dedicated to private and public health services over the past few decades (with similar increases in areas such as finance and insurance, and rental, hiring and real estate) reflects that structural shift. It also reflects the high value that New Zealanders place on good health, which is one of the fundamental determinants of a good life. As good health is also a major contributor to productivity and economic growth it is not clear why investment in good health is singled out as problematic for the economy.

Rationale for increasing health spending
There are a number of reasons why New Zealand should and could be spending more on health, including:

- New Zealand’s health needs are increasing with population growth and ageing
- If these needs are not met by public health services, the costs do not disappear; they still have to be borne by the economy
- There is mounting evidence of increasing unmet need
- Investment in health can mitigate health costs and improve the quality of life.

While the population is projected to increase by approximately 0.9% per year over the 10 years to 2026, the Ministry of Health estimated the cost of demographic changes, including the impact of an ageing population, will require an increase in health service budgets of approximately 1.8% per year on average over the same period.

While the contribution of population ageing to past health spending growth has been modest, the projected growth in the proportion of older people in the coming decades will lead to a greater impact on health spending. Chronic diseases disproportionately affect older adults and contribute to ongoing disability and increased need for long-term health care. These impairments might be physical (e.g., rheumatological, cardiological, respiratory, or a decline in hearing or eyesight), psychological, or related to cognitive functioning and loss of memory, including the dementias. Thus, ageing is associated with a growing need for acute health care services and ongoing chronic illness that sometimes requires long-term care.

However, when older people are in good health, they will need relatively fewer health care resources. Policies that allow a healthy ageing of the population include a better coordination of health and long-term care services and enhanced prevention services to tackle obesity, smoking and mental illnesses. These policies need long-term planning and investment but they will allow more people to age healthily and will help to ensure future health services are properly equipped to accommodate population ageing.

The importance of ensuring people age well, including having timely access to treatment when it is needed, is underscored by Treasury modelling indicating that by 2060 a ‘no healthy ageing’ scenario (increased longevity with an increase in the number of years lived in poor health) could cost the equivalent of 2.9% of GDP more than a ‘healthy ageing’ scenario (increased longevity with an increase in the number of years lived in good health). Pressures on the health system also arise from the introduction of new technologies.
The impact of new technologies on health expenditure is complex. On the one hand, they can reduce costs through efficiency gains or health improvements that reduce the need for further, and perhaps more costly, care. On the other hand, they can also contribute to higher costs, such as by extending the scope and range of possible treatments available. Either way, new technologies, when put to use after proper evaluation, are highly desirable for the well-being of the population.

The alternative to public health care

If people do not have reasonable access to the public health system when they need it, either they must go untreated or face longer delays in being treated, or they must pay for treatment privately—individually or through private insurance. The first option is likely to reduce quality of life and there is a wealth of evidence showing poor access to treatment is more costly for health services in the long run, and more costly for the economy through lost productivity. The option of people paying privately means the economy still has to stand the cost of the increase in health expenditure—it is just that the government does not pay for it. The important question then becomes whether it is more efficient and equitable to pay for health needs privately or publicly. There are good reasons to conclude that it is more efficiently and equitably provided publicly. As Treasury itself has noted: “We do not currently see a clear case for moving away from a predominantly single-payer, tax-financed health system. Systems like ours are typically better at containing health spending and there is no one system that presents a clearly more efficient alternative.”

If we add considerations of equity to cost-containment, private provision is not likely to be better for people, the country and the economy, and that is well illustrated by the costly and inequitable situation in the US.

Of course it is important that New Zealand gets the best value out of each health dollar. Treasury’s assessment is that, “New Zealand’s health system as a whole is not obviously underperforming those of other developed economies.” Reports comparing health systems internationally rate New Zealand’s health service favourably. For example, the Commonwealth Fund’s comparison of health systems in 11 comparable countries (Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the UK, and the US) show New Zealand’s performance on efficiency and quality of care is ranked 3rd and 4th respectively. This has been achieved despite being ranked bottom on health expenditure per capita.

Unmet need

Indications of unmet need in New Zealand are reflected in the Commonwealth Fund’s performance indicators for access to services (7th out of 11), and equity (10th), and on a measure of ‘healthy lives’ (infant mortality, healthy life expectancy and mortality amenable to health care—that is, deaths that could have been prevented with timely and effective care) New Zealand was placed 9th. New Zealand’s poor rankings for access-related performance measures include: access to diagnostic tests (11th out of 11); long waits for treatment after diagnosis (10th); long waits to see a specialist (9th); and long waits for elective surgery (8th). Currently, there are no detailed or accurate measures of unmet need in New Zealand, but anecdotally it appears to be unacceptably high and growing. Of the New Zealand doctors surveyed by the Commonwealth Fund, 59% reported difficulty for patients gaining access to diagnostic tests, and 34% said patients “often experience long waits to receive treatment after diagnosis”. Twenty-one percent of New Zealanders surveyed reported cost-related barriers to accessing health care, compared with 4% reported for the best-ranked UK. In fact, the New Zealand Health Survey for 2014/15 reports 27% of adults have one or more types of unmet need for primary care.

Even in the Government’s high priority services, such as elective surgery, the Commonwealth Fund reports 15% of New Zealand patients waited 4 months or more for their operation compared to an average of 9% across the 11 comparable countries surveyed. Reports of increasing barriers to accessing elective surgery have also been appearing in the media. They reinforce a 2013 survey by the Health Funds Association.
(HFA) and Private Surgical Hospitals Association (NZPSHA), which indicated 170,000 people needing elective surgery did not make it onto the waiting list that year, although the accuracy of that survey has been questioned owing to possible conflicts of interest. The New Zealand Medical Association has noted that, anecdotally, the gap between the patients who meet the clinical threshold for surgery, but fall short of our hospitals’ financial threshold, is widening.

Overview

As health systems in most countries face the challenges of increasing needs and growing public expectations, policy makers search for new ways to deliver services in innovative and cost-effective ways. In New Zealand, there is continuing talk of restructuring and new system models, despite their lack of obvious success in the past—especially in the 1990s. Looking back at the 1990s ‘reforms’, economist Brian Easton, notes that:

“The New Zealand experience provides strong evidence that comprehensive commercialisation—business practices within, market relations between institutions—will not make a significant contribution to the design of effective health systems.”

While it is clear that the ideologically-based reforms of the 1990s were an expensive failure, it is not clear whether appropriate lessons have been learned. For example, in 2009, the OECD suggested that New Zealand should radically reform its health sector proposing: “...more competition among public hospitals and with private providers...so as to spur competition and burden-sharing.” Of particular concern Bill English, Minister of Health at the time of the Stent inquiry into unnecessary deaths from the ‘reforms’ of the early 1990s and now Minister of Finance, has stated: “We’re already implementing some of the (OECD) ideas and will consider others.”

Indeed the competitive market-based approach of the 1990s underlies proposals emanating from the recent Director-General of Health’s Review of Health Funding Arrangements, led by banker and former Treasury Secretary Murray Horn. The proposals include opening up DHB services to competitive tendering and fragmenting DHB funding into four ‘pools’, with a suggestion this may be managed by some unidentified body in the future. At the time of writing, the Government had yet to officially announce its response to the proposals, but they are an example of the kind of thinking currently going on in some government circles.

The Government also seems to be reverting to the 1990s’ contractualism approach with its experimental ‘social impact bonds’ policy programmes, encompassing specific health and social initiatives, including in mental health services, which will be funded through private investment. The bond-holding investors’ profits would be derived by achieving certain goals—or ‘targets’ by another name—but there is no evidence to show the policy works, and there are significant risks that it may do a lot of harm.

Given that OECD data indicate government spending in this country is low internationally, fiscal policies that moved New Zealand’s general government expenditure back towards the average OECD level would allow substantial increases in those areas of government that have endured funding shortfalls over recent years, including health.

The oft-repeated, but unsubstantiated, assertion that health funding levels are unsustainable echoes the tactics used to introduce the radical, ideological health changes in the 1990s. Notwithstanding, the issues with access and the unacceptable—but poorly documented—level of unmet need, the country’s healthcare system, as already mentioned, has delivered relatively well in recent times on basic indices such as quality of care and efficiency. The system does not need ‘reforming’, it simply needs to be funded to a level that enables New Zealanders’ healthcare needs to be met. Indeed, there is a moral imperative to do so.

There are also alternative and more productive avenues for achieving better cost efficiency, such as the promotion of clinical leadership. The potential for this to be realised has been hindered by entrenched shortages of medical specialists—an issue that has been recognised by the Government’s health workforce agency, Health Workforce New Zealand: “The most important issue
currently is the impact of a prolonged period of medical labour shortages on the workloads, wellbeing and productivity of DHB-employed senior doctors.\textsuperscript{59}

As already noted, New Zealand is not alone when it comes to wrestling with what level of funding should be directed to its public healthcare system. Nor is it alone when it comes to obscuring or confusing what is the true, versus the claimed, cost of funding healthcare.\textsuperscript{60} The National Health System (NHS) in England is reported to be under severe financial stress with calls for an emergency injection of £1 billion.\textsuperscript{61} Substantial underfunding of hospitals is probably key to these current problems in England, as highlighted by the recent down-grading of the renowned Addenbrooke’s Hospital (part of Cambridge University Hospital NHS Foundation Trust) because it is running at a weekly deficit of £1.2 million. The King’s Fund has suggested to Treasury in England that public spending on health and social care should be increased to 11%–12% of GDP.\textsuperscript{62}

But just as the underfunding of the NHS has occurred amid reports of official obfuscation,\textsuperscript{63,64} it is clear that an honest appraisal of health funding in New Zealand has been similarly hampered by official misinformation. The likely reasons for this subterfuge include a desire by both the Labour Government in the 1980s and the National Government in the 1990s (and signs of this in the current Government) to support the private healthcare industry under an umbrella of pro-market ideology, to set the scene for yet more reduction and restructuring of the public healthcare system and to employ funding policies designed for short-term political gain rather than longer-term health gains. It is time for an honest appraisal and public debate about what the appropriate level should be to fulfil the original aims of universal access to comprehensive healthcare services.

Author information:
Lyndon Keene, Director of Policy and Research, Association of Salaried Medical Specialists; Philip Bagshaw, Chair, Canterbury Charity Hospital Trust and Clinical Associate Professor, University of Otago–Christchurch; M Gary Nicholls, Emeritus Professor, Department of Medicine, University of Otago–Christchurch, Christchurch Hospital, Christchurch; Bill Rosenberg, Economist and Director of Policy, New Zealand Council of Trade Unions; Christopher M Frampton, Professor, University of Otago–Christchurch, Christchurch; Ian Powell, Executive Director, Association of Salaried Medical Specialists.

Corresponding author:
Lyndon Keene, Director of Policy and Research, Association of Salaried medical Specialists, PO Box 10763, Wellington 6143, New Zealand.

lk@asms.org.nz

URL:
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Dispensing data captures individual-level use of aspirin for cardiovascular disease prevention, despite availability over-the-counter

Vanessa Selak, Yulong Gu, Natasha Rafter, Sue Crengle, Andrew Kerr, Chris Bullen

ABSTRACT

AIM: To assess the level of agreement in aspirin use measured by self-report and dispensing data.

METHOD: We assessed preventive cardiovascular medication use (prescription-only statins and blood pressure-lowering therapy; and aspirin—also available over-the-counter) at baseline in participants in the New Zealand IMPACT trial for whom these medications were prescribed by their general practitioner. A trial nurse not involved in their ongoing health care obtained participants’ self-reported aspirin use data. We obtained dispensing data from the national pharmaceutical dispensing database and assessed agreement between the two measures using kappa coefficients.

RESULTS: Of the 513 trial participants, 36% were women, 50% were of Māori ethnicity, and 45% had a history of cardiovascular disease. The level of agreement between self-reported aspirin use and dispensing data was substantial (kappa 0.75, 95% CI 0.69 to 0.82). The level of agreement in aspirin use measured by these two sources of data was similar to that for statin and blood pressure-lowering therapy use, for all participants combined, for subgroups according to ethnicity (Māori and non-Māori) and history of cardiovascular disease.

CONCLUSIONS: Despite its availability over-the-counter, aspirin use in patients for whom cardiovascular medications are indicated can be assessed accurately from dispensing data.

New Zealand guidelines for the assessment and management of cardiovascular disease (CVD) risk recommend ‘triple therapy’ (aspirin/antiplatelet, blood pressure-lowering and statin medication) for people who have had a cardiovascular event, unless contraindicated.¹ The proportion of these patients adequately maintained on triple therapy is one of the indicators for the New Zealand Health Quality & Safety Commission Atlas of Healthcare Variation.²

Medication use data for this indicator are obtained from the national pharmaceutical dispensing database, drawn from community pharmacy subsidy claims.² These national dispensing data are highly likely to be complete for blood pressure-lowering and statin therapy use because these medications are only available on prescription from registered medical practitioners, are dispensed by pharmacists, and virtually all cardiovascular medications prescribed in New Zealand receive a government subsidy.² However, aspirin is also available over-the-counter (ie, without being prescribed and dispensed). Hence, it is possible that the use of aspirin for CVD prevention is underestimated by dispensing data.³

Routinely collected data are being increasingly used to monitor the performance of the health system and to conduct research. It is therefore important for health service agencies, clinicians and researchers to understand the quality and completeness of such data, including aspirin dispensing data.

In Denmark, aspirin is also available over-the-counter as well as on...
prescription, and prescribed medications are partially subsidised by the government. Schmidt and colleagues analysed national sales and prescription data, and found that in 2012, 92% of the total sales of low-dose aspirin (75–150mg, the dose used for the CVD prevention) in Denmark was prescribed. However, in New Zealand such sales data are not readily available. We used an alternative approach to assess individual-level use of aspirin for CVD prevention, one that compares self-report with dispensing data for aspirin—as well as medications available on prescription only (statin and blood pressure-lowering therapy)—drawing on data from the IMProving Adherence using Combination Therapy (IMPACT) randomised controlled trial (RCT).

**Method**

The IMPACT trial methods and main outcomes have been published in full elsewhere. In brief, the IMPACT trial was an open label RCT conducted in patients attending 54 general practices in the Auckland and Waikato regions of New Zealand between July 2010 and August 2013. Participants were eligible if they met the following key inclusion criteria: a) high risk of CVD (prior CVD event or 5-year risk of first event >15%); and b) their general practitioner considered that all pharmaceuticals in a cardiovascular fixed dose combination polypill (aspirin 75mg, simvastatin 40mg, lisinopril 10mg and either atenolol or 50mg or hydrochlorothiazide 12.5mg) were indicated. The primary outcome measures were self-reported use of indicated medications (aspirin, blood pressure-lowering and statin therapy) and change in blood pressure and cholesterol at 12 months.

We restricted our analysis to two baseline measures from the IMPACT trial: 1) self-reported use of medication; and 2) the dispensing of these medications. At the baseline visit, research nurses collected information from participants on self-reported use of all medications. Participants had been asked prior to the visit to bring (or collect, if the visit was at their home) all of their current medications. The research nurse asked the participant to tell them the names and dosages of all of the medications they were currently taking. The participant and nurse were able to refer to the actual medications for confirmation of names and/or dosages if there was any confusion. Nurses were specifically asked to obtain information from the participants about what they were actually taking, as opposed to what they had been prescribed or dispensed.

We obtained dispensing data from New Zealand's national pharmaceutical dispensing database (the Pharmaceutical Collection or Pharmhouse database). Participants were categorised as having a specific medication dispensed at baseline if they had been dispensed the medication prior to the baseline visit, and if the number of days between the dispensing and the baseline visit was less than the days' supply dispensed plus an additional 30 days (to account for gaps).

We categorised participants according to their baseline use (by self-report and dispensing data) for each of three groups of medicines: aspirin; statin; and blood pressure-lowering therapy (see Appendix Table 1 for medications allocated to each group). Statin and blood pressure-lowering therapy were included as a comparison with aspirin because, unlike aspirin, these medications are only available on prescription.

We calculated Cohen's kappa coefficients and their 95% confidence intervals (CI) to determine the strength of the agreement between self-report and dispensing data for each of the three medication groups. Kappa coefficients can range from <0.00 (poor agreement) through to 1.00 (perfect agreement), and can be classified (eg, 'moderate' if 0.41 to 0.60, 'substantial' if 0.61 to 0.80, and 'almost perfect' if 0.81 to 1.00), although these classifications are somewhat arbitrary.

We stratified analyses according to history of CVD (Yes/No) and ethnicity (Māori/non-Māori).

The IMPACT trial was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. Ethical approval was obtained from the New Zealand Northern X Regional Ethics Committee (NTX/06/06/072). Trial participants gave informed consent before taking part.
Figure 1: Agreement between medication use measured by self-report and dispensing data, by medication type.

Results

A total of 513 participants were included in the trial, of whom 36% were women, 50% identified as being of Māori ethnicity, and 45% had a history of CVD at baseline. At baseline, self-reported aspirin use was 77% and 69% according to dispensing data, a ‘substantial’ level of agreement (kappa 0.75, 95% CI 0.69 to 0.82). As with aspirin, the use of statin and blood pressure-lowering therapy at baseline was higher according to self-report than dispensing data (82% vs 74% for statin, and 90% vs 83% for blood pressure-lowering therapy), and the level of agreement between these two measures was ‘substantial’ (kappa 0.66 [95% CI 0.58 to 0.74] for statin, and 0.68 [0.59 to 0.77] for blood pressure-lowering therapy) (see Figure 1).
### Table 1: Agreement between medication use measured by self-report and dispensing data by medication type and history of CVD.

<table>
<thead>
<tr>
<th>Medication group</th>
<th>History of CVD</th>
<th>Dispensed</th>
<th>Cohen's kappa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Aspirin</td>
<td>No</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>18</td>
<td>196</td>
</tr>
<tr>
<td></td>
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<td>4</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>26</td>
<td>154</td>
</tr>
<tr>
<td>Statin</td>
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<td>4</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>20</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>No</td>
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<td>6</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>30</td>
<td>181</td>
</tr>
<tr>
<td>BP-lowering</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>13</td>
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</tr>
<tr>
<td></td>
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<td>2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>24</td>
<td>219</td>
</tr>
</tbody>
</table>

BP=blood pressure, CI=confidence interval, CVD cardiovascular disease

### Table 2: Agreement between medication use measured by self-report and dispensing data by medication type and ethnicity.

<table>
<thead>
<tr>
<th>Medication group</th>
<th>Māori</th>
<th>Dispensed</th>
<th>Cohen's kappa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
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</tr>
<tr>
<td>Aspirin</td>
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<td>2</td>
</tr>
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<td></td>
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<td>24</td>
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</tr>
<tr>
<td></td>
<td>No</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
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<td>190</td>
</tr>
<tr>
<td>Statin</td>
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</tr>
<tr>
<td></td>
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<td>32</td>
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</tr>
<tr>
<td></td>
<td>No</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>18</td>
<td>198</td>
</tr>
<tr>
<td>BP-lowering</td>
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<td>32</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>25</td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>12</td>
<td>226</td>
</tr>
</tbody>
</table>

BP=blood pressure, CI=confidence interval, CVD cardiovascular disease

Among people with a history of CVD, aspirin use at baseline was 92% according to self-report and 85% according to dispensing data. The level of agreement between these two measures was 'moderate', with kappa 0.59 (95% CI 0.43 to 0.75). Among people without a history of CVD, aspirin use at baseline was 64% according to self-report, and 56% according to dispensing data. The level of agreement between these two measures was 'substantial', with kappa 0.78 (0.70 to 0.85). A similar pattern was observed with statin therapy, where agreement between the two measures was 'moderate' among people with a history of CVD and 'substantial' for those without a history of CVD (see Figure 2 and Table 1). Agreement between self-report and
dispensing data was ‘substantial’ for blood pressure-lowering therapy irrespective of history of CVD.

Among Māori, aspirin use at baseline was 72% according to self-report and 63% according to dispensing data. The level of agreement between these two measures was ‘substantial’, with kappa 0.77 (95% CI 0.69 to 0.85). Among non-Māori, aspirin use at baseline was 82% according to self-report and 76% according to dispensing data. The level of agreement between these two measures was ‘substantial’, with kappa 0.72 (0.62 to 0.82). Agreement between the two measures for use of blood pressure-lowering therapy was ‘substantial’ for Māori and non-Māori (Figure 2 and Table 2). For statin therapy, agreement between self-report and dispensing data was ‘moderate’ for Māori and ‘substantial’ for non-Māori.

Discussion

There was substantial agreement in aspirin use measured by self-report and dispensing data among high-CVD-risk participants in a New Zealand primary care trial. The level of agreement in aspirin use measured by self-report and dispensing data was similar to the level of agreement in statin and blood pressure-lowering therapy use measured by these two sources of data for all participants combined and for subgroups according to ethnicity (Māori and non-Māori) and history of CVD.

IMPACT trial participants had high CVD risk and indications for aspirin, statin and blood pressure-lowering therapy for the management of cardiovascular risk, according to current New Zealand guidelines and as confirmed by their own general practitioner at trial entry. Medication use (both by self-report and dispensing data) was obtained at trial baseline, so was unaffected by treatment allocation. We were able to compare the level of agreement between self-report and dispensing data for aspirin with similarly indicated medications (statin and blood pressure-lowering therapy) that were not available over-the-counter.

This study was limited to a relatively small number of trial participants, and therefore may not be representative of the wider population of people at high risk of CVD in New Zealand. We did not calculate sensitivity and specificity as this was not a validation study and neither self-report nor dispensing data can be considered a gold standard for assessing the use of aspirin as both sources of data have limitations.

Self-reported measures are prone to bias by inaccurate recall or social desirability, when an overly optimistic estimation of adherence is provided to a healthcare provider. We attempted to minimise this bias by asking participants only for the medications they were currently taking. In addition, prior to their assessment participants were requested to have all of their current medications available, so that these could be referred to so as to minimise any confusion regarding medication names and/or dosages. We attempted to minimise social desirability bias by asking trial nurses, who were not involved in the participant’s ongoing healthcare, to obtain this information from them.

There were also limitations to the national pharmaceutical dispensing database. At the time data for this study were collected (July 2010 to July 2012), dispensing data were only recorded on the database when a subsidy could be claimed by the pharmacy. A subsidy could be claimed for almost all dispensed subsidised medicines because the dispensing fee exceeded the $3 co-payment charged to most patients at that time. Claims would not have been submitted for dispensings to patients charged a $15 co-payment when this co-payment fully covered the cost of the prescription item. However, these dispensings are likely to have represented only a relatively small number of total dispensings for subsidised medicines (<0.5% in 2013, Pharmaceutical Management Agency (PHARMAC), personal communication, 2014). Dispensings for all subsidised medicines are now required to be submitted and are hence recorded on the database, even when co-payment covers the full cost. (PHARMAC, personal communication, 2014).

Schmidt and colleagues noted that regular aspirin users have an economic incentive to obtain this medication on prescription (rather than over-the-counter) due to the government subsidy. In New Zealand, the out-of-pocket cost to a patient of purchasing a 1-year supply of low-dose aspirin from a supermarket is approximately $55.
Appendix Table 1: Medication classification.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Sub-classification</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>Aspirin</td>
<td>Aspirin</td>
</tr>
<tr>
<td>Statin</td>
<td>Statin</td>
<td>Simvastatin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atorvastatin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pravastatin</td>
</tr>
<tr>
<td>Blood pressure-lowering</td>
<td>Angiotensin-converting-enzyme inhibitor</td>
<td>Captopril</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cilazapril</td>
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<tr>
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<td>Enalapril</td>
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<tr>
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<td></td>
<td>Lisinopril</td>
</tr>
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<td></td>
<td></td>
<td>Quinapril</td>
</tr>
<tr>
<td>Alpha adrenoceptor Blocker</td>
<td></td>
<td>Doxazosin</td>
</tr>
<tr>
<td></td>
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<tr>
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<td>Angiotensin II antagonist</td>
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<td>Beta adrenoceptor blocker</td>
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<td>Carvedilol</td>
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<td>Nadolol</td>
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<td>Dihydropyridine calcium channel blocker</td>
<td>Amlodipine</td>
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<td>Other calcium channel blocker</td>
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<td>Frusemide</td>
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<tr>
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<td></td>
<td>Bumetanide</td>
</tr>
<tr>
<td>Potassium sparring diuretic</td>
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<td>Amiloride</td>
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<tr>
<td></td>
<td></td>
<td>Spironalactone</td>
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<tr>
<td>Thiazide and related diuretic</td>
<td>Bendrofluazide</td>
<td>Chlorthalidone</td>
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<tr>
<td></td>
<td></td>
<td>Hydrochlorothiazide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indapamide</td>
</tr>
</tbody>
</table>

(Using the lowest cost per tablet advertised by the supermarket Countdown, http://shop.countdown.co.nz/, on 18 September 2015). For a patient obtaining aspirin on prescription for a year, the corresponding cost would be $20. This does not take into account the out-of-pocket cost for seeing their general practitioner, but patients at high risk of CVD would be unlikely to attend their general practitioner for a single prescription when most would require multiple medications.

We conclude that in New Zealand, aspirin dispensing is a valid source of data for the use of this medication among patients with cardiovascular indications, despite its availability over-the-counter. Health service agencies, clinicians and researchers can therefore have confidence in using national dispensing data to ascertain aspirin use among patients with cardiovascular indications for this medication, without having to rely on more resource intensive sources of data collection such as self-report.
Competing interests:
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Author information:
Vanessa Selak, Senior Research Fellow, Department of Epidemiology & Biostatistics, University of Auckland, Auckland, New Zealand; Yulong Gu, Assistant Professor of Health Science, School of Health Sciences, Stockton University, New Jersey, US; Natasha Rafter, Senior Lecturer, Royal College of Surgeons in Ireland, Dublin, Ireland; Sue Crengle, General Practitioner, Invercargill Medical Centre, Invercargill, New Zealand; Andrew J Kerr, Cardiologist, Middlemore Hospital, Counties Manukau District Health Board, Auckland, New Zealand; Chris Bullen, Director, National Institute for Health Innovation, University of Auckland, Auckland, New Zealand.

Corresponding author:
Vanessa Selak, Department of Epidemiology & Biostatistics, University of Auckland, Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand.

v.selak@auckland.ac.nz

URL:
REFERENCES:


Antimicrobial stewardship using pharmacy data for the nurse-led school-based clinics in Counties Manukau District Health Board for management of group A streptococcal pharyngitis and skin infection

Jia-Yun Catherine Tsai, Philippa Anderson, Laura Broome, Tracy McKee, Diana Lennon

ABSTRACT

AIM: To evaluate antimicrobial usage in the school-based clinics against operating guidelines.

METHOD: Antimicrobial prescribing data (2014) from 10/18 participating pharmacies serving 14,153/23,588 primary school children of the programme were accessible. Prescriptions from 5/10 pharmacies were available for identifying type, amount, and indication of the medicine. One pharmacy serving a defined population (n=3,513) with single healthcare provider delivering the school programme was selected for detailed evaluation and identifying individuals receiving multiple treatments.

RESULTS: Data from 10 pharmacies (n=7,889 prescriptions) showed 91.2% of prescriptions were for group A streptococcal-positive throat swab, 8.8% for skin infections. More detail from 5/10 pharmacies showed only 2% of group A streptococcal pharyngitis treatments (107/4,672) were not first-line (56 cephalexin and 51 rifampin prescriptions). Fusidic acid (159/452, 35.18%) or cephalexin (169/452, 37.39%) were most commonly used for skin infection. Analysis in the defined population showed <4% (151/4,325) of assessed skin conditions received antimicrobials, and only 6 individuals received more than one course of oral antimicrobial over the year.

CONCLUSION: Antimicrobial administration demonstrates high compliance with the protocol. There was very limited use of second-line antimicrobials for recurrent pharyngitis. Most skin infections did not require antimicrobial treatment. Repeated antimicrobials for individuals were rare.

In New Zealand, infectious diseases continue to be unequally distributed with high hospitalisation rates seen for those living in the most disadvantaged areas. In Counties Manukau District Health Board (CMDHB), skin infection is a leading cause of medical admission in school-aged children, and the rate has been increasing. Similarly, rheumatic fever rates have also been increasing nationwide up to 2010, predominately in Māori and Pacific children 5 to 14 years of age. Nurse-led school-based clinics (Mana Kidz) aiming to improve access to primary care have been implemented in CMDHB since August 2012, with a focus on skin infections and rheumatic fever prevention, by treating group A streptococcal (GAS) pharyngitis. An evaluation has recently been published which shows early
The Mana Kidz programme, provided by a network of 9 primary care providers including Primary Health Organisations (PHOs) and Non-Government Organisations (NGOs), utilised a team comprising of a registered nurse and a whānau support worker (WSW), working in school-based clinics to deliver primary healthcare services, including daily assessments and treatments for throat and skin infections. This approach was first piloted in a sample school in South Auckland, and operational guidelines were developed (Manual of Operation and Standing Orders). Since the launch in 2012, the programme has been rolled out in 61 (predominately Decile 1) schools in CMDHB, reaching around 24,000 school children (5–12 years old) of whom approximately 40% were Māori and 50% Pacific Islanders. Treatment was provided under delegated standing orders, which authorise a registered nurse to supply and administer certain prescription medicines for indications specified in the instructions, without the authorising medical practitioner being present. This was approved by the Medicine Advisory Committee (now known as the Drugs and Therapeutic Committee) of CMDHB. Periodic audits were undertaken, and resistance patterns of common microbes were monitored through the DHB and national surveillance programmes.

Antimicrobial choices were based on published literature including the Heart Foundation of New Zealand’s evidence-based, peer reviewed sore throat guideline, funding by PHARMAC, palatability and availability of elixirs and, in the case of amoxicillin, once a day medication regime to improve adherence. A brief summary of the treatment guideline is provided in Table 1.

The rising antibiotic resistance of bacteria is a major public health concern worldwide.
and in New Zealand. Increased community consumption of antimicrobials has been shown to be one of the factors driving increasing resistance.\textsuperscript{11-13} Concern has been raised that a programme such as this may have the unintended consequence of inappropriate antimicrobial use, and thus impact on antibiotic resistance patterns. At the time the programme was established, there was a dispensing charge for families to collect a prescription, and one of the priorities of the programme was that antimicrobials would be easily available if indicated, and free of charge, which has been achieved by the use of the Practitioner Supply Order (PSO). However, one of the recognised disadvantages of this approach is that the dispensing information is no longer available through the nationally-collected pharmaceutical database, which can make monitoring the patterns and trends in antimicrobial dispensing challenging.

In 2014, 23,588 school-aged (5–12 years old) students were enrolled at the 61 participating schools and consented into the Mana Kidz programme. There were 12,127 GAS pharyngitis and 13,348 skin infections treated in the programme in 2014 (some students were treated more than once), accounting for 47.6\% and 52.4\% respectively of all treatments documented by the Mana Kidz programme. However, there is no information on these treatments, such as the treatment type and antimicrobial usage. The aim of this audit is to analyse and summarise the antimicrobial dispensing pattern of the Mana Kidz programme in 2014 against agreed protocols.

**Methods**

Due to the lack of a nationally-collated database of prescribing history, pharmacies participating in the programme were approached for data. As record storage methods and disclosure policies are different between each pharmacy, only 10 out of the 18 participating pharmacies (serving approximately 14,100 students) were able to provide prescribing data. Five pharmacies serving a population of about 9,000 were evenly located in the four main geographic regions involved in the Mana Kidz programme (Manurewa, Mangere, Otara and Papakura) were included, as their prescribing data contained complete information for the purpose of this audit. The following information was extracted from each record (ie, from PSOs, standing order forms, or prescription detail reports of the pharmacy, collectively referred to as a ‘prescription’ hereafter): date, name of medicine, amount, and indication. One subset was chosen as the sample region for further detailed analysis due to the following reasons:

1. All of the nurses and whānau support workers (WSWs) conducting the programme in this subset were from the same healthcare provider—with its own operating pharmacy—that serves 3,513 children enrolled in 9 primary schools.
2. This provider has delivered the programme since February 2013, and has consistent practices and well-established recording systems to facilitate the collection of reliable data.
3. Standing order forms for the calendar year 2014 were appropriately filed and stored at this pharmacy, which provide information to an individual level. The NHI (National Health Index) number (or date of birth, if the NHI number was not available) of the patient on each prescription was captured, in order to identify repeating infections of the same individual, or multiple treatments administered for the same infection event.

The scheme of data acquisition and utilisation is summarised in Figure 1.

**Results**

**Overview of antimicrobial dispensing pattern in 2014**

23,588 students were enrolled at the 61 participating schools and consented into the Mana Kidz programme in 2014. Data collected from the 10 pharmacies covering 14,153 students (representing ~60\% of the whole population involved in the Mana Kidz programme) showed that a total of 7,889 prescriptions were filled in 2014. Amoxicillin (n=7,122, 90.3\%) was the majority among the 7,786 antimicrobial prescriptions. Other antimicrobial prescriptions comprising this dispensing volume were: cephalexin (n=365, 4.6\%), topical fusidic acid (n=159,
2.0%), erythromycin (n=69, 1.4%), rifampin (n=51, 1.1%), flucloxacillin (n=14, 0.2%) and co-trimoxazole (n=3, <0.1%). There were a small number of non-antibiotic medications, such as permethrin for treating scabies (n=103). Prescribing data from the five pharmacies selected for this audit showed that a total of 5,124 prescriptions were filled in 2014 for this population. Among them, 4,566 prescriptions (89.1%) were given for GAS-positive throat swab findings (throat swabs are only performed with symptoms), and 2.1% (n=106) were prescribed for recurrent GAS pharyngitis. A relatively small portion (n=452, 8.8%) of these prescriptions were indicated for skin infections, including impetigo (324/452, 71.7%), cellulitis (6/452, 1.3%), infected eczema (16/452, 3.5%), scabies (102/452, 22.6%) and confirmed methicillin-resistant S. aureus (MRSA) (4/452, 0.9%) infections unresponsive to first line treatments.

As shown in Table 2, of the 452 prescriptions for skin infections, 22.2% were non-antibiotic ointment for treating scabies (5% permethrin cream). As for antimicrobial prescriptions, cephalexin (n=159, 35.3%) and topical fusidic acid (n=169, 37.4%) were the most common antimicrobials prescribed for various skin infections in 2014, followed by flucloxacillin (2.9%), erythromycin (1.8%), and co-trimoxazole (less than 0.7%).

The most common antimicrobial choice for treating symptomatic GAS-positive throat infection was amoxicillin (96.7%). Cephalexin and rifampin were used to treat recurrent GAS-positive throat swab findings within 3 months, and accounted for 1.2% (n=56) and 1.1% (n=51) of all the prescriptions, respectively. Less than 1% of the throat infection cases (n=46, 0.98%) were treated with erythromycin.

With detailed information enabling analysis at an individual level, a sample subset was used for identifying repeating infections in the same individual, and multiple treatments for a single infection.

Population-based analysis in the sample subset

In 2014, total of 3,513 children were enrolled and consented into the programme in this sample subset of 9 schools. Data from this subset show a total of 1,921 GAS-positive throat swabs were found in 2014, and 1,384 cases received treatment within the programme, while the rest obtained medical care from their GPs. It is important to note that in July 2014 a supply issue (due to a recall of the funded brand) made amoxicillin
Table 2: Number and percentage of each medication dispensed for skin or throat infection in 2014. (Data from n=5 pharmacies).

<table>
<thead>
<tr>
<th>Skin infection treatments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalexin</td>
<td>169 (37.39%)</td>
</tr>
<tr>
<td>Fusidic acid</td>
<td>159 (35.25%)</td>
</tr>
<tr>
<td>Flucloxacillin</td>
<td>13 (2.88%)</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>8 (1.77%)</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>3 (0.67%)</td>
</tr>
<tr>
<td>Non-antibiotics</td>
<td>100 (22.17%)</td>
</tr>
<tr>
<td>Total</td>
<td>452</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Throat infection treatments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>4,519 (96.73%)</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>46 (0.98%)</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>56 (1.21%)</td>
</tr>
<tr>
<td>Rifampicin</td>
<td>51 (1.09%)</td>
</tr>
<tr>
<td>Total</td>
<td>4,672</td>
</tr>
</tbody>
</table>

temporarily unavailable to the programme. While the programme has protocols to ensure such students source treatment from alternative suppliers, the records cannot be captured for this audit. A total of 4,325 cases of skin conditions were assessed by Mana Kidz staff; of the 3,860 cases that were deemed required treatment, 3,677 were treated with cleaning and covering only, another 32 cases were treated with non-antibiotic ointment such as permethrin, leaving 4% (151/3,860) of skin conditions treated with an antimicrobial.

Numbers of prescriptions by medication and indication are summarised for this subset in Figure 2. In line with the overall antimicrobial dispensing pattern of this audit (shown in Table 2), amoxicillin is the most commonly used medicine for treating GAS pharyngitis (1,323/1,384, 96%), followed by cephalexin (30/1,384, 2%). A total of 61 children received antimicrobials other than amoxicillin for a GAS-positive throat swab culture (4.41% of the 1,384 prescriptions) through the Mana Kidz programme. Of these children, 16 were treated with erythromycin (1.06%), and the other 45 prescriptions (3.25%) were cephalexin or rifampicin, reflecting the recurrent throat infection rate in this population. One child was treated three times with erythromycin, with intervals of 16 and 3 weeks between each prescription.

As for skin infection, topical antimicrobial fusidic acid is the most commonly used medication (85/183, 46.4%), followed by cephalexin (52/183, 27.9%) and non-antibiotic permethrin lotion (32/183, 17.5%). Among the less commonly used medications, erythromycin accounted for 4.4% (8/183) of all skin infection prescriptions. Co-trimoxazole and flucloxacillin prescriptions were the least common among the 6 medications (both 3/183, 1.6%). Impetigo was the most common skin condition that required medication (122 out of the 183 cases in total), followed by scabies (34 cases), and infected eczema (16 cases). There were 6 cellulitis cases and 4 positive MRSA findings (skin swabs for culture are only performed when a skin infection fails to respond to treatment) treated with antimicrobials. In all, only five children received two courses of oral antimicrobials, and one child received three courses of oral antimicrobials for a skin infection in this sample subset in 2014.

Of all the impetigo cases, 58.7% were treated with topical fusidic acid, 34.7% with cephalexin, and 3.3% with either erythromycin or flucloxacillin. One impetigo case was treated with co-trimoxazole. All cellulitis cases were treated with cephalexin, whereas infected eczema was mostly treated with topical fusidic acid (75%). Although the majority of scabies cases were treated by non-antibiotic ointments, two out of the 32 scabies cases received topical fusidic acid concurrently. The rare occasions of positive MRSA infections (skin swabs for culture are not routine care) were treated with either erythromycin or co-trimoxazole (2 cases each).

Discussion

The Mana Kidz programme has been highly accepted in the community since its launch in 2012. The high consent rate (94%) and the timely action taken by registered nurses (throat swab results were usually obtained within 48 hours, and medications given within 24 hours upon confirmation of the infection) ensure throat and skin infection were treated effectively and per protocol.
The programme provides children in Counties Manukau access to primary health care for common conditions, and there is evidence to suggest that it is lowering disease burden in this population. In 2014, a high number of treatments were provided through the programme (12,127 GAS pharyngitis cases and 13,348 skin assessments) for this population of approximately 24,000 children, but no information was given on the medication used. Due to the national and global concern on continuous rise of antimicrobial resistance, this audit utilised pharmacy data to evaluate antimicrobial dispensing by the programme. Considering the evenly-distributed geographical location and provider association of the pharmacies involved in this audit, the pattern of antimicrobial usage demonstrated by this analysis is likely to be representative of the whole programme. Furthermore, using a detailed dataset from a defined population served by one pharmacy, this audit was able to provide information about antimicrobial usage on an individual level.

Antimicrobial dispensing by the Manakidz programme displays high compliance with the operating guidelines in terms of treatment options and frequencies, reflecting condition-appropriate antimicrobial prescribing sanctioned at the start of the programme. Second-line antimicrobials were used sparingly for repeated GAS pharyngitis, and most skin conditions did not receive either topical or oral antimicrobials, but instead were treated with cleaning and covering of the lesions.

This audit found an important protocol deviation that is now being rectified. According to the Manual of Operations supporting the nurse-led clinics and the use of antimicrobials by delegated authority, the agreed approach for skin infection management was that topical fusidic acid alone should be used for infections with localised lesions, while oral cephalaxin is reserved for more extensive conditions. This audit found simultaneous use of the two antimicrobials in 12 cases, although this might be explained by the severity of the infection was on borderline between these two treatment suggestions.

In a previous review of sore throat management in New Zealand general practice, data collected from the National Primary Medical Care Survey showed that 61% of sore throat patients, which consisted mostly of Māori and Pacific children aged 5–14 years, were prescribed...
an antimicrobial, while much less throat swabbing (6.6%) was done in this cohort. With the higher prevalence of viral causes of sore throat, administration of antimicrobials without confirmation of the infection agent could be an underlying cause of antimicrobial overuse. It is acknowledged that an up-to-date general practice audit would be informative following the recent increased messaging and guideline availability on pharyngitis management in populations at high and low risk. The New Zealand Heart Foundation’s GAS sore throat management guideline emphasised that throat swabbing remains the gold standard for diagnosing GAS pharyngitis, and is especially recommended for symptomatic school-aged subjects. In the protocol-driven Mana Kidz Programme, school children were only treated with confirmed GAS-positive throat swab, suggesting the practice of this programme can deliver appropriate antimicrobial treatments at the primary healthcare level. It is acknowledged some of these may represent GAS carriage in the context of a viral sore throat. However, this still results in far less antimicrobial being used than if a sore throat was the only criterion for treatment.

This audit showed that the majority antimicrobials prescribed were the first-line treatment, amoxicillin. In the period for this audit (2014), cephalexin (as alternative when available by Standing Orders) was used when a third consecutive pharyngeal GAS isolate was found within 3 months; on a case-by-case basis, rifampin combined with amoxicillin (prescribed outside the programme) was used when a fourth consecutive throat swab culture positive for GAS was found. Management for recurrent GAS pharyngitis has been modified from early 2015 to further reduce rifampin use. The new algorithm for treating the third GAS-positive swab is intramuscular (IM) penicillin, direct observed therapy (DOT) of amoxicillin or oral cephalexin. Rifampin combined with amoxicillin or alternative antimicrobial is only used for persistent GAS pharyngitis confirmed by post-treatment swab.

Regarding skin infection, in 2014 the total number of skin conditions assessed at the 61 Mana Kidz schools was 20,586, and the total number of skin infection recorded as ‘treated’ by the programme was reported to be 13,348. One aim of this audit project is to differentiate treatment by cleaning and covering, as well as non-antibiotic treatment, from antimicrobial treatment. Data from the sample subset provide detailed information to the individual level for this objective, which suggest the majority of the skin conditions (more than 95%) received conservative treatments without the use of antimicrobials. The significant difference between the number of skin conditions assessed and the number of cases requiring medical treatment also indicates that the self-report rate of skin conditions by school children was high. During this audit it was found that a large number of these self-reported cases were superficial lesions such as scratches, insect bites or old scabs, which could be managed with conservative treatment (cleaning and covering) or required no treatment. Furthermore, only a small number of students received more than one antimicrobial from the programme for their skin infections within this 1-year period. There is ongoing research looking at the impact of the programme on skin infection hospitalisations, and the results will provide a useful outcome measurement for the programme.

To date, globally, no penicillin-resistant GAS isolate has been observed, and erythromycin resistance is low in New Zealand. However, it has been reported that the high usage of topical fusidic acid is associated with a clonal expansion of fusidic acid-resistant Staphylococcus aureus strain in New Zealand. The use of topical fusidic acid in this programme is worthy of reflection, as most fusidic acid prescriptions were filled for impetigo as a first-line treatment. Impetigo can be caused by Staphylococcus aureus, Streptococcus pyogenes, or the combination of the two. The relative contribution of the two bacteria in impetigo has not been studied in New Zealand. As swabs from skin lesions for culture are rare in this programme, we have no data on treatment failure and the need to progress to an oral antimicrobial due to known antimicrobial resistance. The latest Cochrane review finds the evidence for efficacy of alternative treatment options for impetigo, such as disinfecting solutions, is still insufficient. Topical fusidic acid is currently...
the only fully-funded topical antimicrobial indicated for treating minor impetigo in New Zealand, and is better accepted in the community while causing less and milder side effects than oral antimicrobials. Therefore, the benefits of using fusidic acid in an area with high disease prevalence need to be weighed against the risk of increasing antimicrobial resistance.

This audit is conducted as an on-going part of the programme among other review procedures, and a further audit of antimicrobial usage for 2015 is planned (funding permitting). Data from the pharmacies compensate the lack of nationally-collated database of prescribing history. The major limitation of this audit was the pharmacy data were not intended for this purpose in the first place, therefore due to the variations between each pharmacy’s data documentation and storage, this audit could only provide a summary with reasonable estimations. The lack of an appropriate national database and established benchmarks for comparison is a common challenge for antimicrobial stewardship.

Conclusion
Antimicrobial dispensing data sampled from the 5 participating pharmacies provide information on the pattern and trend of antimicrobial use for the programme. Antimicrobial administration for throat and skin infections demonstrates high compliance with the protocol. Further investigation in the sample dataset shows that the prescribing pattern is conservative, and repeating exposure per person is uncommon, suggesting antimicrobials are used judiciously in this programme.

It has been reported that the burden of infectious disease in the CMDHB population translates into high community antimicrobial use. This antimicrobial stewardship audit provides affirmation that the implementation of the Mana Kidz programme does not lead to excessive prescribing of second-line antimicrobials in CMDHB. In fact, if the school-based clinics are effective in lowering infectious disease prevalence by improving primary healthcare accessibility, and there is high compliance to the protocol, then it can be concluded that the programme supports judicious antimicrobial use in this population.
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Nil

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Author information:
Jia-Yun Catherine Tsai, Molecular Medicine and Pathology, University of Auckland; Philippa Anderson, Public Health Team, Counties Manukau District Health Board, Auckland; Laura Broome, Tamariki Outcome Initiatives, National Hauora Coalition, Auckland; Tracy McKee, National Hauora Coalition, Auckland; Diana R Lennon, Paediatrics: Child & Youth Health, The University of Auckland, New Zealand.

Corresponding author:
Jia-Yun Catherine Tsai, Research Fellow, Department of Molecular Medicine and Pathology, The University of Auckland, Grafton Campus, School of Medical Sciences, Private Bag 92019, Auckland, 1023, New Zealand.
j.tsai@auckland.ac.nz

URL:

REFERENCES:


Pharmacological therapy following acute coronary syndromes in patients with atrial fibrillation: how do we balance ischaemic risk with bleeding risk?

Aimee L Fake, Scott A Harding, Philip P Matis, Peter D Larsen

**ABSTRACT**

**BACKGROUND:** Dual anti-platelet therapy (DAPT) with aspirin and a P2Y₁₂ receptor antagonist is standard of care following an acute coronary syndrome (ACS), as it has been shown to reduce recurrent myocardial infarction (MI) and death. In atrial fibrillation (AF) patients, the use of oral anticoagulants (OACs) is the standard of care as these agents have been shown to reduce the risk of stroke and death. Current guidelines suggest that decisions around antithrombotic therapy should be made by assessing ischaemic and bleeding risks. The aim of this study was to examine current pharmacotherapy of AF inpatients with ACS.

**METHODS:** We prospectively enrolled ACS patients being managed invasively with a medical history of AF, or those in AF during admission ECG, from the pre-existing Wellington ACS registry. Enrolment criteria included pre-treatment on DAPT. Demographics, clinical characteristics, management, in-hospital outcomes and discharge medications were recorded.

**RESULTS:** At discharge, only 11.8% of AF patients were prescribed an OAC and this was not related to risk of stroke (CHA₂DS₂-VASc score), bleeding (CRUSADE score) or any other clinical characteristics. However, discharge OAC use was associated with whether the patient was treated with an OAC at admission (OR 14, CI 3.4–58, p=0.001). DAPT was the default discharge treatment and occurred in 72% of AF patients. A moderate correlation between stroke risk and bleeding risk was identified ($r_s=0.68$, $p=0.01$). A group of 44 (47%) patients were identified who were at high risk of stroke (CHA₂DS₂-VASc ≥2) and low risk of bleeding (CRUSADE score ≤30).

**CONCLUSION:** At discharge we observed a very low rate of OAC prescription. Despite most AF patients being high risk for stroke, DAPT was the preferred treatment option. Our data suggests there is a group of patients with high stroke risk and relatively low bleeding risk, in who OAC use may be appropriate. Developing a guideline to assist clinicians in targeting this group of patients may help improve outcomes in AF patients following MI.

Atrial fibrillation (AF) is the most commonly sustained cardiac rhythmia, affecting 1–2% of the general population, with rates projected to increase as the population ages. AF is associated with an increased risk of ischaemic stroke, and oral anticoagulants (OACs) are the mainstay preventative therapy for AF patients to reduce this risk. In addition to stroke risk, 25–35% of AF patients also have coronary artery disease, putting them at risk of experiencing an acute coronary syndrome (ACS). Following an ACS event, dual anti-platelet therapy (DAPT) is the standard of care as this therapy has been shown to reduce recurrent cardiovascular events and mortality. Administering an OAC and DAPT (triple therapy) to AF patients who suffer an ACS provides protection from both thromboembolic and atherothrombotic events,
but carries a significantly increased risk of major bleeding.4

Defining optimal medical therapy for patients with AF and ACS is complicated by the variety of drugs that can constitute triple therapy and the corresponding lack of clinical trials evaluating safety and efficacy. Since the 1950s vitamin K antagonists (VKAs), particularly warfarin, have been the OAC of choice, but the recently developed non-VKA oral anticoagulants (NOACs) show superiority with regard to patient convenience and efficacy, with no increase in bleeding events.7-10 For treatment of ACS, aspirin and clopidogrel have been standard of care, but the introduction of the adenosine diphosphate P2Y12 receptor antagonists prasugrel and ticagrelor, have added complexity to DAPT. There have been a small number trials assessing triple therapy for the treatment of ACS which have yielded mixed results.11-14 However, these findings are not necessarily applicable to AF patients, and their unique antithrombotic requirements.

When AF patients present with ACS, current guidelines recommend balancing both ischaemic and bleeding risk, and tailoring pharmacotherapy accordingly.15-17 This study was undertaken to examine current practice in managing AF patients with ACS, and to determine whether use of OACs in this group appears to be based on an assessment of ischaemic and bleeding risk.

Methods

Patient enrolment

We identified a cohort of AF patients from within the pre-existing Wellington ACS registry. Patients eligible for enrolment into the registry were those presenting to Wellington Regional Hospital with an ACS that had been adequately pre-treated with DAPT (chronic therapy with aspirin (≥75mg/day) and either clopidogrel (≥75mg/day) or ticagrelor (90mg/bd), or, loading doses of ≥300mg aspirin (at least 2 hours prior) and either ≥300mg clopidogrel (at least 6 hours prior) or 180mg ticagrelor (at least 1.5 hours prior). Risk of stroke for AF patients was calculated on admission and at discharge (including index event) using the CHA2DS2-VASc assessment tool;18 a score of ≥2 = high risk, 1 = intermediate risk and 0 = low risk. Bleeding risk was calculated post-admission using the CRUSADE bleeding score;19 a score of ≤20 = very low risk, 21–30 = low risk, 31–40 = moderate risk, 41–50 = high risk and >50 = very high risk. The CHA2DS2-VASc assessment tool and CRUSADE bleeding score can be seen in the Appendix. Admission medication was defined as the patients’ regular medication prior to index admission. Discharge medication was defined as the medication
prescribed at the time of discharge from Wellington Regional Hospital.

Statistical analysis
Categorical variables are expressed as frequencies and percentages. Continuous variables are expressed as mean and standard deviation. We compared characteristics of AF and non-AF patients using chi-squared tests for dichotomous data and independent t-tests for continuous data. Use of oral anticoagulants was examined for dichotomous data using binary logistic regression and continuous data using independent t-tests. Risk scores were analysed using Spearman rank tests. For all statistical analyses a p-value ≤0.05 was considered significant. All statistical tests were performed using SPSS version 22 (IBM, Armonk, NY).

Results

Patient characteristics
Many characteristics of the AF cohort (n=93) differed compared to the non-AF patients (n=997) and this data is shown in Table 1. The AF cohort was older (mean age in years 69.8 ± 9.6 vs 62.4 ± 11, p=0.001), however there was no difference seen in percentage female or body mass index between the two groups. All AF patients were considered to have non-valvular AF as none had greater than mild valve disease, nor had received valve replacement surgery.

In the AF cohort, the predominant presenting ACS was non-ST segment elevation myocardial infarction (75.3%) followed by ST segment elevation myocardial infarction (18.3%) and unstable angina (6.5%) Overall, post angiography clinical management was as follows: medical therapy in 45.2%; percutaneous coronary intervention (PCI) in 45.2%; and the remaining 9.7% received coronary artery bypass grafting (CABG).

Drug therapy
The use of OACs in the AF cohort was low. Of the patients with a known history of AF (n=77), a total of 15 (19.5%) patients were on an OAC at admission for the treatment of AF (not for any other clinical indication). It is possible that the enrolment requirement of being on DAPT contributed to a sampling bias, as it is possible that patients on OAC may have been less likely to receive DAPT. Admission OAC was OAC alone in 12 (15.6%) patients, and an OAC/aspirin combination in 3 (3.9%) patients (Table 2). Admission OAC use was not related to risk of stroke as defined by the patients admission CHA\textsubscript{2}-DS\textsubscript{2}-VASc risk score (OR 1.3, CI 0.93–2, p=0.116).

Based on admission, CHA\textsubscript{2}-DS\textsubscript{2}-VASc calculations 6.5% of the AF cohort were

Figure 1: Flow diagram of the patient selection process.
Table 1: Demographics and clinical characteristics.

<table>
<thead>
<tr>
<th></th>
<th>AF/ACS patients n=93</th>
<th>Non-AF/ACS patients n=997</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEMOGRAPHICS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (year, mean ± SD)</td>
<td>69.8 ± 9.6</td>
<td>62.4 ± 11</td>
<td>0.001</td>
</tr>
<tr>
<td>Female</td>
<td>29 (31.2)</td>
<td>298 (29.9)</td>
<td>0.800</td>
</tr>
<tr>
<td>BMI (mean ± SD)</td>
<td>30.1 ± 5.1</td>
<td>29.2 ± 5.6</td>
<td>0.130</td>
</tr>
<tr>
<td><strong>STROKE RISK FACTORS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous stroke/TIA</td>
<td>12 (12.9)</td>
<td>63 (6.3)</td>
<td>0.017</td>
</tr>
<tr>
<td>Hypertension</td>
<td>77 (83)</td>
<td>598 (60)</td>
<td>0.001</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>6 (6.5)</td>
<td>23 (2.3)</td>
<td>0.018</td>
</tr>
<tr>
<td>Diabetes</td>
<td>29 (31.2)</td>
<td>184 (18.5)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Vascular Disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous MI</td>
<td>34 (36.6)</td>
<td>231 (23.2)</td>
<td>0.004</td>
</tr>
<tr>
<td>Peripheral artery disease</td>
<td>7 (7.5)</td>
<td>73 (7.3)</td>
<td>0.940</td>
</tr>
<tr>
<td><strong>CARDIOVASCULAR RISK</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperlipidaemia</td>
<td>69 (74.2)</td>
<td>643 (64.5)</td>
<td>0.067</td>
</tr>
<tr>
<td>Current smoker</td>
<td>8 (8.6)</td>
<td>226 (22.7)</td>
<td>0.002</td>
</tr>
<tr>
<td>Angina</td>
<td>29 (31.2)</td>
<td>238 (23.9)</td>
<td>0.106</td>
</tr>
<tr>
<td>Prior PCI</td>
<td>15 (16.1)</td>
<td>147 (14.7)</td>
<td>0.723</td>
</tr>
<tr>
<td>Prior CABG</td>
<td>9 (9.7)</td>
<td>68 (6.8)</td>
<td>0.305</td>
</tr>
<tr>
<td>Angiogram showing CAD</td>
<td>26 (28)</td>
<td>205 (20.6)</td>
<td>0.098</td>
</tr>
<tr>
<td>Family History CAD</td>
<td>25 (26.9)</td>
<td>374 (37.5)</td>
<td>0.040</td>
</tr>
</tbody>
</table>

BMI = body mass index; TIA = transient ischaemic attack; MI = myocardial infarction; PCI = percutaneous coronary intervention; CABG = coronary artery bypass graft; CAD = coronary artery disease.

At discharge CHA<sub>2</sub>DS<sub>2</sub>-VASc calculations included the index event and therefore no patient was at low risk of stroke, while 6.5% of patients were at intermediate risk of stroke and 93.5% at high risk of stroke. Discharge OAC use was observed in high-risk patients only (Figure 2). The clinical management of each patient, be it medical therapy, PCI or CABG surgery, was not associated with the discharge use of OAC.

OAC use in the AF cohort at discharge (n=93) was again low with 11 patients (11.8%) discharged on an OAC; this was OAC alone (2 patients), OAC and aspirin (4 patients), and OAC and P2Y12 inhibitor (5 patients) (Table 3). Discharge OAC use was not related to discharge CHA<sub>2</sub>DS<sub>2</sub>-VASc score, nor to any other clinical characteristic. However, discharge on an OAC was more likely in patients treated with an OAC prior to admission (OR 14, CI 3.4-58, p=0.001). No patient was discharged on OAC and DAPT (triple therapy) in this cohort (Table 3).

At discharge DAPT was the most common treatment regime. A total of 67 (72%) patients in this cohort were discharged on DAPT, 83.3% of intermediate risk patients and 71.3% of high-risk patients (Table 3).
Table 2: Pre-existing drug therapy prior to ACS admission.

<table>
<thead>
<tr>
<th>CHA_DS_VASc risk (score)</th>
<th>Admission</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (0) n=5 (%)</td>
<td>Intermediate (1) n=8 (%)</td>
<td>High (≥2) n=64 (%)</td>
<td>Total n=77 (%)</td>
</tr>
<tr>
<td>OAC use</td>
<td>0</td>
<td>0</td>
<td>15 (23.4)</td>
<td>15 (19.5)</td>
</tr>
<tr>
<td>OAC alone</td>
<td>-</td>
<td>-</td>
<td>12 (18.8)</td>
<td>12 (15.6)</td>
</tr>
<tr>
<td>OAC + aspirin</td>
<td>-</td>
<td>-</td>
<td>3 (4.7)</td>
<td>3 (3.9)</td>
</tr>
<tr>
<td>OAC + P2Y_12 inhibitor</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>OAC + DAPT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aspirin</td>
<td>3 (60)</td>
<td>1 (12.5)</td>
<td>29 (45)</td>
<td>33 (42.9)</td>
</tr>
<tr>
<td>DAPT</td>
<td>0</td>
<td>0</td>
<td>6 (9.4)</td>
<td>6 (7.8)</td>
</tr>
<tr>
<td>Aspirin + Clopidogrel</td>
<td>-</td>
<td>-</td>
<td>5 (7.8)</td>
<td>5 (6.5)</td>
</tr>
<tr>
<td>Aspirin + Ticagrelor</td>
<td>-</td>
<td>-</td>
<td>1 (1.6)</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>Nil</td>
<td>2 (40)</td>
<td>7 (87.5)</td>
<td>14 (22)</td>
<td>23 (29.9)</td>
</tr>
</tbody>
</table>

OAC = oral anticoagulant; DAPT = dual anti-platelet therapy.

Table 3: Discharge drug therapies.

<table>
<thead>
<tr>
<th>CHA_DS_VASc risk (score)</th>
<th>Discharge</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (0) n=0</td>
<td>Intermediate (1) n=6 (%)</td>
<td>High (≥2) n=87 (%)</td>
<td>Total n=93 (%)</td>
</tr>
<tr>
<td>OAC use</td>
<td>0</td>
<td>0</td>
<td>11 (12.7)</td>
<td>11 (11.8)</td>
</tr>
<tr>
<td>OAC alone</td>
<td>-</td>
<td>-</td>
<td>2 (2.3)</td>
<td>2 (2.2)</td>
</tr>
<tr>
<td>OAC + aspirin</td>
<td>-</td>
<td>-</td>
<td>4 (4.6)</td>
<td>4 (4.3)</td>
</tr>
<tr>
<td>OAC + P2Y_12 inhibitor</td>
<td>-</td>
<td>-</td>
<td>5 (5.7)</td>
<td>5 (5.4)</td>
</tr>
<tr>
<td>OAC + DAPT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aspirin</td>
<td>0</td>
<td>1 (16.7)</td>
<td>13 (15)</td>
<td>14 (15.1)</td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>0</td>
<td>0</td>
<td>1 (1.1)</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td>DAPT</td>
<td>0</td>
<td>5 (83.3)</td>
<td>62 (71.3)</td>
<td>67 (72)</td>
</tr>
<tr>
<td>Aspirin + Clopidogrel</td>
<td>-</td>
<td>5 (83.3)</td>
<td>55 (63.2)</td>
<td>60 (65)</td>
</tr>
<tr>
<td>Aspirin + Ticagrelor</td>
<td>-</td>
<td>-</td>
<td>7 (8)</td>
<td>7 (7.5)</td>
</tr>
</tbody>
</table>

OAC = oral anticoagulant; DAPT = dual anti-platelet therapy.
DAPT was predominantly a combination of aspirin and clopidogrel, and in a small number of patients, aspirin and ticagrelor. No patient was discharged on DAPT with aspirin and prasugrel in this cohort.

Bleeding Risk
CRUSADE bleeding scores were calculated for each AF patient after the index admission. Figure 3 shows a significant relationship between CRUSADE bleeding score and CHA2DS2-VASc score; that is, as risk of bleeding increases so does risk of stroke ($r=0.683$, $p=0.01$). All patients who were at moderate (22, 23.7%) or high/very high (21, 22.6%) risk of bleeding were also at high risk of stroke. However, there was a group of patients who were at high risk of stroke and low/very low risk of bleeding (44, 47.3%), who may have been suitable candidates for OAC therapy. Risk of bleeding based on CRUSADE scores was not related to whether a patient was discharged on an OAC (OR 1.01, CI 0.96–1.05, $p=0.818$).

Discussion
There is limited information available about how patients with the combination of AF and ACS are being currently managed.
There are many therapeutic options, and decision making is complex in this group of patients. In our study of patients with AF and ACS, we observed low use of OACs prior to hospital admission. Furthermore, OAC use at discharge was lower again, with DAPT being the predominant discharge regime. Prescription of an OAC at discharge did not appear to be based on stroke or bleeding risk analysis, or any other identifiable clinical factors. The probability of being discharged on an OAC was substantially higher if the patient was on an OAC at admission.

At the time of hospital admission, only 19.5% of patients with a known history of AF were on an OAC. In the group classified as high risk on the basis of CHA\textsubscript{2}DS\textsubscript{2}-VASc score, only 23% were on an OAC. Guideline recommended therapy for patients with AF and CHA2DS2-VASc score of 2 or more is OAC therapy.\textsuperscript{15,16} Despite this, significant underutilisation of OACs in eligible AF patients has been widely reported,\textsuperscript{20-24} similar to that seen in our cohort. In addition, of those admitted on an OAC, most (10/15) were on warfarin treatment despite randomised trials demonstrating the superiority of NOACs compared to warfarin therapy,\textsuperscript{7,18} and the availability of dabigatran through New Zealand government funding since 2011.\textsuperscript{25} Our study has not examined reasons for the low use of OACs in the AF patient group. It is possible that a selection bias has been introduced due to enrolment criteria, specifically pre-treatment on DAPT, and this has resulted in fewer patients on long-term anticoagulation entering the study. In addition to this, previous reports have suggested that a lack of knowledge of trials and guidelines, and overestimation of potential contraindications and risk, including fear of bleeding, may contribute to low OAC prescription rates.\textsuperscript{21}

On discharge from hospital following an ACS event, we observed an even lower rate of OAC prescription in AF patients at high risk of stroke. In our cohort, only 12% of such patients were prescribed an OAC. Use of an OAC was not related to ischaemic risk (CHA\textsubscript{2}DS\textsubscript{2}-VASc score) or bleeding risk (CRUSADE score), nor to any other clinical characteristic. This is despite consensus that decisions regarding OAC therapy should be based on careful considerations of stroke and bleeding risk.\textsuperscript{26,27} The only statistically significant factor contributing to discharge OAC prescription in our cohort was whether the patient was admitted on an OAC. We did identify a group of patients with high risk of stroke and low or very low risk of bleeding on the basis of risk scores, and in theory this is the group who may have had greatest opportunity to benefit from OAC use with lowest risk of potential harm. When OACs were prescribed a variety of strategies were used, including with or without a single anti-platelet agent (aspirin or P2Y\textsubscript{12} inhibitor). No triple therapy was observed in this cohort.

DAPT was the predominant discharge regime and was prescribed to 72% of patients. Given that clinical guidelines advocate DAPT as best practice for post-ACS patients, and de-emphasise the use of OACs due to risk of bleeding, this result is not entirely surprising.\textsuperscript{28-31} While DAPT may offer some protection from stroke in AF patients, antiplatelet agents do not prevent the activation of coagulation factors that play a greater role in the development of fibrin-rich thrombi, as seen in AF,\textsuperscript{32} and are not as effective as OAC at preventing stroke.\textsuperscript{33,34} The evidence base for optimal treatment of AF patients with ACS is limited, and current guideline recommendations may not provide practical means of determining which combination of agents is optimal.

**Limitations**

Firstly, as enrolment criteria for the Wellington ACS registry, and therefore this study, included adequate pre-treatment on DAPT, we may have introduced a selection bias in our AF cohort. AF patients on OAC may have been less likely to be given DAPT due to concerns regarding bleeding risk. If this was the case, then our cohort may under-represent the use of OAC in AF patients in our community. Secondly, we did not collect information regarding the presence of possible contraindications to OAC use and it is possible that contraindication account for some of the gap in prescribing. In estimating bleeding risk, we have used an ACS-based bleeding risk score (CRUSADE) rather than a bleeding score developed for AF patients on OAC (such as HAS-BLED\textsuperscript{35}). Bleeding risk scores have
been developed for either AF or ACS, but not the combination of AF and ACS. Use of an AF-based bleeding score may have identified a slightly different cohort as having low bleeding risk.

**Conclusion**

In our cohort of AF patients who experienced an ACS, we observed very low rates of OAC use despite most patients being at high risk of stroke. Notwithstanding, evidence in favour of NOACs, warfarin was the most commonly prescribed OAC on admission. Post-ACS, discharge OAC use was lower again, with DAPT the predominant discharge regime. Use of OACs was not driven by ischaemic or bleeding risk. Our data suggests there is a group of patients with high stroke risk and relatively low bleeding risk, in whom OAC use may be appropriate. Developing more specific guidelines or decision support tools to assist clinicians in targeting this group of patients may help improve outcomes in AF patients following MI.

**Appendix**

### CRUSADE bleeding score

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Score</th>
<th>Bleeding risk</th>
<th>Predictor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline haematocrit, %</strong></td>
<td></td>
<td></td>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>90–100</td>
<td>0</td>
<td>≤20 = very low risk</td>
<td>Male</td>
<td>0</td>
</tr>
<tr>
<td>81–100</td>
<td>2</td>
<td>21–30 = low risk</td>
<td>Female</td>
<td>8</td>
</tr>
<tr>
<td>72–80</td>
<td>3</td>
<td>31–40 = moderate risk</td>
<td>Signs of CHF at presentation</td>
<td></td>
</tr>
<tr>
<td>63–70</td>
<td>5</td>
<td>41–50 = high risk</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>54–60</td>
<td>7</td>
<td>&gt;50 = very high risk</td>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>≥50</td>
<td>10</td>
<td></td>
<td>Prior vascular disease**</td>
<td></td>
</tr>
<tr>
<td><strong>Creatinine clearance, * mL/min</strong></td>
<td></td>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>≤15</td>
<td>39</td>
<td></td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>16–30</td>
<td>35</td>
<td></td>
<td>Diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td>&gt;30–60</td>
<td>28</td>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>&gt;60–90</td>
<td>17</td>
<td></td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>&gt;90–120</td>
<td>7</td>
<td></td>
<td>Systolic blood pressure, mmHg</td>
<td></td>
</tr>
<tr>
<td>&gt;120</td>
<td>0</td>
<td></td>
<td>≤90</td>
<td>10</td>
</tr>
<tr>
<td><strong>Heart rate (bpm)</strong></td>
<td></td>
<td></td>
<td>91–100</td>
<td>8</td>
</tr>
<tr>
<td>70–80</td>
<td>18</td>
<td></td>
<td>101–120</td>
<td>5</td>
</tr>
<tr>
<td>81–90</td>
<td>3</td>
<td></td>
<td>121–180</td>
<td>1</td>
</tr>
<tr>
<td>91–100</td>
<td>6</td>
<td></td>
<td>181–200</td>
<td>3</td>
</tr>
<tr>
<td>101–110</td>
<td>8</td>
<td></td>
<td>≥201</td>
<td>5</td>
</tr>
<tr>
<td>111–120</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥121</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHF indicates congestive heart failure.

*Creatinine clearance was estimated with the Cockcroft-Gault formula.

**Prior vascular disease was defined as history of peripheral artery disease or prior stroke.
ARTICLE

CHA\textsubscript{DS}\textsubscript{2}-VASc stroke risk score

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Score</th>
<th>Stroke risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>1</td>
<td>0 = Low risk</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>1 point = Intermediate risk</td>
</tr>
<tr>
<td>Age &gt;75 years</td>
<td>2</td>
<td>High risk = ≥2 points</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stroke/TIA/embolism history</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Vascular disease</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Age 65–74 years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sex category female</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Max total</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

0 = Low risk
1 point = Intermediate risk
High risk = ≥2 points


6. Capodanno D, Angiolillo DJ. Management of antiplatelet and anticoagulant therapy in patients

Competing interests:
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Author information:
Aimee L Fake, PhD candidate, Department of Surgery and Anaesthesia, University of Otago, Wellington; Scott A Harding, Cardiologist, Department of Cardiology, Wellington Regional Hospital; Philip P Matsis, Cardiologist, Department of Cardiology, Wellington Regional Hospital; Peter D Larsen, Associate Professor, Department of Surgery and Anaesthesia, University of Otago, Wellington.

Corresponding author:
AL Fake, University of Otago, Wellington, PO Box 7343, Wellington, New Zealand.
aimee.fake@otago.ac.nz

URL:


ARTICLE


ARTICLE

A national survey of cardiac rehabilitation services in New Zealand: 2015
Geoff Kira, Fiona Doolan-Noble, Grace Humphreys, Gina Williams, Helen O’Shaughnessy, Gerry Devlin

ABSTRACT
AIMS: Guidelines for cardiac rehabilitation (CR) programmes inform best practice. In Aotearoa New Zealand, little information exists about the structure and services provided by CR programmes and there is a poor understanding of how existing CR programmes are delivered with respect to evidence-based national guidelines.

METHODS: All 46 CR providers in New Zealand were invited to participate in a national survey in 2015. The survey sought information on the following: unit structure; referral processes; patient assessment; audit (including quality assurance activity); Phase 2 CR content; and support for special populations. Simple descriptive analysis of the responses was conducted, involving forming counts and percentages.

RESULTS: Thirty-six distinct units completed the survey and 94% provided Phase 2. Assessment tools, Phase 2 educational components, and the methods of providing the exercise component varied. Most units audited their services, 25% audited their programme six-monthly or more frequently. Just over half of the units (56%) reported key performance indicators.

CONCLUSIONS: The survey identified variations in delivery and content of CR in New Zealand, with poor understanding of the impact on patient outcomes. This is likely due to the absence of standardised audit practices and routine collection of key performance indicators on a national basis.

Cardiac rehabilitation (CR) has the aim of improving and maintaining patient’s wellbeing following a cardiac event. The effectiveness of CR to improve patients’ health outcomes is well studied and documented.1,2 This evidence base has been used to inform multiple international CR guidelines.3-6 In Aotearoa New Zealand, there is little knowledge about whether CR services are providing programmes as recommended by evidence-based guidelines.4 This article establishes the current state of CR services with reference to the CR guidelines of New Zealand.4

Typically there are three phases of CR in New Zealand: inpatient rehabilitation (Phase 1); outpatient rehabilitation (Phase 2); and long-term maintenance (Phase 3).4 Phase 1 includes early mobilisation and education, with inclusion of the family. Phase 2 consists of an exercise component and education sessions, which may be conducted as a group, one-on-one or with family, and is delivered by a multi-disciplinary team. Phase 3 is hosted by independent community cardiac clubs, with the assistance of the Heart Foundation of New Zealand (HFNZ).7

The New Zealand CR guidelines primarily focus on Phase 2, and are consistent with evidence-based CR guidelines from Australia, the UK, and the US.3-6 The guidelines4 recommend that ongoing follow-up and support is provided, and that programmes are tailored to meet the individual needs of the patient and their family. A comprehensive Phase 2 CR programme in New Zealand should provide the following components: exercise programmes; nutrition management; smoking cessation; pharmacotherapy; weight management; management of risk factors including blood pressure, lipids and diabetes; enhancement of self-management skills; and management of psychosocial issues.

All guidelines draw attention to disadvantaged groups, which may include those living rurally or with socioeconomic hardship, who may need alternative provision to accrue the benefits of CR. In
New Zealand, specific emphasis is placed on ensuring acceptability and appropriateness for Māori and Pacific Peoples, in an effort to reduce disparities in cardiovascular outcomes. The New Zealand and Australian CR guidelines explicitly recommend that Phase 1 and 2 programmes collect and analyse data to inform quality improvement activities. The UK CR standards go further by recommending units should register and submit programme data to the national audit database hosted by the University of York.

In recent times, it has become more widely accepted that different service models of Phase 2 CR are needed, such as home-based CR, case management approaches, nurse coordinated prevention programmes, and telephone based programmes. For example, the HFNZ developed an alternative model of Phase 2 CR, the Heart Guide Aotearoa (HGA). The HGA was based on the successful Heart Manual which enables those who are unable to attend centre-based CR to complete their CR at home. The HGA has been successfully implemented and used in the very northern region of New Zealand, where uptake is high and patient response excellent. Approaches similar to the HGA have been found to be comparable in effectiveness to traditional centre-based CR programmes.

Evidence-based guidelines provide a template to inform best practice. In New Zealand, existing information about the structure of CR programmes and services is more than 10 years old. Obtaining an updated overview of current CR programmes and services offers the opportunity to observe the direction and diversity of CR services. Furthermore, our understanding of the alignment of existing CR programmes with evidence-based guidelines is poor. In order to understand how New Zealand CR services are performing in relation to the New Zealand CR guidelines, a survey was commissioned by the committee of the New Zealand Cardiovascular Prevention and Rehabilitation Group (NZCPRG), an affiliate of the Cardiac Society of Australia and New Zealand. The intent of this survey was to address these issues.

Method
The survey was developed by the CR survey team, and based on international survey tools, as well as including questions from a previous New Zealand survey of CR units conducted early in 2000s.

Pre-testing of the tool took place via the Executive of the NZCPRG. The survey topic areas corresponded with NZCR guideline recommendations regarding the provision of CR, with the survey divided into the following areas:

- Structure of the units, including services provided, available resources and employees; referral process; inclusion and exclusion criteria; how services meet the needs of under-represented groups; heart failure (HF) and transcatheter aortic valve implantation (TAVI) services were also noted, but are not the focus of this survey
- Phase 2 including sessions provided; their format and content; session frequency, locations, and assessments used
- Phase 3 referral
- Quality assurance activity including recording of attendance, DNAs and drop-outs; monitoring of outcomes of CR.

The survey was analysed using simple descriptive statistics. Percentages were calculated based on number of units who were eligible to answer the question. For example, for unit characteristics the total number (n=36) was used to calculate percentage, but for questions relating to Phase 2, percentage was based on the number of units (n=34) who offered Phase 2. Each question listed pre-determined responses for selection by respondents with the option for a free-text ‘other’ option, which were analysed and grouped.

A list of all CR units in New Zealand was obtained from HFNZ on 19 December 2014. No region was excluded and all providers were invited to respond. Two weeks prior to the survey being distributed, on 5 February 2015, a pre-survey email was issued and respondents were asked to updated their contact details and provide details of any other units that were not represented on HFNZ records. If no response was received after one week, the CR units were contacted by telephone and details updated. The survey went live on 19 February 2015 and survey
questions and responses were populated directly to the Qualtrics survey system (http://www.qualtrics.com/).

### Results

Forty-six units were approached, with 42 agreeing to participate. Three respondents identified that they operated five CR programmes, in multiple locations, and data was amalgamated to their overseeing unit. One respondent completed the first six questions only and was excluded from further analysis, resulting in a total of 36 distinct units. The majority (n=34, 97%) stated that they use the New Zealand Evidence-Based Best Practice Guidelines for cardiac rehabilitation to inform their programmes.

### Participating units’ demographics

Two-thirds (n=25) of respondents provided Phase 1 and 94% (n=34) offered Phase 2 CR. Phase 3 programmes were available in seven units. As described in Table 1, the majority of units offered more than one service.

<table>
<thead>
<tr>
<th>Count</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>One phase or service only</td>
<td>8</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Phase 2 only</td>
<td>6</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td>Phase 3 only</td>
<td>1</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>HF only</td>
<td>1</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Two phases or services</td>
<td>8</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Phase 1 &amp; Phase 2</td>
<td>7</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Phase 2 &amp; Phase 3</td>
<td>1</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Three phases or services</td>
<td>14</td>
<td>39%</td>
<td></td>
</tr>
<tr>
<td>Phase 1 &amp; Phase 2 &amp; Phase 3</td>
<td>1</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Phase 1 &amp; Phase 2 &amp; HF</td>
<td>11</td>
<td>31%</td>
<td></td>
</tr>
<tr>
<td>Phase 2 &amp; HF &amp; TAVI</td>
<td>2</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Four phases or services</td>
<td>6</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td>Phase 1 &amp; Phase 2 &amp; Phase 3 &amp; HF</td>
<td>4</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Phase 1 &amp; Phase 2 &amp; HF &amp; TAVI</td>
<td>2</td>
<td>6%</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Source of patient referrals.

<table>
<thead>
<tr>
<th>Source</th>
<th>Response n=36</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Hospital</td>
<td>34</td>
<td>94%</td>
</tr>
<tr>
<td>Medical team</td>
<td>31</td>
<td>86%</td>
</tr>
<tr>
<td>Ward nurse</td>
<td>31</td>
<td>86%</td>
</tr>
<tr>
<td>CR nurse</td>
<td>31</td>
<td>86%</td>
</tr>
<tr>
<td>General Practitioner</td>
<td>29</td>
<td>81%</td>
</tr>
<tr>
<td>Self-referred</td>
<td>24</td>
<td>67%</td>
</tr>
<tr>
<td>Practice Nurse</td>
<td>24</td>
<td>67%</td>
</tr>
<tr>
<td>Community based nurse</td>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>5</td>
<td>12%</td>
</tr>
<tr>
<td>Other sources</td>
<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>Psychologist</td>
<td>2</td>
<td>5%</td>
</tr>
</tbody>
</table>
Patient referrals

The majority of programmes accepted either paper (n=33, 92%) or electronic referrals (n=33, 92%), with a lesser number accepting telephone referrals (n=22, 61%). Referrals into the programme came from a variety of sources, such as, hospitals, CR nurses, ward nurses, medical teams and general practitioners (Table 2). Sixty-seven percent of the units accepted self-referred patients.

Patients who did not attend or dropped out were followed up by 78% (n=28) of units. Of these, 88% (n=23) offered patients alternatives which included individual sessions at a clinic (32%, n=9), home visits (21%, n=6) or phone calls (17%, n=5). Units also referred patients to other programmes, such as Māori providers or programmes held in the evenings (28%, n=8). Two units offered HGA or similar to patients who dropped out.

Sixty-seven percent (n=24) of units stated that there were Phase 3 programmes in their area, of which 96% (n=23) made patients aware of those programmes. Three units maintained Phase 3 referral records.

Assessment

Table 3 provides an overview of the various patient assessments undertaken prior to commencing CR. Patient goals and psychological status were assessed by two-thirds of CR units. Other indicators included BMI and waist circumference, cultural background and exercise capacity (Table 3). The six-minute walk test was utilised by 59% (n=22) of units that assessed exercise capacity. Four units (11%) reported no assessment.

The Hospital Anxiety and Depression Score (HADS) was the most commonly used psychological test. Other tools included the PHQ-2, COOP, Holmes & Rahe, SF36, IPQ, individual discussion, DASS and K10. Following assessment, 72% (n=26) of units develop a personalised rehabilitation plan with the patient. Thirty-three percent (n=12) conduct a formal re-assessment of patients post discharge from Phase 2.

Audit of CR

Thirty-one percent (n=11) reported that their unit was audited 6-monthly or more frequently, and a further 11 units (31%) were audited less frequently. The remaining respondents either stated they were not audited formally (n=10, 28%), that auditing was restricted to participant feedback (n=2, 6%), or that only part of the team were audited (n=1, 3%). Just over half of the units (n=20, 56%) employed key performance indicators (KPIs), with the most frequently reported KPIs being smoking cessation, back to work, and assessment for depression. Other KPIs included wait times (for first contact and from referral to attendance) (25%) and medication adherence (35%, n=7). One unit reported uptake or attendance as a KPI.

The majority of CR units collected information on patient satisfaction (n=31, 86%). Ninety-two percent invited all attendees to complete patient satisfaction surveys.
and 32% sought feedback from patients’ spouse/partner.

**Phase 2 programme**

The majority of units involved in Phase 2 provided this either in a community-only (n=17, 50%) or hospital-only location (n=13, 38%), and 12% (n=4) provided it in both settings. A minority (n=4, 12%) provided home-based support. The mean length of programmes was 6 weeks, with a maximum duration of 12 weeks. Fifty-three percent (n=18) held one session per week.

The HGA was used by a quarter of the units, however five offered it to all patients. Reasons for low utilisation included a lack of funding and low patient uptake. Four units which utilise HGA provide formal guidance through the programme prior to discharge.

Ninety-one percent (n=30) of respondents stated that they recorded attendance at Phase 2 programmes, with 50% (n=17) documenting reasons for non-attendance and programme discontinuation.

Fifteen different education components were recorded from the survey responses (Table 5). Most CR units (85%) provided all of the minimum components outlined in the New Zealand CR guidelines. Psychosocial components were generally divided into specific topics, such as psychological aspects, stress management, resumption of sexual activity, and returning to work. The majority of CR units provided advice for physical activity (n=33; 97%) and nutrition (n=31; 91%) using in-house staff. External providers (EP), those agencies and individuals not employed as CR unit staff, provided a wide range of education services such as weight management (n=15; 44%), smoking cessation (n=8; 24%) and coronary disease management (50%). Several units worked in collaboration with EPs to address a variety of education components. For example, six of 32 units delivered stress management modules in conjunction with EPs.

Exercise support was commonly offered, with the majority of units offering group exercise sessions and Green Prescription (GRx). Green Prescription (GRx) is an initiative funded through the Ministry of

<table>
<thead>
<tr>
<th>Table 5: Phase 2 components.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education component</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Recommended in the CR guidelines</strong></td>
</tr>
<tr>
<td>Physical activity and exercise</td>
</tr>
<tr>
<td>Pharmacotherapy</td>
</tr>
<tr>
<td>Nutritional advice</td>
</tr>
<tr>
<td>Smoking cessation</td>
</tr>
<tr>
<td>Weight management</td>
</tr>
<tr>
<td><strong>Psychosocial management</strong></td>
</tr>
<tr>
<td>Stress management</td>
</tr>
<tr>
<td>Resumption of intimate and sexual activity</td>
</tr>
<tr>
<td>Psychological aspects</td>
</tr>
<tr>
<td>Returning to work</td>
</tr>
<tr>
<td>Relaxation training</td>
</tr>
<tr>
<td>Support group for spouse, whanau</td>
</tr>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>Modifiable and non-modifiable risk factors</td>
</tr>
<tr>
<td>Coronary disease management</td>
</tr>
<tr>
<td>Health literacy</td>
</tr>
<tr>
<td>Cardio Pulmonary Resuscitation</td>
</tr>
</tbody>
</table>

* External providers (EP), those agencies and individuals not employed as CR unit staff.
Health and contracted via district health board regions for general practitioner prescription to nutrition and physical activity patient support (Table 6). Many units (n=24, 65%) offered patients a structured exercise programme. A structured exercise programme is exercise which has a specific plan and purpose. Usually time to exercise is organised and the programme is monitored or supervised in some way. Three quarters of the units offered more than one type of exercise programme (n=31, 76%).

Support for special groups
Respondents reported that the needs of rural patients and socioeconomically deprived were most often met by phone contact, home visits or internet communication. Fifty-six percent (n=20) offered a specific cultural provider or liaison, with 95% (n=19) of those providing support for Māori and 22% (n=5) for Pacific people. Fifty percent (n=18) of the units were able to re-orient their mainstream programme for specific cultural needs. Common ways for re-orienting were providing resources in the language of the patient, or support in a location that was culturally appropriate and/or acceptable (Table 7). Ten units neither offered a cultural liaison nor re-oriented their programme.

### Table 6: Exercise programme.

<table>
<thead>
<tr>
<th>Programme</th>
<th>Response n=34</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group sessions</td>
<td>30</td>
<td>88%</td>
</tr>
<tr>
<td>Green Prescription</td>
<td>27</td>
<td>79%</td>
</tr>
<tr>
<td>One-on one with a physiotherapist/exercise professional</td>
<td>13</td>
<td>38%</td>
</tr>
<tr>
<td>Offered through external group other than Green Prescription</td>
<td>5</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>3%</td>
</tr>
</tbody>
</table>

### Table 7: Methods for supporting under-served groups.

<table>
<thead>
<tr>
<th>Methods for re-orienting programmes</th>
<th>Response n=18</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language (eg, pamphlets in the patients language)</td>
<td>15</td>
<td>83%</td>
</tr>
<tr>
<td>Setting (eg, marae, greater home-based visits)</td>
<td>14</td>
<td>78%</td>
</tr>
<tr>
<td>Greater consideration of family</td>
<td>12</td>
<td>67%</td>
</tr>
<tr>
<td>Cultural competency training of staff</td>
<td>12</td>
<td>67%</td>
</tr>
<tr>
<td>Awareness of spiritual needs</td>
<td>8</td>
<td>44%</td>
</tr>
<tr>
<td>Interpreters</td>
<td>3</td>
<td>17%</td>
</tr>
</tbody>
</table>

### Discussion

In this survey, large variations between units were observed in delivery and content of CR. There was also no clear standardised process guiding the assessment of patients. This is despite the guidelines encouraging specific formal assessments and re-assessments in areas of nutrition (dietetic support), social support and anxiety or depression (such as the HADS scale), and pre-exercise risk. It is uncertain whether the diversity is due to patient need or an effect of environmental influences, for example policy and funding. If the former, CR services would appear to be appropriately variable, but if the latter, patients may not be receiving appropriate service or all the components needed to rehabilitate optimally. Variation in types of, and number of, assessments significantly affect the reporting of outcomes, which poses challenges to audit processes and evaluation of effectiveness. Regular auditing of CR practice is crucial to provide critical performance data of programmes.

Performance guidelines also encourage standardised self-assessment for continuous quality improvement. The New Zealand CR guidelines specifically
ARTICLE

recommend a regular 6-monthly audit. Significantly, almost 1 in 4 CR surveyed units did not regularly audit their service. Furthermore, the survey results suggest that there may be some misunderstanding of what comprises an audit in some units. This is a critical area for quality improvement in order to identify areas of strength and weakness. Audits should be complemented by the use of KPIs, particularly meaningful patient-specific indicators. Only half of the CR programmes in New Zealand reported any outcome indicators.

A key finding from this survey was the scarcity of nationally co-ordinated CR data collection, highlighting the importance of developing a core minimum national data set. Given that international research has found that attending CR improves health outcomes, uptake and attendance data should be deemed essential. Standardising and centralising CR unit and patient data would enable a profile of regional differences in service provision and support understanding of how these might be linked to patient outcomes. A national database of CR uptake and attendance would have obvious utility in audit and evaluation of CR.

The All New Zealand Acute Coronary Syndrome Quality Improvement (ANZACS QI) register is one avenue where this information could be co-ordinated. Establishing a new and independent database for CR would require substantial resources to be implemented. This survey has identified that data currently collected is almost exclusively held locally, and as such a national profile of CR referrals, uptake, attendance, and performance is incomplete and a significant gap for CR services.

Support for special groups was incorporated by the majority of CR units. Half of programmes were able to re-orient their programmes for cultural needs, and this was reflected in the cultural competency training levels of staff (33% of all CR units). The HGA provides a useful resource for units that have patients who are unable to participate in centre-based CR programmes. These patients can include those that are located rurally, transport-limited, or unable to attend for cultural reasons. Despite the potential utility of the HGA, it was infrequently used throughout the units and this survey was unable to identify reasons for this low use. Given that the HGA was specifically developed for home-based rehabilitation, there is a need to further investigate the reasons for the low use of this evidence based model of CR.

Strengths and limitations

A key strength of this survey was the high rate of responses received from CR units nationwide (86%). Consequently, there is now a greater understanding of the services, their structure, processes, content and use of quality improvement strategies. However, while this survey had been pre-tested by 10 health professionals, comprising mostly of cardiac rehabilitation or cardiac specialist nurses, the question syntax and meaning were queried by several respondents. Consequently some respondent answers may not be reflective of the question. The survey tool will undergo additional testing prior to the next survey.

The collected data indicated a wide use of resources and flexibility in delivering CR services. Importantly, the survey did not collect data on the rationale and frequency for the use of these multiple resources, which is the role of an audit. For example, the survey reports that 79% of units include GRx, however, frequency of patient utilisation of GRx was not collected. As such the proportion of enrolments referred to GRx and whether GRx is being used in place of CR exercise intervention or post-CR cannot be confirmed.

Conclusion

A national survey of New Zealand cardiac rehabilitation services was conducted and respondent participation was high. This survey identified that variation in services and resources exists, and the variation in data collection makes determining the efficacy of current services challenging. The establishment of a national database for the collection of an agreed set of patient specific quality indicators would provide performance feedback and patient outcome efficacy data and as such would strengthen quality improvement strategies.
ARTICLE

Competing interests:
Nil

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Author information:
Geoff Kira, Research Centre for Māori Health and Development, Massey University, Palmerston North; Fiona Doolan-Noble, Department of Preventive and Social Medicine, University of Otago, Dunedin; Grace Humphreys, School of Sport and Exercise, Massey University, Palmerston North; Gina Williams, Heart Foundation of New Zealand, Wellington; Helen O’Shaughnessy, Auckland City Hospital, Auckland District Health Board, Auckland; Gerry Devlin, Medical Director, Heart Foundation, Auckland, New Zealand.

Corresponding author:
Geoff Kira, Research Centre for Māori Health and Development, Massey University, Massey University Private Bag 11222, Palmerston North 4442, Aotearoa New Zealand.
g.kira@massey.ac.nz

URL:

REFERENCES:
12. Lewin B, Robertson


Medical students: where have they come from; where are they going?
Phillippa Poole, Tom Stoner, Antonia Verstappen, Warwick Bagg

ABSTRACT

AIMS: There remain shortages of doctors in rural areas. This study aimed to describe the location and size of New Zealand medical students' hometowns over the past decade; to document changes in intended practice location between entry and graduation; and to explore the relationship between background and intended location of practice.

METHODS: All commencing and graduating students from one New Zealand medical programme from 2006–2015 were invited to complete a career intention survey. Students' reported background and practice location intention at entry were compared with intention at exit.

RESULTS: Response rates were 92% for entry and 84% for exit surveys. On average, 21% of medical students were from regional-rural (RR) backgrounds, with no significant change over time (p=0.4036). Most were admitted via a designated rural entry pathway. Students from RR backgrounds were four times more likely at entry, and nearly three times more likely at exit, to have an RR intention than urban students. Those with an RR intention at entry were three times more likely to have an RR intention at exit than students with an urban intention.

CONCLUSION: Medical students from an RR background, or with RR intention at entry to medical school, are more likely to indicate a RR intention upon graduating. Yet students of an urban background with an RR career intention are important to consider. Future research might explore factors which help consolidate RR career choices in both groups.

As in other parts of the world, New Zealand continues to have shortages of doctors practising outside major urban areas, especially in general practice. In 2014, there were 1.4 doctors for every 1,000 people in rural New Zealand, compared to 3.7 in urban areas. For years, New Zealand has not trained enough of its own doctors. As a consequence there has been reliance on international medical graduates, especially outside major urban areas. The government has recently increased medical student numbers, with increased numbers of graduates beginning to flow into the workforce.

Medical schools have an obligation to produce graduates with the requisite competencies and disposition to serve their communities. Through selection policies and undergraduate experiences, schools may affect the shape of the future workforce. There is a well-established association between coming from a rural background and practising in a rural setting. Yet, in 2002, under-representation of rural New Zealand medical students was evident, with 85% of students originating from main urban areas (then defined as a centre >30,000 containing 69% of New Zealand's population) and only 3% from rural areas (then areas <1,000 containing 15% of New Zealand's population). In 2004, each of New Zealand's two medical programmes introduced a rural origin admission pathway for 20 students. At that time, 'rural' meant coming from an area of 20,000 or fewer. In 2012, the University of Auckland changed its rural pathway to a regional-rural admission scheme (RRAS). This acknowledged the geography of its upper North Island catchment, and clarified eligibility for those in previously rural areas within the new Auckland super-city boundary. Criteria for RRAS are either to have undertaken pre-secondary education or spent at least 3 years at a secondary school located in a regional-rural area, which is defined as being outside the boundary of New Zealand's...
main urban areas (Auckland, Hamilton, Tauranga, Wellington, Porirua, Hutt, Upper Hutt, Christchurch, and Dunedin). Up to 52 places are now available for Auckland students under the RRAS (Faculty of Medical and Health Sciences, personal communication).

Future rural practice is associated with undergraduate experience in rural areas. To this end, both New Zealand medical programmes have introduced dedicated rural immersion programmes for a subset of the class, with other clinical experiences outside major urban centres for all students. It is likely that a rural background and prolonged experience in rural clinical settings interact to increase intentions to work rurally in a rural location. However, these observations may be subject to selection bias, as students from a rural background may be more likely to apply to or be chosen for rural immersion programmes.

From 2006, Auckland medical students have been invited to enrol in the Faculty of Medical and Health Sciences Tracking Health Professional Students and Graduates project (Tracking Project), which aims to investigate the effects of individual characteristics and curricula on career patterns. Since 2013, this project has been linked with the Australasian Medical Schools Outcome Database (MSOD) project with similar aims.

Participants complete an entry survey at the start of their second year and an exit survey at the end of their sixth year. Questions relate to demographics, intentions with respect to discipline and location of future practice, as well factors important in career choice. A finding based on 2006 and 2007 exit data was that 58% of students intended to work in a city, 15% in a regional-rural setting and 27% were undecided. However, these students were selected before the existence of a rural origin pathway, and neither the effect of background nor how intentions changed while at medical school were documented.

The Tracking Project database now contains information on ten entry and ten exit cohorts, with individual student data on career intentions able to be linked between entry and exit for three of these. This study aims to:

(i) Describe the location of Auckland medical students’ home towns and backgrounds;
(ii) Determine whether urban and rural proportions changed as student numbers increased, and as criteria for rural entry changed to regional-rural entry in 2012;
(iii) Document patterns of change in intended practice location between entry and exit from the programme;
(iv) Explore the relationships between student background, size of home town, entry pathway and intended location of practice.

Results may be useful to medical programme leaders, postgraduate training bodies, workforce planners and other stakeholders interested in the workforce outcomes of undergraduate medical training.

Methods
Ethical considerations
Ethics approval for the Tracking Project was granted in 2006 by the University of Auckland’s Human Participants Ethics Committee, and remains current. The present study used data from students who gave written consent and completed Tracking Project entry and/or exit surveys in the years 2006 to 2015. Analyses were conducted blinded to student identity.
Definition of rurality
Within New Zealand there is no agreed definition of rurality, being “areas not specifically designated as urban.” However, some indication may be derived from the current definition of a city as “50,000 or more.” Furthermore, coding in the Tracking Project for size of town has changed over the years, as the New Zealand population has both grown and become more urbanised.

For the purposes of this study, we classified responses for size of town into either <100,000 (regional-rural or ‘RR’) or 100,000 or more (‘Urban’). This was to cover variations in coding of town size over the years, as well as to align with the present University of Auckland regional-rural pathway selection policy. We classified each student either of RR or Urban background by triangulation from the following information:
ARTICLE

• Student report of size of home town (chosen from a list of four population ranges with examples of towns)
• Student response to whether they considered themselves to have ‘come from a rural background’
• Location of home town and address (prior to university) relative to current RRAS entry scheme boundaries
• Medical programme office information on students admitted via the rural origin pathway (pre 2012) or RRAS (from 2012).

Data considerations
For several reasons, sample sizes are smaller than the total number of medical students completing surveys. Students were asked at exit where they intended to practice in all surveys from 2006, but at entry only from 2009 onwards. Other reasons for exclusion were:
• Student had a home address outside New Zealand (all analyses)
• Student was ‘undecided’ (intention analyses)
• No response to relevant survey question.

Analysis
Summary statistics were used to describe the cohorts. Comparisons were made using Chi-square or Fisher’s exact tests with Yates’s continuity correction. Statistical packages used were Excel and R.

Results
From 2006 to 2015, 1,935 students completed at least part of an entry survey (response rate 92%), with 1,367 students at least part of an exit survey (response rate 84%). For the linked data—ie, for entry cohorts from 2009 to 2011 corresponding to exit cohorts in 2013 to 2015—364 students completed both surveys, including information on their background. This was 73% of those who were eligible.

Region of student hometown
The origin of Auckland medical students reporting a hometown in New Zealand is shown in Table 1 (source: Entry survey 2006–2015, n = 1,718). Of these, 369 (21.5%) were from an RR background (population <100,000).

Trends in urban vs RR background over time
The proportions of students from Urban or RR backgrounds over the past decade are shown in Figure 1. The trend was not significant (p=0.4036) even though the absolute number of students entering via the RR pathway has increased steadily from 21 in 2006 to 42 in 2015 (personal communication). Moreover, there was no obvious

<table>
<thead>
<tr>
<th>Region</th>
<th>Number</th>
<th>%</th>
<th>%RR</th>
<th>%Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>1,117</td>
<td>65</td>
<td>1</td>
<td>99</td>
</tr>
<tr>
<td>Waikato/Taupō</td>
<td>154</td>
<td>9</td>
<td>44</td>
<td>56</td>
</tr>
<tr>
<td>Wellington/Hutt Valley/Wairarapa</td>
<td>82</td>
<td>5</td>
<td>12</td>
<td>88</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>72</td>
<td>4</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>Northland</td>
<td>71</td>
<td>4</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>Canterbury</td>
<td>65</td>
<td>4</td>
<td>17</td>
<td>83</td>
</tr>
<tr>
<td>Manawatu/Wanganui</td>
<td>46</td>
<td>3</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>39</td>
<td>2</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Taranaki</td>
<td>22</td>
<td>1</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Gisborne</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>Nelson</td>
<td>9</td>
<td>0.5</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Otago</td>
<td>9</td>
<td>0.5</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Marlborough</td>
<td>4</td>
<td>0.2</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Westland</td>
<td>4</td>
<td>0.2</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Tasman</td>
<td>3</td>
<td>0.2</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Southland</td>
<td>2</td>
<td>0.12</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1718</td>
<td>100</td>
<td>21</td>
<td>79</td>
</tr>
</tbody>
</table>
After the introduction of the RRAS selection policy in 2012, the proportion of students who were ‘undecided,’ or did not answer, was 4% at entry and 30% at exit. For those who had decided on location of practice, the relationship with their background is shown Table 2a (entry) and 2b (exit) with the differences statistically significant at both times (p<0.0001, source: Entry surveys 2009–2015, n=1,332; Exit surveys 2010–2015, n=604). At both entry and exit, just under two-thirds of students were from an urban background with an urban career intention. On the other hand, at entry 16% of students were from an RR background and had an RR career intention, but this dropped to 11% in exit cohorts. Put another way, RR background students are over four times more likely than urban students to indicate an RR career intention at entry (relative risk 4.54, 95% CI 3.91–5.39, p<0.0001), and 2.85 times as likely at exit (relative risk 2.85, 95% CI 2.27–3.58, p<0.0001). Yet, the absolute number of urban background students intending a career in an RR area at exit is still greater than the number of RR background students with an RR intention (105 vs 66).

**Effect of student background on intended practice location**

The proportion of students who were ‘undecided,’ or did not answer, was 4% at entry and 30% at exit. For those who had decided on location of practice, the relationship with their background is shown Table 2a (entry) and 2b (exit) with the differences statistically significant at both times (p<0.0001, source: Entry surveys 2009–2015, n=1,332; Exit surveys 2010–2015, n=604). At both entry and exit, just under two-thirds of students were from an urban background with an urban career intention. On the other hand, at entry 16% of students were from an RR background and had an RR career intention, but this dropped to 11% in exit cohorts. Put another way, RR background students are over four times more likely than urban students to indicate an RR career intention at entry (relative risk 4.54, 95% CI 3.91–5.39, p<0.0001), and 2.85 times as likely at exit (relative risk 2.85, 95% CI 2.27–3.58, p<0.0001). Yet, the absolute number of urban background students intending a career in an RR area at exit is still greater than the number of RR background students with an RR intention (105 vs 66).

**Background by entry pathway**

The admission pathway of medical students compared to their background is shown in Table 3 (source: Entry survey 2006–2015, n=1,718). Over 80% of those students were from an urban background with an urban career intention. On the other hand, at entry 16% of students were from an RR background and had an RR career intention, but this dropped to 11% in exit cohorts. Put another way, RR background students are over four times more likely than urban students to indicate an RR career intention at entry (relative risk 4.54, 95% CI 3.91–5.39, p<0.0001), and 2.85 times as likely at exit (relative risk 2.85, 95% CI 2.27–3.58, p<0.0001). Yet, the absolute number of urban background students intending a career in an RR area at exit is still greater than the number of RR background students with an RR intention (105 vs 66).

**Table 2a:** Intentions by background of Auckland medical students at entry 2009–2015.

<table>
<thead>
<tr>
<th>Background</th>
<th>RR Career Intention</th>
<th>Urban Career Intention</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR Background</td>
<td>218 (16%)</td>
<td>71 (5%)</td>
<td>289 (22%)</td>
</tr>
<tr>
<td>Urban Background</td>
<td>173 (13%)</td>
<td>870 (65%)</td>
<td>1,043 (78%)</td>
</tr>
<tr>
<td>Total</td>
<td>391 (29%)</td>
<td>941 (71%)</td>
<td>1,332 (100%)</td>
</tr>
</tbody>
</table>

**Table 2b:** Intentions by background of Auckland medical students at exit 2010–2015.

<table>
<thead>
<tr>
<th>Background</th>
<th>RR Career Intention</th>
<th>Urban Career Intention</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR Background</td>
<td>66 (10%)</td>
<td>43 (7%)</td>
<td>109 (18%)</td>
</tr>
<tr>
<td>Urban Background</td>
<td>105 (17%)</td>
<td>390 (65%)</td>
<td>495 (82%)</td>
</tr>
<tr>
<td>Total</td>
<td>171 (28%)</td>
<td>433 (72%)</td>
<td>604 (100%)</td>
</tr>
</tbody>
</table>

**Table 3:** Entry pathway and background of medical students 2006–2015.

<table>
<thead>
<tr>
<th>Entry pathway</th>
<th>RR Background</th>
<th>Urban Background</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General or MAPAS*</td>
<td>169 (10%)</td>
<td>1,309 (76%)</td>
<td>1,478 (86%)</td>
</tr>
<tr>
<td>Rural/RRAS</td>
<td>201 (12%)</td>
<td>47 (3%)</td>
<td>248 (14%)</td>
</tr>
<tr>
<td>Total</td>
<td>370 (21%)</td>
<td>1,356 (79%)</td>
<td>1,726 (100%)</td>
</tr>
</tbody>
</table>

*MAPAS= Māori and Pacific admission scheme
from an RR background came through the rural or RRAS entry pathway.

When classified by entry pathway, rural / RRAS students were over three times more likely than general or MAPAS students to indicate an RR career intention at entry (relative risk 3.43, 95% CI 3.02–3.91, p<0.0001), and over two times as likely at exit (relative risk 2.19, 95% CI 1.69–2.82, p<0.0001).

Pattern of intended career location at entry and exit

Longitudinally-linked individual student data on background, and career intentions at entry and at exit, were available for 364 students (see Table 4). Most students (74%) had the same career intention at both entry and exit—56% urban/urban and 17% RR/RR. Over a quarter (26%) of students changed their intentions, with more changing from RR to urban, than urban to RR (17% vs 9.6%, p<0.0001). Nearly half of those intending an RR career at entry (49.2%) changed to an urban intention at exit. Yet, if a student had an RR career intention at entry, they were still over three times more likely to have an RR intention at exit than a student with an urban intention at entry (RR 3.48, 95% CI 2.45 to 4.96, p<0.0001).

The effect of background on changes in intention

We divided students into four groups, based on the concept of Stagg et al. The ‘Concordant’ (65%) were those whose practice location intention at both entry and exit matched their background. ‘Switchers’ (15%) were those who had the same practice location intention as their background at entry, but who changed their intention to the opposite of their background at exit. ‘Reverters’ (11%) were those whose practice location intention at entry was opposite to their background, but who changed to the same as their background at exit. The ‘Never Evers’ (9%) were those whose practice location intention was opposite to their background at both entry and exit. Relationships between student background and intention patterns are shown in Figure 2. There was a higher proportion of Switchers from RR backgrounds compared to urban backgrounds (32% vs 11%), and a higher proportion of Reverters from urban backgrounds compared to RR backgrounds (13% vs 3%), (p< 0.0001). Yet, the absolute numbers of Switchers from urban backgrounds exceeded those from RR backgrounds (33 vs 23). In this subset, those from RR backgrounds were almost three times as likely to intend practice in RR areas than those from urban backgrounds (RR 2.97, CI 2.19–4.03, p<0.0001).

Discussion

This study was based on data from students in a medical programme in New Zealand.

Table 4: Patterns of intentions at entry and exit for individual students.

<table>
<thead>
<tr>
<th></th>
<th>RR Intention Exit (%)</th>
<th>Urban Intention Exit (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR Intention Entry</td>
<td>63 (17%)</td>
<td>61(17%)</td>
<td>124 (34%)</td>
</tr>
<tr>
<td>Urban Intention Entry</td>
<td>35(10%)</td>
<td>205(56%)</td>
<td>240 (66%)</td>
</tr>
<tr>
<td>Total</td>
<td>98(27%)</td>
<td>266(73%)</td>
<td>364 (100%)</td>
</tr>
</tbody>
</table>

Figure 2: Pattern of change in practice location by background. Bars show the proportion of background cohort, with actual numbers above the bars.
Zealand's largest city. It described patterns of intended location of practice and related this to student background. The main finding is the importance of a regional-rural (RR) background on an intention to practice in an RR setting. Just over 20% of medical students were from a RR background, with these students over four times more likely than urban students to state an intention of a RR career at entry, and nearly three times at exit. Even though our RR definition included regional centres, these effects are remarkably similar to those reported internationally for rural practice.\(^{8,13-15}\)

Second, our results highlight the importance of rural preferential pathways into medical programmes.\(^{27}\) Over 80% of those with an RR background in the Auckland programme had been admitted via the rural or RRAS entry pathways. Moreover, the effect size of a RR career intention in those admitted by rural/RRAS pathway vs general or MAPAS pathways is likely underestimated as students from larger regional towns were not eligible for the rural pathway before 2012, and Māori or Pacific students from an RR background would usually enter via the Māori and Pacific Admission Scheme (MAPAS). Conversely, a small number of students had an urban background by our study definition, yet came via the rural or RRAS pathway. Three quarters of these (35/42) were from entry cohorts from 2006 to 2011 when the definition of ‘rural’ was less stringent.

We saw an over-representation of students reporting an urban home address, especially from Auckland, with an under-representation from RR areas across New Zealand. To provide context for our finding that 78.5% of students came from urban areas and 21.5% from RR areas, we calculated the expected proportions from the 2013 New Zealand census data.\(^{28}\) The population in the main urban areas of New Zealand (ie, would be excluded from the RR admission scheme) was about 2.5 million, including 1,415,550 in Auckland, compared to a total New Zealand population of 4,242,051. Hence, about 60% lived in main urban areas (with 33% in Auckland alone) and 40% in RR areas. These proportions are reflected in the recent MCNZ workforce survey, which estimated the New Zealand population in main urban areas and non-urban areas at 58% and 42% respectively.\(^4\)

These findings suggest there may be potential to increase the number of students from RR areas. On the other hand, the proportion of RR background students has not changed significantly over the past decade, nor is this admission pathway always fully subscribed. Furthermore, our findings are consistent with those reported from Otago, New Zealand's other medical school,\(^{36}\) before the advent of rural admission pathways. In that study, only 15% of medical students, compared with 31% of the population, came from outside main urban areas. Understanding the potential for growth in RR medical students entering an urban school requires more information on those of an age to apply to medical school, their aptitude and motivation for a medical career, and factors in their choice of medical school.

Third, we found most students (75%) showed stability in location intentions at both entry and exit, with two-thirds showing concordance with their background. Others have shown that having a rural career pathway intention at both entry and exit from medical school increases the likelihood of subsequent rural practice as does having both a rural background and rural career intention.\(^{26}\) In one study, 25% of practicing physicians in rural US had rural backgrounds, with 32% of these having both a rural background and a rural intention at exit from medical school.\(^8\) On the other hand, we saw evidence of increasing uncertainty in career choice for a subset of students. From being relatively certain at entry, nearly a third of students were undecided on career location at exit. Those from RR backgrounds showed a greater likelihood of switching their intended location to urban practice than vice versa. Possible reasons include social desirability bias in responses from those from RR areas or rural entry pathways;\(^{29}\) or changes in personal circumstances, job or lifestyle preferences during medical school. While others have found a similar fall off in levels of interest in rural careers in rural background students,\(^{26}\) our study does not allow us to determine whether this is due to personal or curriculum factors.
While background may be more important than experiences at medical school, rural educational experiences may reinforce commitment for those from rural backgrounds, those inclined towards rural careers, as well encourage a switch in urban students with a rural interest. Currently, every Auckland medical student spends at least one clinical year in a centre outside Auckland, the largest of which is Hamilton (population 150,000). In addition, each student undertakes a rural GP placement. Any student may join the rural social and educational club, Grassroots. The early post-graduate period, when most doctors confirm career intentions, is also important in rural workforce development. Attrition from RR practice continues after graduation, with one report noting over 50% of rural doctors in Western Australia left within 5 years of commencing postgraduate training. On the positive side, the 10% increase in retention of rural doctors in that study was attributed to government-led education and workforce distribution programmes. Strengths of the present study include prospective nature of data collection, large sample size and high response rates. There were internal consistencies in the analyses by background and by entry pathway, as well as between entry and exit. Furthermore, the effect size of an RR background was the same whether we calculated this on collated cross-sectional data or the subset with longitudinal prospective data. We made some assumptions, but used a conservative approach that would underestimate differences. Our coding of urban vs RR appears pragmatic in the New Zealand setting.

Limitations include the self-reported data, including of home address. It is possible that some students interpreted Auckland as their current home address, regardless of where they grew up. Further, those who were undecided on career location or did not answer were removed from the dataset. The effect of this is uncertain, but there is no reason to expect that those excluded would act differently to other participants in terms of future intentions. To understand the predictive effects of the patterns observed, including for those undecided, requires knowledge of the final destination of all students. Now that Auckland has joined the MSOD project, which follows graduates for 8 years, this should be possible. Further studies might explore factors that promote a switch towards or away from an RR career intention in both urban and RR background students. These may be different.

Factors before, during and after medical school influence career decisions. Selecting more medical students from RR backgrounds is one important way to address RR workforce shortages. However, a wider understanding of the capacity of the RR student pool is needed. Given there are more students intending to work in RR settings from urban backgrounds than from RR backgrounds, determining how undergraduate and early postgraduate experiences interact with background to modify initial career choices is an important next step.
ARTICLE

Competing interests:
Antonia Verstappen is the manager of the Tracking Project. Tom Stoner is a Year 4 medical student. Warwick Bagg is Head of the Medical Programme, and Phillippa Poole Head of the Department of Medicine. Their opinions as authors are not necessarily those of the University of Auckland.

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Author information:
Phillippa Poole, Department of Medicine, The University of Auckland, Auckland; Tom Stoner, Faculty of Medical and Health Sciences, University of Auckland, Auckland; Antonia Verstappen, Faculty of Medical and Health Sciences, University of Auckland, Auckland; Warwick Bagg, Medical Programme Directorate, University of Auckland, Auckland, New Zealand.

Corresponding author:
Phillippa Poole, Department of Medicine, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland 1142, New Zealand, p.poole@auckland.ac.nz

URL:

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Cardiac rehabilitation in New Zealand—moving forward

Jocelyne Benatar, Fiona Doolan-Noble, Andrew McLachlan

ABSTRACT

Modern guideline-based cardiac rehabilitation provides an evidence-based, cost effective and comprehensive approach to reduce re-infarction and mortality. It offers a multidisciplinary approach to support self-management, improves psychological and social functioning and adherence to recommended life-style changes and medications. The challenge is to broaden uptake of cardiac rehabilitation, increase participation in supervised exercise programs and ensure that healthy behaviours are maintained in the long term. Shared care planning between cardiac rehabilitation specialists and primary health providers could improve long-term adherence by ensuring continuity of care of patients who have completed a Phase 2 cardiac rehabilitation program, either facility or home based.

Evidence suggests that survivors of myocardial infarction (MI) are at high risk of recurrent events, accounting for more than 40% of admissions to coronary care. Survivors have an annual death rate of 7.2%—six times that in people of the same age who do not have coronary heart disease. Contributing factors for this include poor adherence to secondary prevention strategies such as lifestyle changes (smoking cessation, physical activity and adoption of a cardioprotective diet) and medications (antiplatelet agents, statins, ACE inhibitors and beta blockers), with adherence to medication falling sharply after discharge from hospital. Consequently, the prevalence of poorly controlled risk factors is high in this population group and is associated with a poorer prognosis.

Compounding the problem are shorter inpatient stays (2–3 days) where patients are exposed to multiple interventions and investigations. This interferes with the ability to effectively address secondary prevention strategies, especially in an ageing population with multiple comorbidities. Finding time, while in hospital, to identify and address psychosocial issues associated with non-adherence, such as low health literacy, depression, non-traditional health beliefs, cardiac misconceptions and lower education level, is increasingly difficult.

Cardiac rehabilitation (CR) offers a successful and cost effective method to effectively support self-management and improve psychological and social functioning, as well as reducing non-adherence to recommended life-style changes and medications. Modern CR has developed into a multidisciplinary, comprehensive approach focusing on group and tailored patient education, personalised exercise training, and provision of individualised support for the modification of risk factors and psychosocial issues. As an intervention, CR is suitable for a range of patients, including: post myocardial infarction; stable angina pectoris; coronary artery bypass graft surgery; heart valve repair or replacement; percutaneous transluminal coronary angioplasty; implantable cardiac defibrillator; and heart transplantation or heart-lung transplantation. Contraindications to participation in CR are few and concern only the exercise aspect of the program. In most guidelines, CR is a class I recommendation.

Cardiac rehabilitation protocols are generally applied over three time periods (Figure 1). Phase 1 generally refers to the in-hospital phase; Phase 2 begins
after discharge from the hospital and traditionally includes a supervised and monitored out-patient program. The Phase 2 program generally consists of a 4–8-week long guideline-based education and exercise program provided by a multidisciplinary team. Following assessment, patients may also be referred to other services, for example, psychologists, dieticians and the heart failure service.

The structured exercise component of CR is recognised as an important part of guideline-based programs and studies show that its inclusion reduces mortality.\textsuperscript{14,16} It comprises an individual exercise prescription based on the patient’s cardiovascular status (arrhythmias, left ventricular ejection fraction), general health (presence of sternotomy, frailty, arthritis) and significant comorbidities (chronic obstructive pulmonary disease, diabetes).\textsuperscript{17,18} The exercise program is generally run by physiotherapists or clinical exercise physiologists who are qualified to prescribe exercise after a functional test.

A recent overview of Cochrane systematic reviews that included 148 randomised controlled trials (RCTs) (n=98,093) identified that for people who are clinically stable following myocardial infarction or percutaneous coronary intervention, or who have heart failure, exercise-based CR is an effective and safe therapy that reduces hospital readmissions and improves quality of life.\textsuperscript{19} In their systematic review and meta-analysis (34 RCTs (n=6,111),
Lawler and colleagues found that patients randomised to exercise-based CR had a lower risk of re-infarction (odds ratio [OR] 0.53, 95% CI 0.38–0.76), cardiac mortality (OR 0.64, 95% CI 0.46–0.88), and all-cause mortality (OR 0.74, 95% CI 0.58–0.95).

Detractors of CR often point to the lack of benefit seen in the randomised RAMIT study. This, however, was a flawed study that did not reflect current evidence-based practice, with little to demonstrate that guidelines were followed.

There is no question that CR that adheres to guideline recommendations is effective. The key challenges for CR programs globally are how to enhance access to a broader group of patients who have the potential to benefit from CR, but who may not be able to attend traditional group programs; how to improve referral rates to CR and how to more effectively support the maintenance of long-term behaviour change and medication adherence to reduce recurrent cardiac events.

**Cardiac rehabilitation in New Zealand**

In New Zealand CR programs are funded by respective District Health Boards (DHBs), sometimes in partnership with Primary Health Organisations (PHOs). Patients are recruited to CR usually as in-patients (Phase 1). In centres that are unable to perform revascularisation, for example Northland, first contact with patients is often post discharge. Generally, however, during the Phase 1 period, the CR team start to address psychosocial issues, major risk factors like smoking, and to identify those at high risk of non-adherence.

Some DHBs, for example Auckland and Counties Manukau, have implemented CR nurse-led clinics 2 weeks post discharge. These clinics are supervised by a physician and facilitate the prescribing and up-titration of evidence-based medications and supports the problem solving of any self-management issues.

Prior to commencing a Phase 2 program, patients in collaboration with a nurse specialist and their family/whanau, develop a shared care plan incorporating a plan for their Phase 2 program, including their goals, and taking into account, cultural traditions, personal preferences and values, family situations, social circumstances and lifestyles. New Zealand CR teams have developed specific education programs that are relevant to their populations and geographical location. Some try and cover most aspects of the education process in one day, while others spread the sessions over a number of weeks with people being able to choose the sessions that interest them. Many programs have developed a more patient-centred approach to encourage discussion and include self-management support, such as goal setting and problem solving, moving away from traditional ‘chalk and talk’ models. These group sessions are being held increasingly across New Zealand in venues outside the hospital facility in community halls or in association with local PHOs. Health professionals contributing to the educational component include psychologists, pharmacists, dieticians, exercise physiologists/physiotherapists, and cardiologists with this aspect of the program generally being led by the cardiac rehabilitation nurse specialist.

Despite a recent Australasian audit suggesting poor uptake of cardiac rehabilitation, data collected directly from a subset of CR providers in New Zealand suggests access in some DHBs (Auckland, Counties Manukau, and Bay of Plenty) to be well above international levels at over 68%, an improvement from the findings from earlier studies. A range of factors may contribute to the improved engagement noted in some DHBs, including the partnership some DHBs have with the Heart Foundation GoRed for woman program, as well as Whanau Ora and Pacific Island programs, which target Māori and Pacific populations respectively. Both these population groups are recognised as experiencing the greatest burden of cardiovascular disease in New Zealand. In addition, patients who are unable to access traditional group programs, due to rurality, work or family commitments, or personal preferences, can also be referred to the Heart Guide Aotearoa (HGA) program. This home-based program has been set up to be “an individualised, menu-based, cognitive behavioural, chronic disease management program for people with coronary heart diseases” and has been noted to increase participation in CR programs, especially for Māori.
Despite these initiatives, a number of significant gaps in the delivery of CR in New Zealand exist. For example, apart from the HGA, there is a paucity of options for patients who are unable, or find it difficult to attend traditional group-based programs (due to comorbidities, work/family commitments, geography) that needs to be addressed. Nationally, there are no clear key performance indicators or credentialing of individual CR providers to ensure quality. Data collection is poor and as a consequence there is a lack of a consistent approach to assessing the efficacy of programs and their associated long-term outcomes, such as mortality or medication adherence at 1 year. There is also no cohesive approach to delivering CR exercise programs across New Zealand; the component with the strongest evidence underpinning its inclusion. Reasons for this are complex, and include a significant lack of resource to run the program, lack of staff with core competencies, and variable attention to basic exercising testing measurement, e.g., the walk test or the step test. Less than 50% of programs assess exercise capacity at all, or formally risk-stratify patients prior to starting an aerobic training program. There is also a lack of access to more comprehensive tests of functional capacity, like incremental cardiopulmonary exercise tests, outside university testing laboratories. It is unclear whether eligible patients across New Zealand are offered exercise programs within the scope of exercise guidelines.

The way forward

Evidence suggests that CR initiated as early as within 2 weeks of discharge improves uptake and long-term outcomes, and commencement of a structured exercise program within 1 month of discharge is beneficial. The timing of CR may, therefore, need to shift to earlier contact with patients post hospital discharge and early risk stratification for exercise prior to a cardiology outpatient visit or commencement of a Phase 2 program. Stratification of patients into lower and higher risk patients may also allow for a better use of the highly skilled CR team members. Lower risk patients could be referred and assessed at a specialist nurse-only clinic, with ongoing follow-up by primary care chronic disease nurses in conjunction with a home-base program, such as the HGA, or a web-based resource, for example the New Zealand Heart Foundation website. Complex patients with multiple comorbidities or complex cardiac disease could be case managed by CR specialist nurses with supervision of a cardiologist; as has been done by heart failure services nationally. Such a service could provide a more intensively supervised exercise and rehabilitation program.

Novel approaches to the delivery of CR, such as text messaging services, and remote exercise monitoring programs need further exploration as they may provide options to extend CR beyond the setting of supervised, structured, and group-based rehabilitation. Uptake of home-based CR, such as the HGA program could be increased; evidence suggests that these programs can be equally effective in improving outcomes of mortality, cardiac events, exercise capacity, or modification of risk factors. The long-term effectiveness of these approaches, and the optimal mode of their delivery within New Zealand, remain unknown, however the attractiveness of these models lies in their potential to increase the provision of CR to low- and moderate-risk coronary patients, who comprise the majority of contemporary post infarction patients, many of whom do not participate in the current structured, supervised, facilities based exercise program.

An approach to better facilitate the transition from Phase 2 to 3 programs to ensure continuity of care, as has been done with other services such as diabetes, need consideration. For example, there could be a system of automatic referrals from cardiology to a long-term conditions management coordinator within a PHO or general practice. This shared management plan between primary and secondary health care may ensure long-term follow-up of all patients, especially those who are at high risk of recurrent events and complications, such as heart failure.

The All New Zealand Acute Coronary Syndromes—Quality Improvement (ANZACS-QI) registry is a national quality
improvement registry which has been introduced to all New Zealand hospitals. A CR module is being developed in this database and will allow for all CR units to be able to report uptake of CR, recurrent major cardiovascular events, as well as long-term medication adherence. This may lead to a better understanding of the benefits and cost-effectiveness of CR programs within the New Zealand health system.\(^5,7\)

**Conclusion**

Modern guideline-based cardiac rehabilitation is a cost effective way to significantly reduce morbidity and mortality. A shift in philosophy is needed to maintain its relevancy in the modern cardiology era, with shorter hospital stays and an increasing burden of patients with multiple comorbidities. Increased access is needed to a menu of CR options available closer to where people live, that suits a broader group of patients and programs need to be resourced appropriately so they can provide education and exercise components that mirror the evidence in the guidelines. Stronger integration with primary care to support collaborative models of care may facilitate a smooth transition from Phase 2 to ongoing care in the community, and to assist in ensuring long-term adherence to healthy behaviours and cardiac medications. In addition, the use of innovative tools like remote monitoring, text messaging, home- and community-based programs need further exploration and evaluation in the New Zealand setting. Finally, all CR providers need a system to collect and compare data across programs to assess uptake and compare outcomes.

**Competing interests:**

Fiona Doolan-Noble reports she is also a co-author on a paper describing a nation-wide audit of cardiac rehabilitation services in New Zealand, also in this issue.

**Author information:**

Jocelyne Benatar, Cardiology Department, Auckland City Hospital, Auckland; Fiona Doolan-Noble, Department of General Practice and Rural Health, University of Otago, Dunedin; Andrew McLachlan, Cardiology Department, Counties Manukau DHB, Auckland, New Zealand.

**Corresponding author:**

Jocelyne Benatar, Cardiology Department, Auckland City Hospital, Auckland.

jbenatar@adhb.govt.nz

**URL:**


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The complexities of designing therapy for Māori living with stroke-related communication disorders

Karen M Brewer, Clare M McCann, Matire LN Harwood

ABSTRACT

Stroke-related communication disorders can have a substantial impact on Māori whānau (extended family). Timely and appropriate speech-language therapy is required, but there are many challenges in providing this. In this article we discuss the need for a kaupapa Māori approach to speech-language therapy that is designed by Māori for Māori, and undertaken in a Māori way. We report the results of a literature review that revealed a small but significant body of literature describing Māori experiences of stroke, aphasia and speech-language therapy, and evidence that a Māori-specific therapy programme can improve outcomes for people with stroke. We then consider the social and political context that impacts the design and delivery of such an approach. Informed by the literature, we propose a hierarchy of skill and resource acquisition for speech-language therapists, in which they learn why to be culturally safe, how to be culturally safe, and how to interact before creating resources to build relationships, resources for education and for therapy. The creation of a kaupapa Māori speech-language therapy approach should bring together people with stroke, whānau members and service providers to create therapy that crosses sectors and disciplines and acknowledges the wider social and political context.

Approximately 67% of people admitted to hospital with stroke will have a communication impairment, including motor speech disorders (dysarthria and apraxia of speech), language disorders (aphasia) and cognitive communication disorders. International research shows that, compared to other stroke survivors, people with stroke-related communication disorders have lower health-related quality of life, are less likely to return to work, and more likely to suffer from depression. Stroke-related communication disorders can reduce social participation and leisure activities and negatively impact family relationships.

Given the effect of communication disorders on family and social life, and the connection between language and culture, it is likely that stroke-related communication disorders are culturally-determined. There is a small but growing body of research about bilingual speakers with aphasia, but almost none on bilingual people with motor speech disorders caused by stroke. Another significant gap in the literature surrounds cultural factors, which play a vital but under-recognised role in aphasia. Integrated with linguistic and cultural factors, experiences of aphasia are also shaped by social, political, historical, and economic processes. These are areas in which many indigenous peoples have significant, and often negative, experiences. It follows that indigenous peoples might have unique experiences of stroke-related communication disorders and, consequently, unique needs for speech-language therapy.

In this article we focus on Māori experiences of stroke-related communication disorders and suggest direction for a suitable speech-language therapy approach for this population. In doing so we employ kaupapa Māori theory, “a foundation for theory and research [that] has grown out of Māori struggles for tino rangatiratanga and mana motuhake”. Tino rangatiratanga and mana motuhake can both be translated as self-determination, sovereignty, autonomy or self-government. Kaupapa Māori theory is cultural and political.
mative (aims to make a positive change for Māori) and decolonising (this includes working within a Māori world view to understand and use research for Māori purposes). These concepts are all essential in the development of a speech-language therapy approach for Māori, one which could be called “kaupapa Māori”.

In 2011, McLellan, McCann and Worrall completed a structured review of the literature, asking whether Māori with aphasia and their whānau were being included in research and what, if any, specific outcomes or concerns had been reported. This search revealed no published literature involving Māori participants stated to have aphasia. We repeated the search in July 2015, seeking work dating from 2011. The aim was to ascertain the extent of the literature now available and gain direction for future research on this topic. This search revealed six articles, one unpublished doctoral thesis and one book chapter. In addition, it uncovered an article showing lower levels of stroke awareness and knowledge of how to treat stroke in Māori members of the New Zealand public compared to New Zealand Europeans. Several recent articles about aphasia in Aboriginal communities in Australia were also found. In addition, we are aware of a second unpublished doctoral thesis.

To be of relevance to more people with stroke, we widened the scope to include all stroke-related communication disorders, and repeated the literature search using the terms ‘Māori’ AND ‘dysarthria’, ‘Māori’ AND ‘apraxia’ and ‘Māori’ AND ‘right hemisphere language’, with no limits on dates. No articles relevant to Māori with stroke were revealed for any of the terms. Having found no articles about communications disorders other than aphasia, we proceeded to analyse the aphasia literature. We recognise that the findings do not necessarily extend to all communication disorders, but expect that many issues will be similar.

While it is pleasing to see an increase in publications on this topic, most of the Māori aphasia articles were by our research team. These cover the methodologies used in the programme of research, insight into the experiences of Māori with aphasia and their whānau members, Māori experiences of speech-language therapy, and speech-language therapists’ (SLTs) experiences working with Māori whānau. In Harwood’s thesis, whānau with stroke were interviewed about all aspects of their stroke, goals, rehabilitation and recovery. Participants expressed a need for more information about speech-language therapy and support from SLTs. Neuropsychology research has highlighted the difficulties in undertaking formal assessment with Māori with aphasia when there are no culturally-appropriate assessment tools available. Finally, a randomised controlled trial with Māori and Pacific people (some of whom had communication disorders) showed that participation in a self-directed rehabilitation programme signifcantly improved health-related quality of life and reduced dependence and carer strain.

Between all of these articles, Māori experiences of aphasia and the challenges faced by clinicians in this field are now well described. However, only one of the articles offers a therapy approach, and this is generic stroke rehabilitation that may not be suitable for people with communication disorders. While revealing a lack of speech-language therapy intervention studies, the literature provides a solid foundation on which therapy could be built, and evidence that stroke rehabilitation outcomes can be improved with the provision of a suitable intervention. The literature shows that whānau with stroke are seeking a culturally-safe therapy service, in which they feel comfortable, respected and able to receive care as Māori. Equally, SLTs have expressed a desire to practise in a culturally-safe manner. Whānau are seeking guidance from SLTs so they can take care of their own rehabilitation. Non-Māori SLTs require guidance from Māori colleagues to work successfully with Māori whānau. Whānau with aphasia report frustrations arising from having insufficient information about their communication disorder, speech-language therapy, and how to support rehabilitation. At the same time, SLTs recognise a need for specific information and education about how to work with Māori whānau. Linked to the desire for information, both whānau and clinicians have identified a need for therapy resources
and settings that reflect the world views and identities of whānau.\textsuperscript{17,20,23}

In summarising this literature, it became abundantly clear that post-stroke therapy resources are desired by Māori, Māori whānau and clinicians. However, the development of kaupapa Māori speech-language therapy for stroke-related communication disorders is not straightforward. The impact of the social, political, historical, and economic context\textsuperscript{12} means that the availability of a Māori therapy resource would not address all the issues associated with speech-language therapy provision for Māori. The therapy would be for whānau who have their own personal context shaped by culture, colonisation and collective experience. It would be undertaken by SLTs who have a personal culture as well as the professional culture of their discipline, and are working for a health organisation that is within a health system. We will address these complexities and suggest a solution in the remainder of this article.

Social and political context

The Treaty of Waitangi is the fundamental political context for Māori health, and therefore the development of a kaupapa Māori therapy approach for stroke-related communication disorders. Under Article Two of the Treaty, Māori have the right to exercise tino rangatiratanga. Article Three entitles Māori to “a fair share of society's benefits” of good health.\textsuperscript{28} Current inequities in health status between Māori and non-Māori\textsuperscript{29} demonstrate that Article Three is not yet being fulfilled. The equity of outcomes promised in Article Three is more likely to be achieved if Article Two is fulfilled and Māori are able to exercise tino rangatiratanga over resources and service delivery.

\textit{He Korowai Oranga: Māori Health Strategy}\textsuperscript{30} has the overarching goal of “pae ora” (healthy futures). It includes four “pathways for action” that provide many concepts important for kaupapa Māori speech-language therapy. The first pathway focuses on community development, capacity building, and removal of barriers so that Māori communities and individuals, including those with disabilities, are able to manage their own wellbeing and long-term health outcomes. The second recognises that, to ensure the services are “appropriate and effective for Māori”, Māori must be involved in decision-making and service delivery. The third acknowledges that most Māori receive care from mainstream services, and these services need to work hard to reduce health inequalities and achieve good outcomes for Māori. The fourth states that service provision should be structured to provide “seamless delivery of care” that meets whānau needs rather than providers' needs.

Whānau Ora is the New Zealand government's current approach to health and social service delivery. The Taskforce on Whānau Centred Initiatives\textsuperscript{31} identified the following key characteristics of Whānau Ora. These could be taken as guidelines for the development of a speech-language therapy approach. Whānau Ora:

1. Is about group (ie, whānau) wellbeing
2. Is about self-determination
3. Values bidirectional intergenerational exchanges
4. Has a strong cultural dimension
5. Is concerned with the ways whānau interact with wider society
6. Transcends sectors.

These documents provide guidance as well as challenges for the development of a kaupapa Māori therapy approach for stroke-related communication disorders. They clearly demonstrate that to be successful, and reduce inequities, the therapy must have a strong cultural dimension and be led, developed, delivered, and owned by Māori. It should provide Māori communities and individuals with tools to work towards self-determined goals to manage their own wellbeing and long-term health outcomes. It should seek to improve intergenerational communication within the whānau, and address the barriers and communication needs of whānau when interacting with and contributing to wider society. The therapy must not sit solely with the discipline of speech-language therapy, but facilitate working across disciplines to benefit whānau.

Striving to be decolonising, kaupapa Māori speech-language therapy does not need to have a relationship with He Korowai Oranga, Whānau Ora or any other
A hierarchy of skill and resource acquisition

Considering the social and political context, and having acknowledged that a therapy resource alone is unlikely to improve therapy outcomes, we propose an approach in which the SLTs cultural safety and clinical skills are developed before kaupapa Māori resources are provided. The proposed approach is illustrated by the poutama (stepped pattern) in Figure 1.

1. Learning why to be culturally safe

Culturally-safe interactions begin with the SLT learning why it is important to be culturally safe. In New Zealand, the application of cultural safety is intertwined with Te Tiriti o Waitangi. Therefore, an understanding of the Treaty of Waitangi and Māori status as tangata whenua is required. Cultural safety focuses on the culture of the clinician and discipline, and the clinician as the bearer of power, whether they are aware of it or not. The focus is not on the cultural practices of a group, but how they are perceived and treated by society. Learning why to be culturally safe, therefore, involves SLTs understanding their individual cultures and that of the SLT profession. It requires an analysis of the power inherent in the position of the SLT and how this can be managed in the clinical setting. It also requires critical analysis of how Māori are perceived and treated, including knowledge of health inequities and social determinants of health.

2. Learning how to be culturally safe

Once a clinician understands why to be culturally safe, they can learn how to be culturally safe. Learning how to be culturally safe involves developing a culturally-safe mind-set in which the clinician recognises and tries to eliminate power differences. Whānau have expressed a desire for guidance from SLTs so they can take care of their own rehabilitation. This is an example of tino rangatiratanga, or self-determination.
which is part of culturally-safe practice. For true whānau tino rangatiratanga, the SLT and whānau must work in partnership. Working in this way may require changes in models of service delivery or scope of practice, changes the speech-language therapy profession may not be ready to make. Improving cultural safety in speech-language therapy is not straightforward. Cultural safety aims to change individual attitudes, but if social structures are not redesigned, changing individual attitudes will make minimal difference. Therefore, it is difficult for clinicians to provide a culturally-safe service for Māori when they work within systems that are not compatible with Māori ways of being.

3. Learning how to interact
Once clinicians have acquired a culturally safe attitude they can learn how to interact in a way that demonstrates that attitude to Māori patients and whānau. Learning how to interact is fundamentally different to learning how to be culturally safe. Addressing power differences is essential for culturally-safe practice. However, clinicians can learn how to interact without acknowledging power, such as the techniques taught in transcultural nursing. If a clinician learns how to interact without learning how to be culturally safe, Māori may perceive his or her actions as patronising or hypocritical.

4. Resources to build relationship
Once a clinician understands why and how to build a relationship with Māori whānau, they can be guided to develop resources which can be used to help build that relationship. This might include processes for interacting with Māori patients and whānau (eg, the Hui process), building relationships with Māori health colleagues who provide cultural support, or creating physical resources such as photo books to use when building a relationship with patients with language disorders.

5. Resources for education
Resources for education will enable the SLT to provide guidance for the whānau about the nature of the stroke and communication disorder, the role of the SLT and ways for whānau to assist rehabilitation, needs which have been identified by whānau living with aphasia. There are many challenges involved in providing information for people with stroke and whānau. It needs to be provided by the right people, at the right time, and in the right format. Provision of health information is closely intertwined with health literacy and the information needs to be provided in a way that is accessible. Kaupapa Māori directs that, as well as being at an accessible reading level, health information presented to Māori needs to be decolonising; not marginalising Māori or taking a deficit approach. In addition, health information should privilege mātau-ranga Māori (traditional Māori knowledge).

6. Resources for therapy
When all of this has been achieved the focus can shift to the final element, the provision of resources for use in speech-language therapy (eg, communication assessments, picture cards and reading passages). While it is tempting to begin at this point, therapy is not so much about the resources used, but the relational ability and cultural safety of the person using them. If kaupapa Māori resources are provided to an SLT who has not mastered the earlier steps, they are unlikely to be beneficial, and could even be harmful. There are a few factors to consider when developing Māori therapy materials. Māori should have control over the design, content, and method of delivery, and the therapy should work towards self-determined goals. Māori resources need to be created by Māori, for Māori, using mātau-ranga Māori. Given that the application of mātauranga Māori varies between Māori groups, a true kaupapa Māori resource can never be pan-Māori. It is necessary to use mātauranga-ā-iwi to create iwi or hapū specific resources. The magnitude
of such a task is immediately apparent. In the absence of any Māori speech-language therapy resources, and considering the time required to create them, in the short-term, a generic Māori resource might be better than no Māori resource at all. This could be created in a way that allows it to be tailored for individual iwi or hapū. Alternatively, rather than creating any resources, it might be preferable to provide SLTs with cultural safety education, cultural support and guidelines for how to use existing resources (whānau photos, artefacts, magazines, etc) in therapy. This way the resources would always be suitable for the whānau because they belong to the whānau. This approach would require a higher skill level from clinicians, increasing the likelihood of resources being utilised correctly.

Conclusion

In preparing this article we repeated and extended the literature search undertaken in 2011. This revealed that in the intervening years, a small but significant body of literature has developed, describing experiences of stroke, aphasia and speech-language therapy. There is evidence that Māori-specific interventions can improve outcomes. Gaps remain in the areas of communication disorders other than aphasia, and specific speech-language therapy approaches and resources. The design and delivery of a speech-language therapy approach is impacted by the social and political context. While this context can be challenging, He Korowai Oranga and Whānau Ora already provide many of the necessary guidelines and outcomes to support the process. Guided by the existing literature, and working with whānau with stroke-related communication disorders, SLTs, and Māori health staff, we are now moving forward with the development of a kaupapa Māori therapy for stroke-related communication disorders.

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Karen M Brewer reports grants from Health Research Council of New Zealand, during the conduct of the study, and "Māori and Cultural Development" portfolio on the New Zealand Speech-language Therapists' Association Executive Council.

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Author information:
Karen M Brewer, Postdoctoral research fellow, Te Kupenga Hauora Māori, The University of Auckland, Auckland; Clare M McCann, Senior lecturer, School of Psychology (Speech Science), The University of Auckland, Auckland; Matire LN Harwood, Senior lecturer, Te Kupenga Hauora Māori, The University of Auckland, Auckland, New Zealand.

Corresponding author:
Karen M Brewer, Te Kupenga Hauora Māori, The University of Auckland Tāmaki Innovation Campus, Private Bag 92019, Auckland Mail Centre 1142, Auckland, New Zealand.

k.brewer@auckland.ac.nz

URL:

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A "Rottie' appendix

Jonathan Paulin, Omid Yassaie

A 4-year-old female was referred by a general practitioner with a 3-day history of central abdominal pain, anorexia, malaise, and dysuria. On examination she was tachycardic, febrile, and peritonitic over the right lower quadrant/suprapubic area. Blood tests were significant for neutrophilia and an elevated C-reactive protein. An ultrasound of the abdomen revealed echogenic free fluid in the right iliac fossa and paracolic gutter. The patient was taken to theatre with suspected appendicitis. On laparoscopy, a perforated appendix was noted with feculent and purulent material throughout the abdominal cavity.

Upon closer inspection of the appendix in-situ, it was noted a distinct black foreign object was protruding with surrounding gangrenous tissue. After removal of the appendix, a short stiff black hair was extracted from the appendix. Further questioning with the family after the operation revealed the young girl had a close relationship with the family pet—a black Rottweiler. We suspect this dog was the source of the incriminating hair causing the perforation. There appears to be one reported previous case of canine hair causing perforation of the appendix, however we believe this is the first documented in-situ evidence of canine hair perforation. The girl made a full recovery and was discharged home.

Figure 1: In-situ picture of Rottweiler hair perforating the appendix.

Author information:
Jonathan Paulin, Trainee Intern, University of Otago School of Medicine, Dunedin Public Hospital, Dunedin; Omid Yassaie, Surgical Registrar, Department of Urology, Capital Coast District Health Board, Wellington, New Zealand.

Corresponding author:
Jonathan Paulin, Trainee Intern, University of Otago School of Medicine, Dunedin Public Hospital, Dunedin, New Zealand.
jonopaulin@gmail.com

URL:

REFERENCES:
Losartan and amlodipine overdose—Case Report of a patient with anuric renal failure prior to the onset of hypotension

Fiona Croft, Emma Brunette-Lawrey

**ABSTRACT**

Dihydropyridine calcium channel blockers are generally considered to have lower risk profiles because of their relative lack of negative inotropy when compared to diltiazem and verapamil. Serious toxic effects following a large ingestion of angiotensin receptor blockers (ARBs) are rarely reported. Prerenal renal failure is reported in overdoses of these agents as a result of severe hypotension. We report a case of amlodipine and losartan overdose where anuric renal failure appears to have developed prior to the onset of severe hypotension. We hypothesise that the early anuria observed in our patient is secondary to afferent and efferent renal arteriole dilation in response to profound block of the AT1 receptors.

Cardiovascular drug overdoses are the fifth most common cause of calls to poison centres for adult overdose in the US, and are the second most common causing fatality, with 305 reported deaths in the US in 2011.1 Within this category, calcium channel blocker (CCB) overdoses are well recognised as high-risk toxicological emergencies, and comprise 34% of single substance cardiovascular drug deaths reported to the American Association of Poison Control Centers.1 Of the subclasses of calcium channel blockers, dihydropyridines, such as amlodipine, are generally considered to have lower risk profiles because of their relative lack of negative inotropy when compared to diltiazem and verapamil, however, a few fatal single and polypharmacy ingestions of amlodipine are reported in the literature.3,4 Serious toxic effects following a large ingestion of angiotensin receptor blockers (ARBs) are rarely reported.5 The majority of adults and children remaining asymptomatic, and a minority experiencing mild self-limiting hypotension dizziness and gastrointestinal upset,5,6 even in large overdose.7 Of >6,500 exposures reported by the National Data Poisons System in 2011, there were no recorded major severity outcomes or deaths.1 There are no reports of anuric renal failure directly attributable to ARB overdose.

In a literature review of EMBASE, OVID and Medline databases (5/5/2015), we identified two previous reports of severe combined calcium channel blocker and angiotensin II receptor blocker overdose. Both focus on management of resultant severe hypotension, which was hypothesised to be the result of synergistic toxicity limiting the effects of both endogenous and exogenous catecholamines. One reports treatment success with hyperinsulinaemia-euglycaemia, the other success with metaraminol after failure of all traditional inotropes including hyperinsulinaemia-euglycaemia.

We report a case of amlodipine and losartan overdose where anuric renal failure appears to have developed prior to the onset of severe hypotension.

**Case report**

A 54-year-old Indian woman, weight estimated at 75kgs, presented by ambulance...
to the ED at 0145 after an intentional ingestion of 200mg of amlodipine (20 times daily dose) and 2,700g of losartan (27 times maximum daily dose) at 1800 the previous evening. The ambulance was called at the onset of vomiting at 6 hours post ingestion. Past medical history included hypertension, hypothyroidism and hypercholesterolaemia. She had no past psychiatric history.

On ambulance pickup, and prior to any fluid, she was orientated, BP 101/75 (MAP 84), PR 76, RR 18. On arrival to the ED she was alert and orientated with no compromise of airway or breathing. She had a heart rate of 86 and a BP of 90/60 (MAP 70) following 500mls of IV fluid prehospital. Her ECG showed 0.5mm ST depression, inferolaterally.

Initial labs showed acute renal failure with a normal venous blood gas (pH 7.43, bicarbonate 24, lactate 2.0, ionised calcium 1.17, Na 141, K 4.4, Cr 159, Urea 6.2). LFTs and FBC were unremarkable.

An arterial line was inserted, and despite 2L IV fluid, 40mins after arrival to the ED she precipitously dropped her BP to 72/36. She was managed with calcium boluses and an infusion, hyperinsulinaemic euglycaemia (bolus 1 unit/kg and infusion of 1u/kg/hr) and noradrenaline infusion (3mg/hr). She received a number of adrenaline boluses while infusions and central line were prepared.

An IDC was inserted and she was found to be anuric with no urine in the bladder on insertion, suggesting onset of anuria prior to ambulance pickup and deterioration of mean arterial pressure (MAP) to <70.

One hour after arrival to the ED, her venous blood gas showed a progressive metabolic acidosis (pH 7.28, pCO2 4.3, bicarbonate 16, lactate 4.1, ionised calcium 1.13). She was transferred to the Department of Critical Care Medicine, where a dopamine infusion (20mg/hr) was added as chronotropic support. Inotropes were titrated to maintain MAPs >60, however she remained oliguric (20mls in 6 hours) and renal function continued to deteriorate.

On day 2 of admission, she developed progressive respiratory failure, likely secondary to volume overload and required intubation, ventilation and haemofiltration was commenced. Renal function started to improve on day 4, but she required vasopressor support until day 9. She was discharged from hospital 13 days after admission with return to normal renal function.

Discussion

Losartan is an angiotensin II receptor antagonist that is metabolised to an active metabolite E-3174 by the cytochrome P450 system. It acts by competitively inhibiting the binding of angiotensin II at the type 1

Figure 1: Timeline of events.
angiotensin II receptor (AT1), hence blocking the vasoconstrictive and aldosterone-secreting effects of angiotensin II. Among numerous other effects, angiotensin II causes constriction of the afferent and, to a greater extent, the efferent renal arterioles. We hypothesise that the early anuria observed in our patient was secondary to afferent and efferent renal arteriole dilation in response to profound block of the AT1 receptors. The resultant renal hypoperfusion would be further exacerbated by the peripheral vasodilatation and hypotension resulting from the large amlodipine overdose, and the AT1 blockade would render the normal renin-angiotensin-aldosterone system response to hypotension ineffective.

Following oral ingestion, the peak plasma concentrations of losartan is 1–2 hours and the terminal half-life 6–9 hours. The plasma concentration of amlodipine peaks at approximately 6–8 hours after ingestion with a terminal elimination half-life of 40–50 hours. There is some evidence that severe renal failure leads to higher plasma concentrations and a prolonged half-life.

We surmise that the early anuria and renal failure in our patient, presumably as a consequence of the combination of the amlodipine and losartan overdose, would therefore serve to further prolong the toxic effects of the amlodipine, likely accounting for the prolonged hypotension and inotrope dependence observed.

The patient in this case report gave written consent for this case to be published.

Author information:
Fiona Croft, Emergency Department, Auckland City Hospital, Auckland; Emma Brunette-Lawrey, Emergency Department, Auckland City Hospital, Auckland, New Zealand.

Corresponding author:
Emma Brunette-Lawrey, Emergency Department, Auckland City Hospital, Auckland, New Zealand.
emma-b@xtra.co.nz

URL:

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Rural healthcare practice is influenced by social, economic, political and cultural factors particular to its geographical location. However, studies typically report that accessibility, isolation, team-working, professional development, being ‘specialist generalists’, and human resources are key issues for services.\(^1\)

We report on research involving semi-structured, face-to-face interviews with a paediatric allied health team in rural New Zealand. The focus was paediatric dysphagia as an example of a complex health condition requiring team-working and education for professionals.\(^2,3,4\) Rural allied health professionals (AHPs) report a lack of support and confidence in working with children and complex conditions, such as feeding disorders.\(^5\) All six team members (all female, New Zealand European; 3 physiotherapists, an occupational therapist, a speech-language therapist, and a social worker) participated. Analysis of interviews using a general inductive approach identified four themes: attitudes, knowledge and skills, scheduling, and support.

Participants commented on client and community attitudes of resilience as a positive aspect of rural work.

“...people from...a really strong farming community, families' attitudes to getting on with things are really different. And that kind of Kiwi do-it-yourself attitude which is different from say some of the families in [small town]...”

There was an overall sense of resignation, especially about self-managing and funding their time, resources, professional development, and supervision. The use of Skype or video links for meetings, therapy and supervision was supported by most participants, but they raised doubts about the effectiveness of interactions over the internet.

“I'd love to have more knowledge [about dysphagia] but it's just really hard...if I was doing full time paediatrics, then I'd definitely put more effort into it but it's such a small window of my working week that I can't really justify it.”

“I haven't got the energy to do it for myself...one day a week you don't have a lot of time...to come up with ideas and do stuff like this.”

Participants described difficulties, but appeared to accept these rather than actively seek solutions. Recent research suggests that rural professionals, especially females, may be more agreeable and cooperative than urban professionals.\(^6\) In international comparisons, people from New Zealand are often described as easy-going, ‘she'll be right’, and agreeable.\(^7\) Research is needed to determine whether this ‘national personality’ is relevant to rural AHPs’ abilities to manage complex cases such as paediatric dysphagia.

Except for the speech-language therapist, participants reported limited dysphagia knowledge and skills, and felt uncomfortable and unskilled:

“I'm nervous actually...I don't always feel like I know the advice...if people ask me...I just say 'look it's not my specialty, I'll have to find out for you'...Which isn't ideal, 'cause we need to be a bit generalist...”
Most participants recognised their upskilling needs, but without practical experience or easy access to expertise, noted it was hard to maintain competency with complex conditions.

“...you’re not seeing the same numbers through in a place like this, but you’re still expected to see the same severity or acuteness of some of those children.”

“...we can’t just pop down the hallway and have a chat with the paediatrician or the neurologist or whoever else the specialist might be.”

Participants’ discomfort around their knowledge and skills working with children with dysphagia reflects previous findings. Challenges with accessing advice and education in rural settings are known, and were a factor for the AHPs interviewed here. Despite reported barriers, most participants were positive about the team and none attributed blame to the team or management.

A consistent theme was difficulty scheduling meetings and liaison with colleagues. A major barrier to discussing clients was differences in employment hours. Lack of opportunity for relationship building and upskilling added to the frustrations. Family-centred practice was difficult due to distance, time, prioritisation and family availability, which seemed out of the professionals’ control.

“Travelling an hour and a half to two hours to see four children in one region who all feed at the same time or at very similar times...that is a constant difficulty for me.”

Limited accessibility to and for clients, and limited team-working opportunities, are associated with poorer health outcomes for clients, increased cost for health providers, and reduced job satisfaction. Similar to AHPs in Australia, participants found scheduling a barrier. Dysphagia posed additional scheduling difficulties in terms of children’s sleeping and feeding patterns.

All participants commented on the support of the team and employer, as well as feeling isolated. Those based away from the main healthcare centre felt more isolated and less supported than those in the main centre. A lack of shared clinical notes, resources and opportunities for liaison enhanced feelings of isolation. Past experience and networks played a large role in mitigating feelings of isolation.

We interviewed a team of rural AHPs who felt under-skilled and lacking in resources for working with complex paediatric cases, highlighting a need to further examine the state of rural allied health practices in New Zealand with a view to reducing barriers to effective healthcare in complex cases.

Acknowledgements:
Sincerest thanks to the professionals who took part in this research and the organisation who agreed to their participation. Particular thanks to Turid Peters for her inspirational ideas on the research topic, and ongoing consultation and support during the research process.

Author information:
Aimee Burgess, Speech Language Therapist, Wairarapa District Health Board & Ministry of Education, Masterton & Wellington; Suzanne C Purdy, Professor, Speech Science, University of Auckland, Auckland; Bianca N Jackson, Professional Teaching Fellow, Speech Science, University of Auckland, Auckland.

Corresponding author:
aimee.burgess@wairarapa.dhb.org.nz

URL:
REFERENCES:


Flexible sigmoidoscopy and bowel cancer screening: reply to Professor Cox

Paul Frankish, Michael Hulme-Moir, Russell Walmsley

We read Associate Professor Cox's editorial on bowel screening with flexible sigmoidoscopy (FS) with interest and we strongly disagree with his conclusions. It seems that we are not alone in this belief. A recent global overview of screening programmes reveals that out of the 71 reported programmes, FS is only used in 5 programmes, and there is nowhere in the world that once-only FS is the sole screening modality for colorectal cancer. In comparison, 40 programmes (56%) used faecal immunochemical testing (FIT), which is used in the Waitemata pilot, and several programmes that have used guaiac-based occult blood testing are in the process of changing to FIT.

It is not correct for Cox to say that the UK is moving to an FS-based programme when it is actually moving to FIT testing, with FS as an add-on to the programme.

FS is an unsatisfactory primary screening test for several reasons.

Firstly, the screened organ is only partly examined; rather like undertaking screening mammograms on only one breast.

Secondly, FS is not a simple test. FS properly undertaken is a good deal more complex and difficult than Cox would have us believe. Enema preparation alone is often not adequate to view all the way to the splenic flexure (a true complete FS), particularly in the older screening population with diverticulosis, previous pelvic surgery, etc. Therefore, in the real world these patients require full bowel preparation. If the patients actually need an identical preparation to colonoscopy, why not examine the whole colon and screen for the important right-sided lesions that are there too?

The implication that a workforce to perform FS can be created by sending willing clinicians on a short course abroad is fantasy. Two to 300 sigmoidoscopies are required to reach consistent performance standards, which would require access to training lists and trainers here in New Zealand for 1–2 years.

Importantly, we believe Cox's estimate that only 5% of FS would need to be followed by colonoscopy is far too low. The US PCLO trial,¹ and Norwegian NORCCAP study, had colonoscopy rates of 21.9 and 21% respectively. Current endoscopic practice in New Zealand would mandate a full colonoscopy if an adenomatous polyp is detected at sigmoidoscopy, so the New Zealand rate of colonoscopy would undoubtedly be higher. The UK study with a 5% colonoscopy rate which Cox relies on for his modeling is an aberration as colonoscopy was not offered to patients with left-sided colonic adenomas.

Cox wants to commit us to a bowel cancer screening programme that would be unique to New Zealand. We believe that the best way forward in New Zealand is to persevere with the FIT test as trialed in the Waitemata DHB pilot. The 4 years of the pilot has shown that this FIT screening programme can be successfully run within an existing DHB framework with an acceptable participation rate of 56.8% in the first screening round.

We urge the government to fund a nationwide programme of FIT-based bowel cancer screening, as there is substantial data now available attesting to the success of this very lengthy pilot.
LETTER

Author information:
Paul Frankish, Gastroenterologist, Lead Endoscopist Bowel Screening Pilot, Waitemata DHB, Auckland; Michael Hulme-Moir, Colorectal Surgeon, Clinical Director Bowel Screening Pilot, Waitemata DHB, Auckland; Russell Walmsley, Gastroenterologist, Waitemata DHB, Auckland, and President New Zealand Society of Gastroenterology

Corresponding author:
Paul Frankish, Gastroenterologist, Lead Endoscopist Bowel Screening Pilot, Waitemata DHB, Auckland, New Zealand.
Paul.Frankish@waitematadhb.govt.nz

URL:

REFERENCES:


Menevit—the data never seen
Lance Gravatt

Menevit has been promoted for healthy male sperm for many years, largely on the basis of the Tremellen paper which demonstrated a marginal (p=0.046) improvement in pregnancies at 3 months. Uncertainties regarding the conclusions from the Tremellen paper include: Tremellen was the inventor of Menevit; there was no significant improvement in DNA fragmentation or progressive sperm motility, which are considered to be surrogate targets for the antioxidants contained in Menevit; and 3-month live birth endpoint rather than full-term live births.

Nevertheless, the Tremellen paper is regarded by many as the standard reference for supporting the role of Menevit in sub-fertile men.

However, there was a second study with Menevit conducted by Tremellen's team, the so-called ‘ADAM Study’, which has never been published in a peer-reviewed paper. It exists as a thesis only entitled Treatment of Oxidative DNA Damage in sperm using an Oral Antioxidant Therapy.

The ADAM trial provided mixed results:
- No statistically significant improvement in sperm concentration (p=0.304), sperm motility (p=0.778) or overall sperm morphology (p=0.938)
- A 4.0% decrease in DNA fragmentation after 90 days therapy (p=0.002)
- A 4.8% decrease in early apoptosis after 90 days therapy (p=0.004).

Menevit remains a much recommended therapy, but caution should be exercised when interpreting its full dataset.

Author information:
Lance Gravatt, Chairman, Te Arai BioFarma Ltd, Auckland, New Zealand.

Corresponding author:
Lance Gravatt, Chairman, Te Arai BioFarma Ltd, PO Box 46205, Herne Bay 1147 Auckland, New Zealand.
gavatt@ihug.co.nz

URL:

REFERENCES:
Radical cystectomies: a case for prolonged thrombo-prophylaxis
Don Ponnamperuma, Manmeet Saluja, Angela Ballinger, Kevin Bax

Thrombo-prophylaxis using both mechanical and chemical methods for the prevention of venous thrombo-embolism (VTE) following oncological resection has been well established in general surgery and gynaecology. The use of thrombo-prophylaxis following radical cystectomy is less well defined; however it is known that that up to 24% of patients undergoing cystectomy will develop VTE.\(^1\)\(^2\) What is less well characterised is the duration of risk of VTE following radical cystectomy. There is evidence that the duration of risk following oncological surgery extends beyond that of hospitalisation.\(^3\) This contrasts with conventional practice, which is to only provide VTE prophylaxis during hospitalisation.

A recent retrospective study, looking solely at radical cystectomy, showed nearly 58% of cases of VTE occurred after discharge, at a median time to diagnosis of 20 days after surgery. This was a large study that included over 2,300 patients from 1971–2012. The authors also found four statistically significant predictors of VTE: BMI; surgical margins; diversion type; and duration of hospitalisation. A potential source of bias in this study is that patients from before the era of chemical thrombo-prophylaxis were included in the study.\(^4\)

A retrospective audit of VTE following cystectomy performed at Christchurch Public Hospital (unpublished data) found that the rate of VTE is comparable to that of other centres.\(^1\)\(^2\)\(^4\) Additionally, over 90% of patients in this study had a recorded administration of chemical VTE prophylaxis and TED stocking use. This study also corroborated that the majority of VTEs occur after discharge, with a mean time to diagnosis of 21 days. A recent change in protocol resulted in patients receiving extended VTE prophylaxis, in the form of low molecular weight heparin. Two patients undergoing this protocol were captured in the audit, neither of whom suffered VTE. This audit failed to find any statistically significant risk factors for the development of VTE.

There is increasing evidence for the extended use of VTE prophylaxis after radical cystectomy. The results of the audit done at Christchurch Public Hospital add to the case for prolonged VTE prophylaxis. Current practice is to prescribe a 28-day course of enoxaparin 40mg once daily. This presents two potential delays to patient discharge. Firstly, the patient has to be educated on how to self-administer enoxaparin. Secondly, prescribing enoxaparin outside hospital, in New Zealand, requires a special authority from PHARMAC. This issue may partly be resolved by the use of electronic special authority application by clinicians. These may be incorporated into the conventional package of care so as to expedite patient’s discharge from hospital.
LETTER

Acknowledgments:
Maria Yamit, Audit facilitator, Department of Urology, Canterbury District Health Board; Ma Yi, Biostatistician, Canterbury District Health Board, Christchurch, New Zealand.

Author information:
Don Ponnamperuma, Surgical registrar, Canterbury District Health Board, Christchurch; Manmeet Saluja, Urology registrar, Waikato District Health Board, Hamilton; Angela Ballinger, Trainee intern, University of Otago, Dunedin; Kevin Bax, Urologist, Canterbury District Health Board, Christchurch, New Zealand.

Corresponding author:
Don Ponnamperuma, Surgical registrar, Canterbury District Health Board, Christchurch, New Zealand.
pondo873@gmail.com

URL:

REFERENCES:
Defence of the Living Dead: zombies as vectors for transmitting positive health messages

Rajan Ragupathy

The study by Houghton et al (NZMJ: 129; 1430) should be of great interest to all health professionals studying the zombie phenomenon. However, the authors may have been too hasty in dismissing zombies as vectors for transmitting positive health messages.1 In the process, they may also have missed an opportunity for alleviating health and social issues that blight the (un)lives of the often overlooked zombie patient population (see Commentary 1). There is little doubt that zombies are portrayed negatively in the media and in popular culture. Some reasons for this—transmitting highly virulent pathogens, consuming human flesh (see Commentary 2), and bringing about the end of civilization—are objectively verifiable. However, zombies are also unfairly associated with such things as failing banks, moribund national economies and slow depopulation of isolated small towns.2,3 (If there's one thing that zombies never do, it's slow depopulation of isolated small towns).

Many factors may explain such unfair portrayals. It could be argued that the loss of verbal and fine motor skills in zombification leaves this group unable to articulate its own interests. However, biologically deterministic explanations for observed inequities risks excusing, and even justifying, societal biases. For example, zombies may not have the conventional attractiveness that draws positive coverage.4 Like others who have met violent ends, they may not fit the image of the ‘ideal victim’, and may be portrayed negatively for an ‘extra-legal’ reason.4,6 (To wit, the lamentable tendency to rise again and consume the temporarily still-living). They may be afflicted by stigma surrounding their condition.7 It therefore falls on health professionals to advocate for zombies.

In light of the above, using zombies as a means of transmitting positive health messages potentially both empowers and destigmatises this population, and should not be cast aside lightly. Failing to integrate zombies into society could come back to bite us—as it were.

Houghton et al note that using zombie epidemic metaphors to reinforce disaster preparedness leads young Americans to make unprompted associations with weaponry. Where the authors may err is in attributing this to zombies. Possession of weaponry (particularly firearms) plays a central role in Americans’ culture and national psyche. Efforts to combat (or even study) gun violence have been fiercely resisted as affronts to American liberty.8 Furthermore, it has been argued that ‘zombie apocalypse’ is often a code for American cultural anxieties such as racial conflict, crime or societal upheaval.9 It is not therefore unreasonable that a proportion of Americans would seek to arm themselves in any uncertain (or routine, or social) situation. This effect may not occur in other cultural settings.

Furthermore, by dismissing the role of zombies in disaster preparedness, we risk rushing to slam the door on zombies in other contexts. (Again. Sigh.) Zombies may transmit many positive health messages. In an age of rising obesity and physical inactivity, zombies relentlessly reinforce the survival benefits of regular cardiovascular training. In this context, they also educate on the difference between absolute and relative risk reduction. (While being able to outrun zombies is an absolute survival benefit, there is also a statistically

LETTER
significant advantage to simply being able to outrun the other guy). Zombies may convey the health risks of isolation ("This will be faster if we split up"). Given concerns about the health impacts of climate change, zombies highlight the risks of dismissing dangerous changes in one's environment as transient weather phenomena ("It's probably just the wind").

In conclusion, health professionals must not prematurely bury the idea of using zombies to convey positive health messages. That, after all, is a fate that zombies themselves know all too well.

Commentary 1

In fact, conventional medical thinking is highly sceptical of the mere existence of zombies. However, there is a dearth of peer-reviewed literature. In the best traditions of evidence-based medicine, we must therefore keep an open mind. This is especially true as zombies have every reason to hide from 'real humans'—see Commentary 2.

Commentary 2

The prejudicial term 'cannibalism' should be avoided. If zombies are no longer human, then ipso facto the consumption of human flesh cannot be cannibalism. Conversely, if zombies are human, our routine reaction to them would violate national laws, international humanitarian conventions, and arguably even the laws of war. One cannot have it both ways.

Competing interests:
The author is parent to rambunctious 2-year-old twin boys. As such, the author has a natural affinity with those bitten by human teeth, dragged untimely from their rest, and condemned to exist in a perpetual shambling and semi-coherent haze. The author self-prescribes a weekly therapeutic dose of iZombie.

Disclaimer:
This article does not necessarily represent Waikato DHBs position on the undead. It was written on the author's own (now severely limited) free time, which probably says a great deal about the author's priorities.

Author information:

Corresponding author:
Rajan.Ragupathy@waikatodhb.health.nz

URL:

REFERENCES:


Clinical insignificance of alcohol in salbutamol metered-dose inhalers—it’s time to stop flogging the horse

Felix SF Ram, Elissa M McDonald

The ozone-depleting potential of chlorofluorocarbons (CFC) in metered-dose inhalers (MDI) has led to the end of CFCs being used in MDIs. Currently available generic MDIs in New Zealand (Respigen®, Salamol®, and the recently introduced SalAir®), are developed containing the less ozone-depleting hydrofluoroalkane, HFA-134a. To aid this changeover these formulations literally contain microscopic amounts of ethanol (2–5 micrograms/actuation) as a co-solvent. Anecdotal evidence suggests that community pharmacists are being misled into believing that the recently introduced (September 2015) SalAir® containing less ethanol (2 micrograms) is clinically superior to the other similar inhalers. We wanted to inform and provide assurance to all healthcare practitioners regarding any clinical differences between these devices by reviewing the evidence to date.

Many good clinical studies have shown that the actual dose of ethanol delivered per actuation is insignificant, with no evidence of any health impact in children or adults. These inhalers have been reviewed and approved as safe for use in children and adults, not only by Medsafe (Ministry of Health) in New Zealand, but by regulatory authorities in many different countries in Europe, the Middle East, Africa and the US.

PHARMAC’s Respiratory Subcommittee of experts has extensively reviewed both Respigen and Salamol, and did not report ethanol as an issue, due to the extremely low and clinically insignificant levels present. In New Zealand, approximately 8–10 years ago, there was misinformed publicity regarding MDI and ethanol content. However, high quality clinical studies conducted in New Zealand and overseas have clearly demonstrated the insignificance of the ethanol content in these MDIs. Any perceived patient issues (eg, road side alcohol breath tests), even with the MDI containing the highest level of ethanol (Salamol, 4.85 micrograms/actuation), proved insignificant during extensive repeated testing. Furthermore, studies have shown that even non-alcohol containing salbutamol MDIs (eg, Ventolin®) have been reported as giving elevated breath-alcohol recordings, and the authors suggests that this may be due to the actual propellants used rather than the alcohol. Any effects of ethanol in these inhalers (even with highest level) appear extremely low (if any), incredibly short-lived (2–3 minutes), and only localised with no long-term effects highlighted in any studies conducted to date. Based on ethanol content, there is absolutely no reason to choose one salbutamol inhaler over another, and any claims of differences based on ethanol between salbutamol inhalers remains entirely unsubstantiated.
LETTER

References:


Author Information:
Felix SF Ram, Senior Lecturer in Clinical Pharmacology, College of Health, Massey University, Auckland; Elissa M McDonald, Lecturer, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand.

Corresponding Author:
Felix SF Ram, Senior Lecturer in Clinical Pharmacology, College of Health, Massey University, Auckland, New Zealand.
fsfram@yahoo.co.uk

URL:
OBITUARY

Clemens Franzmayr
18 October 1938–22 December 2015

With the death of Clemens Alfonz Franz Franzmayr on 22 December 2015, musculoskeletal medicine in New Zealand lost one of its most compassionate, colourful, and experienced exponents.

Clemens trained in non-trauma orthopaedic medicine and surgery in Germany, and this training included extensive instruction and experience in manual medicine techniques. Clemens' compassionate nature was displayed when, as a young German, he was involved with international friendship excursions, particularly to Holland, that endeavoured to repair some of the tragic relationship ruptures that had occurred between European countries as a result of the terrible Second World War. Clemens had a beautiful singing voice, and this interest, manifested as choir participation, continued until the last year of his life.

In 1987 Clemens, with his wife and children, moved to New Zealand. He applied to Mr Bill Gillespie, Chief of Orthopaedics at Christchurch, to have a supervised position that would allow him to register in New Zealand. When informed that he would have to do 2 years of acute hospital trauma, he declined, and chose instead to go to the remote Chatham Islands, 900km offshore from Christchurch. His time there not only allowed him to register in New Zealand, but he made long-term friends of the people on the Islands. Long after he was an established specialist in Christchurch, many would...
make the long journey to visit him, bringing intriguing gifts from these isolated Islands.

In 1988, he was offered a sponsored position at the Musculoskeletal Pain Assessment and Management Centre at Burwood Hospital, Christchurch, working under rheumatologist Dr Barrie Tait. In 1989, Dr Tait began the Diploma of Musculoskeletal Medicine through the auspices of the University of Otago. The Diploma aimed to educate general practitioners, rheumatologists and orthopaedic trainees in the area of musculoskeletal and manual medicine, and to fill a significant gap in medical education. Clemens was one of the founding trainees.

Dr John Robinson was a young GP when he first met Clemens at Burwood. Clemens inspired John to become interested, and then train in musculoskeletal medicine. John learned Clemens’ approach to patients, and was taught many manual therapy techniques by Clemens. Clemens was a very dedicated and skilled teacher, and John describes him as “always very supportive and patient, and taught me a great deal”. Several years later, in the late 1990s, Clemens agreed spend an afternoon a week teaching then GP Dr Elizabeth Eliot, and she too appreciated being able to learn a great deal from his sensitive hands and kindness of heart in both diagnosis and treatment.

When the focus of the Burwood Pain Management Clinic changed, Clemens elected to go into fulltime private practice in Papanui, Christchurch.

Clemens always loved teaching, and he and Elizabeth hosted evening musculoskeletal seminars for Christchurch GPs. For many years Clemens also regularly contributed articles on musculoskeletal medicine to the New Zealand Doctor magazine. Clemens worked in his practice until August 2014, when he developed cerebrovascular symptoms which stopped him from working. Despite that, he remained interested in supportive of musculoskeletal practice while he was well enough.

Clemens was an active member of the New Zealand Association of Musculoskeletal Medicine. For about 15 years, he was the association's treasurer, and he was instrumental in bringing many internationally recognised musculoskeletal specialists to teach seminars in New Zealand, such as Drs Jiri Dvorak, Karel Lewit and Pavel Kolar. Clemens persistently advocated the use of manual therapy techniques, and in his own practice demonstrated their therapeutic and financial effectiveness. Sometimes this emphasis caused controversy, but none could doubt his therapeutic success.

Barrie Tait found Clemens a good colleague, and appreciated his analytical approach to difficult cases and his wide experience in manual medicine. About 5 or 6 years ago, Clemens sent his good friend Barrie a birthday card, expressing the hope that they would both still be working when they were 140! Sadly, health issues cut short that dream.

Dr Clemens Franzmayr was an extremely capable and dedicated doctor, a delightful colleague and a colourful personality who will long be remembered by his colleagues and friends. Clemens is survived by his five children, Yasmin, Jazinta, Florian, Mira, Benjamin and Miko, to whom we offer our condolences.

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Author information:
E Eliot (Auckland), Dr J Keightley (Christchurch, President NZAMSM).
General practitioners with a special interest in Musculoskeletal Medicine.

URL:
OBITUARY

Alexander Keith Jeffery
5 August 1934 – 1 July 2015

Keith was born in Milton, the second son of Bill Jeffery, a stock and station agent, and his wife Reta. He had two brothers, Garry, the elder, and Grant. The family moved to Anderson's Bay in Dunedin when Keith was an infant. He initially attended Anderson's Bay Primary school, where his grandfather had been the first headmaster. As a teenager, he attended Kings High School where he was a prefect and played rugby as a loose forward in the First XV.

Keith won a place at the Otago Medical School and graduated MB ChB (Otago) in 1958, subsequently working in Dunedin Hospital as a house surgeon. He met Knola, a recently graduated nurse, in the operating theatre. A strong, mutually-supportive relationship was cemented by their marriage a year later.

By the end of the 2 house-surgeon years, Keith had decided to specialise in orthopaedic surgery. In 1965, along with Knola and their small daughter Kate, he set off to the UK to undertake specialist training, very quickly becoming a Fellow of the Royal College of Surgeons in 1965. He held posts in Oswestry, Oxford, and Exeter. In Exeter, Keith worked with RSM Ling, who was very involved in the design and engineering of prostheses. Keith also visited Wrightington where John Charnley had established the principles of low-friction arthroplasty and implant fixation, and was working on the development of a clean-air surgical environment. Back in New Zealand, Keith performed one of the first hip replacement operations in New Zealand.

Keith, Knola, Kate, and a new baby, Alistair, returned to New Zealand in 1968 with his appointment as specialist orthopaedic surgeon at Dunedin Hospital, a position he held until 2000. Following his return to New Zealand, Keith gained his FRACS and in 1975 he completed his ChM (Otago). During 1972, Keith was an ABC Travelling Fellow travelling through...
OBITUARY

North America. He revisited the University of Oxford as a Commonwealth Fellow in 1976–77, and in 1989 was awarded the Gold Medal and guest lectureship at Oswestry.

In 1982, Keith succeeded Alan Alldred as Professor of Orthopaedic Surgery in Dunedin. His academic interests and enquiring mind resulted in a lifelong pursuit of meaningful scientific research. He became a world authority on the structure and function of articular cartilage. With Mark Walton, he created a well-respected research department which attracted post-graduate students. He also had a keen interest in the management of amputees and the science of prosthetics, and served on the Artificial Limb Board for many years.

He had a natural ability to engage with people of all ages and from all walks of life, in an uncomplicated way. Keith loved teaching, especially undergraduates, for whom his tutorials were superbly planned and illustrated; students seldom skipped them. His bedside teaching was inspiring. He structured his operating lists as teaching masterclasses for registrars, and served as a RACS examiner. A legacy of Keith’s leadership has been a strong, enduring, department commitment to teaching.

Having served on a number of New Zealand Orthopaedic Association Committees, Keith became the 25th President of the Association in 1993, and he and Knola were great ambassadors for New Zealand orthopaedics at home and abroad. Keith was well known in British orthopaedics, and in particular Oswestry, Oxford, and the Royal National Orthopaedic Hospital in London, where he spent a number of sabbaticals working on cartilage research in collaboration with George Bentley. He lectured extensively on various orthopaedic topics, and in 2007 he was invited to give the College of Surgeons Hamilton Russel Lecture. In the same year, he was presented with the NZOA President’s Award for services to the Association. In 2003, Keith became an Officer of the New Zealand Order of Merit for services to Orthopaedic Surgery.

On his retirement, Keith energetically pursued his interest in the history of the Dunedin Hospital and the School of Medicine. He thoroughly enjoyed researching historical figures in medicine, especially orthopaedic pioneers. He presented regularly at the Otago Medical School Alumni Association history meetings in Dunedin and was a member of its Executive Committee. He had a keen interest in historical maps and over the years built up an important collection, which will remain in Dunedin.

Keith was passionate about his career, loved his profession immensely, and, with Knola, was part of a close family. In his later years, he suffered a significant number of health challenges, which he faced with enormous dignity and strength, and a complete lack of fuss or self-pity. He died from complications of stroke on July 1 2015.

Keith is survived by his wife, Knola, his children Kate, Alistair, and Penny, and 10 grandchildren, all of whom miss him greatly.

Author information:
Lesley and Bill Gillespie, FRACS, with the assistance of family and friends.

URL:
OBITUARY

Peter Mann Meffan
17 April 1930–25 March 2016

Nelson surgeon, Peter Meffan, was known as the region’s first and only urologist for many years; for the four large yachts he hand-built; and for his always dapper appearance. Less well recognised was that he had developed a form of prostate cancer treatment that was picked up internationally, and has continued to help men around the world.

Born in Wellington, Peter spent his childhood further North, where his parents taught at what were known as ‘native schools’ near Ōpōtiki and at Ruatōria.

He did his first high school studies by correspondence, before 2 years as a boarder at Gisborne Boys High School, going from there to Otago Medical School, where he graduated as a doctor in 1954.

It was here that we first met in the Anatomy Department. Our friendship was well established by the time we qualified.

We did not meet again until we travelled to the UK for postgraduate training, in 1958. By then, Peter had married Margaret, who had also qualified in medicine, and they had produced their firstborn Mary, their second, Patrick, was born when they were away. They lived in a house on the edge of London’s North Circular Road, and many happy times were spent there.

Over the next 3 years we both gained postgraduate degrees, Peter in surgery,

MBChB 1954, FRCS 1960, FRACS UROL 1967
and myself in obstetrics and gynaecology. Peter returned to Nelson as a surgeon a few months before I acquired a ships doctor job and returned, also with wife and two children. Peter had written to me from Nelson explaining an O&G was required, but more important, he had started building a yacht and wanted a hand. How could I say No! We were wonderfully welcomed to Nelson, the Meffan and Neill families went forth and multiplied—five and four a piece!

Later, Peter decided to specialise in urology, which necessitated moving with the family back to the UK (Leeds) for a year, then returning to Nelson Hospital, as urologist until his retirement at the turn of the century—where, for the last few years, he worked alongside his son Patrick who remains a consultant urologist in Nelson.

Peter's energy and drive were outstanding. He had the hospital build him a research lab, to investigate renal transplants. However, his greater contribution was in linking hormone therapy and radiotherapy, in dealing with prostate cancer.

Standard therapy had been, radiation for earlier cancers that might cure, while hormones were used to treat wider-spread cancers and shrink them, but not cure. Peter's concept was to give hormones first, to shrink both types of disease, then radiotherapy. This did enhance results, and still applies 30 to 40 years later.

Peter, as a home yacht builder, was prepared to include all aspects of construction, even making aluminium bronze bolts on a lathe. He would ‘have a go’ at all aspects, and succeed.

The 8.5 metre (28 foot) *Amitie* was built in 1962–65 followed by the 11.6m (38 foot) *Amitie 2* built 1967–72, then the 13m (43 foot) *Helix Busby* constructed in 18 months and launched in 1976. The last of the quartet, the 10.7m (35 foot) *Spirit of Joy* was launched in 1993. It remains in the family.

Peter's funeral, in Nelson’s Christ Church Cathedral, was a musical treat. Three of his grandsons sang a Joe Cocker-inspired version of *With a Little Help from My Friends*, known to have been sung by their grandfather with gusto while handling the tiller as they crossed Tasman Bay in a storm.

Grand-daughter, the violinist Juliet Ayre, played a Chopin nocturne, accompanied by her mother, pianist Mary Ayre, who later played Mendelssohn's *Songs without Words*.

Tributes from each of the four sons were outstanding. They described his unbounded enthusiasm for going on adventurous trips, whether they be on the sea or into the hills. His ability to see something positive in everything and everyone he encountered. “He was a man for his times”, yet, as his 14-year-old grandson Burty described him, was a humble person, a role model and a friend.

His legacy has left a family of very high achievers. His grandson, Peter-Patrick’s son, is the third generation of the Meffan family to graduate from the Otago Medical School.

On behalf of all who have been privileged to have known this remarkable man, we offer deepest sympathy to the family, Margaret, his wife and his children, Mary Ayre, Patrick Meffan, Andrew Meffan, Terry Meffan, and James Meffan.

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**Author information:**
Brian Neill, Nelson

**URL:**
Cardiovascular risks associated with clarithromycin

The macrolide antibiotics, in particular clarithromycin, may be associated with the risk of unfavourable cardiovascular outcomes. In this population-based study, the authors compare cardiovascular outcomes in adults aged 18 or more receiving oral clarithromycin or amoxicillin over a 5-year period.

In this cohort analysis, they compared outcomes between over 100,000 patients treated with clarithromycin, and over 200,000 who received amoxicillin. At 14 days, the risk ratio of myocardial infarction was 3.66 for clarithromycin compared with amoxicillin. Similarly, rate ratios of secondary outcomes increased significantly only with current use of clarithromycin vs amoxicillin, except for stroke.

The researchers conclude that the use of clarithromycin was associated with an increased risk of myocardial infarction, arrhythmia, and cardiac mortality short-term, but no association with long-term cardiovascular risks.

BMJ 2016; 352:h6926

Low-cost mesh in groin hernia repair

The most effective method for repair of a groin hernia involves the use of a synthetic mesh, but this type of mesh is unaffordable for many patients in low- and middle-income countries. Apparently, sterilised mosquito mesh may be a lower cost alternative.

This Swedish-funded, randomised trial was conducted in Uganda and compared outcomes between the use of synthetic and mosquito mesh. Three hundred and two patients were randomised and followed-up for one year. Hernia recurred in one patient (0.7%) assigned to the low-cost mesh, and in no patients assigned to the commercial mesh. Postoperative complications, most commonly a groin haematoma, were equally distributed between the two groups.

The researchers conclude that their results support the use of low-cost mesh for hernia repair in resource-scarce settings after appropriate training of staff performing the procedures.


Blood pressure lowering for prevention of cardiovascular disease and death

The benefits of blood pressure lowering treatment for prevention of cardiovascular disease are well established. However, the extent to which these effects differ by baseline blood pressure, presence of comorbidities, or drug class is less clear. This report concerns a meta-analysis of relevant trials dealing with these matters.

One hundred and twenty-three studies involving over 600,000 participants have been reviewed. Every 10mm Hg reduction is systolic blood pressure significantly reduced the risk of major cardiovascular events (relative risk [RR] 0.8, coronary heart disease 0.83, stroke 0.73 and heart failure 0.72). This lead to a significant 13% reduction in all-cause mortality (RR 0.87).

Beta blockers were inferior to other drugs for the prevention of major cardiovascular disease events, stroke, and renal failure. Calcium channel blockers were superior to other drugs for the prevention of stroke. For the prevention of heart failure, calcium channel blockers were inferior and diuretics were superior to other drug classes.

The researchers conclude that “Blood pressure lowering significantly reduces vascular risk across various baseline blood pressure levels and comorbidities. Our results provide strong support for lowering blood pressure to systolic blood pressures less than 130mm Hg”

Lancet 2016; 387:957-67

URL:
A few notes on a case of complicated fracture of the femur of unusual type

Stanley EV Brown, FR0S
June, 1916

JH (æt. 33) admitted to Southland Hospital, at 4 am, on 31 July, 1915.

While riding a motor-cycle, he collided with a car about 2 hours previously. He was thrown clear of the car, but does not remember how he fell.

Examination: A small wound was seen over the left patella, and the joint was tremendously swollen. The patella was fractured transversely, with about one inch separation of the fragments. The skin wound was found to communicate with the joint through the patellar gap. There was also what was apparently a simple fracture of the shaft of the left femur just above its middle.

Operation: A few hours later, I performed an open operation on the patellar fracture by means of a curved incision below the bone. Skin and subcutaneous tissues were reflected exposing the bone, each half of which was found to be very much comminuted. The knee joint was full of blood clot and a considerable quantity of road metal. This was carefully removed, and two small soft rubber tubes put in to drain the joint on either side posteriorly through counter openings.

The patellar fragments were next approximated. Wire sutures would not hold in the bone, owing to extensive comminution, but the fragments were eventually brought together by wire structures through the aponeurosis. The lateral expansions were then repaired, and the wound closed anteriorly.

The limb was subsequently put up in a Hodgén's splint for convenience of dressing.

4 August, 1915: Tubes removed. Small amount of seropurulent discharge from compounding wound over patella.

10 August, 1915: Tube sinuses and compounding wound were still discharging slightly. Bismuth paste was injected into all three, resulting in complete and permanent closure.

Femur: Radiogram on 5 August 1915, revealed an extraordinary condition at the femoral fracture. There was a transverse fracture of the shaft just above its middle, and a splitting of the upper fragment as high as the lesser trochanter.

The lower fragment was slightly impacted into the other. The question of open replacement was considered, and decided against.

From this condition, I concluded that the accident had thrown him with his full weight on the left knee, which was flexed, causing the compound comminuted patella-fracture. Continuation of the violence had caused a transverse fracture of the femoral shaft, and a further continuation had impacted the lower into the upper fragment, splitting the latter as indicated.
Owing to the femoral condition, it was not possible to start passive movements of the knee joint as early as I should have liked.


11 September 1915: Radiogram showed great amount of callus formation between and around femoral fragments.

13 October 1915: Patient left hospital.

**Condition:** Leg half-inch shortening. Knee-flexion to right angle possible. Walks easily with support of one stick. Large amount of callus round femoral fracture. Some oedema of leg after walking.

3 January 1916: Patient reports that he is now following his ordinary occupation of farm labourer, and complains of no disability beyond a little loss of flexibility of the knee.
University of Otago, Otago Medical School
Freemasons Postgraduate Fellowships in Paediatrics and Child Health for 2017

The above Fellowships or Scholarships are intended to support research and training, and are open to University graduates who intend long term to pursue work in Paediatrics or Child Health within New Zealand. The Fellowships include full-time salary for one year with provision for a further year.

Applications close on Friday 8 July 2016 with the Department Manager, Department of Women's & Children's Health, Dunedin School of Medicine, PO Box 56, Dunedin 9054, from whom further details may be obtained (wch.admin@otago.ac.nz).

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