Health, fairness and New Zealand’s contribution to global post 2020 climate change action

Good progress for children coupled with recalcitrant inequalities for adults in New Zealand’s journey towards Universal Health Coverage over the last decade

- Suboptimal smokefree signage at some hospitals: Field observations and the use of Google Street View
- TPPA and the public health
- Potential for health gain equity
- Paediatric empyema in New Zealand
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SUMMARIES

Health, fairness and New Zealand's contribution to global post 2020 climate change action
Hayley Bennett, Alex Macmillan, Rhys Jones
Health and wellbeing have been largely ignored in discussions around climate change targets and action to date. The current public consultation around NZ's post-2020 climate target is an opportunity for health professionals to highlight the health implications of climate change. Without urgent global efforts to bring down global GHG (greenhouse gas) emissions, the world is heading towards high levels of global warming, which will have devastating impacts on human health and wellbeing. New Zealand action to bring down GHG emissions (as part of the global effort) has potential to improve health and reduce costs on the health sector, if health and fairness are put at the centre of policies to address climate change. New Zealand should commit to at least 40% reductions in GHG emissions by 2030, and zero carbon emissions before 2050, with healthy and fair policies across sectors to enable reaching these targets.

Potential for health gain equity
Nina Scott, Ross Lawrenson
Although there has been some progress in ASH rates, there remain large and unacceptable inequities between the most and least privileged ethnic and socioeconomic groups of 0–4 year old New Zealand children. Such health inequities are a problem affecting everyone in society. Health surveys of 2002 and 2012/13 illustrate the percent of patients seeing their GP in a 12-month period has not changed for Māori and New Zealand Europeans, but Pacific engagement has reduced. Long-term strategies need to be developed. Increasing the number of general practice trainees and ensuring funding is targeted to practices in the areas that are most needy. More sophisticated analysis of the influences of general practice on the whole health system would also help.

Good progress for children coupled with recalcitrant inequalities for adults in New Zealand's journey towards Universal Health Coverage over the last decade
Don Matheson, Johanna Reidy, Lee Tan, Julia Carr
Over the last decade, Children who are Maori, Pacific and or from deprived areas have been increasingly less likely to end up in hospital for conditions that are best treated by the GP or Nurse in the community. For Pacific middle aged adults, the reverse is true. They are ending up in hospital more frequently for conditions that could be treated in the community. The government health policies have had a positive impact on children, whereas the situation for adults is either deteriorating or not improving, and this is likely to be due to worsening of incomes, housing and other social conditions, as well as the cost of an appointment.

Paediatric empyema in New Zealand: a tale of two cities
Cameron Burton, Tony Walls, Neil Price, Tamsin Glasgow, Cameron Walker, Spencer Beasley, Emma Best
The Staphylococcus bacteria is the major cause of complicated childhood pneumonia in New Zealand. The North Island has higher rates of complicated pneumonia in children but in both Auckland and Christchurch hospitals the antibiotic guidelines are appropriate to make sure almost all children are treated effectively when they first arrive in hospital.
Retention on anti-tumour necrosis factor therapy: the Waikato experience
Ken Ip, Lorraine Hartley, Kamal Solanki, Douglas White
Anti-TNF therapies are used for a variety of conditions treated by rheumatologists and other medical specialists. We have looked at how long our patients stay on these therapies in comparison to published international data and found that our times are longer. This may reflect the reduced number of treatment options available in New Zealand. Patients came off these treatments for a variety of reasons including initial and delayed lack of benefit as well as side-effects. Retention on the agent given intravenously was significantly lower than the most commonly used sub-cutaneous agent.

Trans-Pacific Partnership Agreement and the public health
Mike Beard
The Trans-Pacific Trade Agreement (TPPA) negotiations have been conducted in secrecy over the past four years. In New Zealand, the government has not released any official details of these negotiations and all the information we have about TPPA is derived from leaks. This makes any analysis of the risks and benefits of TPPA difficult to carry out. However, the consistency of the leaked material indicates that the TPPA appears to have major implications for the New Zealand health system, potentially adversely affecting public health initiatives, the control of alcohol and obesity problems, and reducing the availability of some drugs.

How well does your healthcare system perform? Tracking progress toward the triple aim using system level measures
Fiona Doolan-Noble, Mataroria Lyndon, Sybil Hau, Andrew Hill, Jonathan Gray, Robin Gauld
Counties Manukau DHB has adopted a unique approach of using whole of system measures to understand how its health system is functioning. The measurements adopted inform quality improvement activity and ensuring that quality improvement initiatives are targeted to the right part of the system. In addition, adoption of these measures allows the DHB to compare itself with similar organisations nationally and internationally.
The government's current public consultation about climate change presents a rare opportunity for health and wellbeing to enter the public discourse around climate targets and action.

In December, countries will meet in Paris to establish a critical new international climate change agreement. This agreement will strongly influence whether we have a safe planet to live on in the not-too-distant future, and whether our children and grandchildren will be able to enjoy the same level of health and wellbeing as is possible today.

Before Paris, countries are expected to announce their level of commitment to reducing greenhouse gas (GHG) emissions globally—their Intended Nationally Determined Contributions (INDCs). The New Zealand Government is currently consulting with the public as to what our ‘fair’ contribution should be. The INDC is expected to include specific targets for reducing our carbon and total greenhouse pollutants between now and 2030, longer-term commitments, and specific policy mechanisms to achieve the targets.

A paper published in the New Zealand Medical Journal of November last year summarised the current scientific thinking about climate change and its health and health equity implications. It was clear then that there are limits to the amount of average warming that Earth systems can tolerate before thresholds for irreversible change are reached. Average warming of 2°C or more needs to be avoided to safeguard human health and wellbeing for current and future generations. But without rapid global action to reduce greenhouse gas emissions (particularly from fossil fuels), the world is on a trajectory towards high levels of warming, of 4–7°C on average or even higher by 2100. This would lead to uncontrollable levels of climate change for many future generations and pose severe and possibly insurmountable risks to human health and wellbeing.

All New Zealanders will face direct impacts on health in a +4°C climate (floods, storms, heatwaves, infectious diseases), and we will also have to deal with enormous new health and social challenges such as mass population migrations and resource-related global conflict. Those that are vulnerable already—Māori, Pacific people, children, the elderly, and those on low incomes—will face the greatest impacts in the short term, but very few people will be immune to the widespread social and health threats.

However, it doesn’t have to be that way. A strong global climate deal, if enacted with sufficient urgency, can still avert the most serious consequences of climate change. Swift, decisive health- and equity-centred policies to reduce GHG emissions are not only necessary to limit future climate change, but could also enhance the health, fairness and resilience of our communities today. There are significant short- and medium-term health co-benefits to be gained, especially by shifting from cars to active and public transport; improving housing energy efficiency and heating; reducing red meat and dairy intake in our diets; and phasing out fossil fuel mining and burning.
The government’s INDC consultation document presents climate action as a net cost to our economy. While there are likely to be costs for some groups and industries, the document fails to account for the economic opportunities that are widely acknowledged as societies adapt to a low-carbon world.

Furthermore, Ministry for the Environment officials during the recent public consultation meetings have acknowledged their failure to account for either the health costs of inaction, or the substantial and measurable cost savings for the health sector that could accrue from the health co-benefits of well-designed action. These health benefits need to be included in calculations of costs and benefits of action. The costs of making the needed transition also need to be borne fairly. Policy mechanisms will be crucial for recycling the payments of wealthy climate polluters into support for a healthy transition to a low-carbon world, especially for low-income households.

Climate change is a global issue that requires a collective response. The response must recognise historical contribution to climate change and capability to act, as well as fair sharing of costs. Many of the nations that will be worst affected by climate change have contributed almost nothing to cumulative global GHG emissions, whereas New Zealand has long been one of the highest per capita GHG emitters. As a wealthy, democratic nation with a robust economy and much of the infrastructure needed to further increase our renewable energy generation, New Zealand is in a strong position to make ambitious INDC commitments.

On the basis of contribution, capability and cost, New Zealand has global obligations to set ambitious targets—a total GHG reduction target of at least 40% on 1990 levels by 2030, and a target of zero carbon emissions before 2050. These are the targets determined by the Earth’s environmental physics, not by what is seen as politically popular. However, distant targets have little worth unless they are coupled with commitment across the political spectrum and include annual targets and actions. They therefore need to be underpinned by sector-specific policies for meeting the targets that have human wellbeing and social equity at their heart.

This health-centredness of climate policy needs to extend to the global negotiations. We therefore urge the Minister of Health to join other health officials in Paris in December, to attend the Climate and Health Summit that is planned alongside the climate negotiations, and to call for human health and wellbeing to be at the centre of negotiations. This would signal that New Zealand, like other countries, has made the critical link between climate change and health, and is willing to act to protect and promote the health and wellbeing of New Zealanders.

We also urge all health professionals to get engaged in the climate-health issue, and if possible to make a short submission to the Government by the 3 June. A health-focused submission guide provides some suggested key messages to assist health professionals and organisations to make submissions. We have a responsibility to our patients and communities to push for strong, health-centred climate action. In doing so we have the opportunity to turn one of our greatest health threats into positive action to create a healthy, fair and resilient nation.
EDITORIAL

Competing interests: Dr Hayley Bennett is a part-time paid coordinator for OraTaiao: The NZ Climate and Health Council. Dr Alexandra Macmillan and Dr Rhys Jones are unpaid co-convenors of OraTaiao: NZ Climate & Health Council. OraTaiao is a group of New Zealand health professionals concerned about the health implications of climate change in New Zealand and world-wide.

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EDITORIAL

Potential for health gain equity
Nina Scott, Ross Lawrenson

Health inequities are generated by the health sector as well as by wider social, economic, and political systems, and are a problem affecting everyone in society. Unfair and avoidable differences in health outcomes between the haves and the have-nots, especially for New Zealand children, is very topical. The use of ambulatory sensitive hospitalisations (ASH) rates to assess the impact of policy changes is also topical. The article in this issue of the NZMJ by Matheson et al examining inequities in ASH rates associated with health policy changes, tells a complex and important tale. The authors demonstrate that for children aged 0–4 inequities between ethnic groups in preventable hospitalisations can, and have been significantly and rapidly reduced. Further, the same policy and practice environment that saw a large and rapid reduction in inequities for 0–4 year olds resulted in improvements at the total population level and gains for all ethnic and socioeconomic groups in the same age band. The potential for health gain by achieving equity in ASH rates for all age groups is enormous.

Matheson et al (in this issue of the Journal) demonstrate the value of analysis by ethnicity and Deprivation and illustrate that over a 12-year period the most dramatic differences in ASH rates are between ethnic groups and by social class. Despite excellent progress, there remain large and unacceptable inequities in ASH rates between the most and least privileged ethnic and socioeconomic groups of 0–4 year old New Zealand children. Achieving equity in ASH rates would see avoidable hospitalisations for Māori and Pacific 0–14-year-olds fall from 3,783 and 4,508 per 100,000 respectively to 3,199. There is clearly large potential for gain for these children. There is an even larger potential for gain by achieving equity in ASH rate in the 45–64 year age group. Equity would see the rate for Pacific peoples drop from 8,754 to 2,821 per 100,000. Māori rates would drop from 6,312 to 2,821 per 100,000. Rates for the most deprived groups would drop from 4,112 to 1,707 per 100,000. Because Māori and Pacific populations are dramatically over-represented in highly deprived groups, depicting ASH rates by ethnicity for different levels of deprivation would show the effect of deprivation more clearly. It would also have been helpful to know the influence of rurality, as this has been shown to be an important factor in other studies.

ASH rates are used as a measure of access to primary care services. Associations have been shown with measures such as the number of general practitioners per population, the number of primary care centres or the number of visits to primary care. Of course other factors influence ASH rates, including access to the determinants of health such as housing and income. Accessibility of hospital ED, out-of-hours provision and model of general practice also influence ASH rates. A major concern in the UK has been the reduction in continuity of care due to general practitioners withdrawing from out-of-hours care. PHO enrolment rates for Māori and Pacific populations are less than optimal. Further, the cost of accessing a GP is a known barrier for these groups. For example, results from the New Zealand Health Survey found that Māori were almost twice as likely (at 23.1%) as non-Māori (at 12.8%) to not visit a GP because of cost, at some time in the last 12 months despite having a medical problem. Greater inequities were seen for not seeing a GP due to lack of transport, not going to after hours clinics due to cost or transport and not filling...
a script due to cost. The custom of charging patients to enroll with a practice may also be a significant issue for some.

The authors have linked changing ASH rates with a raft of policy changes—initially by a Labour Government and then, more recently, a National-led coalition government in conjunction with the Māori party. One does have to question whether the policy changes actually made a difference to the delivery of primary care. Smith in her 2009 review noted that, while PHOs had been good at engaging with communities, they had not paid sufficient attention to how services were delivered by their primary care providers. We should note that despite the government support for primary care and the initiation of the Primary Care Strategy, access to general practice actually reduced, with the number of FTE general practitioners per 100,000 population, shrinking from 78 in 2002 to 74 in 2012 (MCNZ Statistics). The extra capitation funding to general practice allowed GPs to reduce their average hours of work from 42 hours per week to 37.3 hours in the same period— a reduction of 11%. There has been no change in the number of primary care clinics. The Health surveys of 2002 and 2012/13 have shown the percentage of patients seeing their GP in a 12-month period has not changed for Māori and New Zealand Europeans. However, use by Pacific reduced from 75% to 72% for Pacific men and 83% to 77% for Pacific women (Health Survey 2002 and 2012). Of course in the same period we have seen a huge investment in hospital services. Probably $3 billion in capital has been spent on new hospital buildings around the country since 2002. We have seen a 60% increase in the number of specialists and 69% increase in house officers/registrars (MCNZ statistics). We have also seen targets for provider arms of DHBs to make ED more accessible, and this has led to substantial increases in ED attendances.

Given that, if anything, there has been a reduction in resource in primary care and a substantial increase in hospital capacity, it is good to see that ASH rates have fallen for most. When considering the difference between children and adults, it is important to remember that the key conditions for children include: dental; otitis media/upper respiratory tract infections; asthma; gastroenteritis; pneumonia and cellulitis/skin infections. Some of these conditions are very sensitive to changes in housing. One initiative over the last 10 years has been to ensure better insulation and heating of houses for families most at need—ie with children or the elderly. It maybe that a change in incidence of respiratory disease in young children is partly due to the fall in ASH rates for this age group. On the other hand, despite targets for CVD and diabetes in adults, the reduction in access for Pacific adults and the increase in ASH rates is a great concern, as is the continued inequities between Māori and ‘Other’ rates.

It is clear that further equity-focused policy and practice are urgently needed to speed up improvements toward achieving equity in ASH rates. The question is what should be done. We can see from the list of policy initiatives that the response has been fragmented and seems ad hoc. Inequities in the social determinants of health, such as income and housing, need to be addressed alongside health system improvements.

We agree with Milne et al that increasing funding and access to primary health care will not, by itself, reduce ASH rates. Rather, until we have a comprehensive strategy for improving primary care, the
wide disparities are likely to continue. We need to consider the model of care. Some research has suggested that physician-owned practices are more efficient, while practices with more nurse practitioners—or physician associates—per physician have higher ambulatory care sensitive (ACS) rates.\textsuperscript{8} We also need to tackle the chronic shortage of general practitioners, particularly in rural and more socially deprived areas. This needs to be a long-term strategy. Currently one could argue that if the desired outcome is a generalist primary-care trained medical workforce then our medical schools are failing the health services. We also need to dramatically increase the number of general practice trainees and ensure that funding is targeted to practices in the areas that are most needy, We also need to ensure that funding, monitoring and reporting is equity focused. The primary care Integrated Performance and Incentive Framework (IPIF) has been acknowledged to be lacking in the equity area. Current IPIF funding could incentivise the creation of further inequities by rewarding focus and the achievement of targets for ‘easy to reach’ groups. For example, the IPIF targets for cervical screening, smoking or immunisation could be met for the total population even if Māori and Pacific rates were to decrease.\textsuperscript{9}

Finally, we need to get more sophisticated in our analysis of the influences of general practice on the whole health system. Currently we have a wide variety of practices: large and small; practitioner-owned; community trusts and corporates; practices with different mixes of medical, nursing and allied health staff. Only by linking these characteristics to changes in the health system usage will we be able to ensure that we see positive changes to the wide outcome disparities between Māori and Pacific, and ‘Other’ New Zealanders.

The cost of the gap between rich and poor is estimated to cost the British government £39 billion per year.\textsuperscript{10} So as well as being avoidable and fixable, unjust and bad for social cohesion, inequities are expensive. We need to build on the policy work that has seen a reduction in ASH rates for our youngest age groups, and make a concerted effort to create an equitable primary care system, rather than the ad hoc, market-driven model we have at the moment.

There is a strong imperative for the government and Ministry of Health to take action and make wise decisions in good time.

Competing interests: Nil

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REFERENCES:


3. Rosano A; Loha CA; Falvo R; van der Zee J; Ricciardil W; Guasticchi G; de Belvis AG. The relationship between avoidable hospitalization and accessibility to primary care: a systematic review. European Journal of Public Health. 23(3):356-60, 2013 June.


Good progress for children coupled with recalcitrant inequalities for adults in New Zealand’s journey towards Universal Health Coverage over the last decade

Don Matheson, Johanna Reidy, Lee Tan, Julia Carr

ABSTRACT
AIMS: This article explores how primary health care policy changes in New Zealand over the last decade have impacted on primary care access equity and avoidable hospital admissions.

METHODS: The national Ambulatory Sensitive Hospitalisations (ASH) data trends by age, ethnicity and area level deprivation were analysed in relation to the Primary Health Care policy initiatives for the period 2002 to 2014.

RESULTS AND CONCLUSIONS: Changes in primary care access over the decade have led to improvement in ASH indicators for parts of the population, but not for others. ASH rates decreased very significantly for children, especially in the 0–4 age group. These trends began in 2004, with decreases most marked for Pacific children, and those from the most deprived neighbourhoods. Inequalities in ASH rates for children between ethnic groups and levels of deprivation have substantially decreased. On the other hand, there has been a significant increase in ASH rates and inequalities for Pacific peoples in the 45 to 64 age group. Māori in the same age band show a modest reduction in ASH rates, with inequalities compared with the rest of the population remaining unchanged. Inequalities in ASH rates between 45–65 year olds living in different levels of deprivation remain large and unchanged, indicative of the recalcitrant nature of inequalities in primary care access for the adult population. Major policy initiatives undertaken by the government during this period have significantly affected primary care access. These include the New Zealand Health Strategy, the Primary Health Care Strategy, the creation of District Health Boards and Primary Health Organisations, and free care to under 6-year-olds. In the latter part of the decade, high-level target setting by successive Ministers is also affecting system performance. We conclude that the success in reducing inequality in access to primary care for children needs to be intensified, and the same principles applied to the adult population groups.

Introduction
This article explores how primary health care policy changes in New Zealand over the last decade have impacted on access equity, through the lens of the primary care interface with secondary care. Enabling access to health care has been a major policy focus in New Zealand for at least 75 years. As part of their attempt to establish the first social security system in the Western world,1 the first Labour government introduced the Social Security Act 1938 with the intent of enshrining health care as a fundamental right of all New Zealanders, and removing financial access barriers to care. By the year 2000 these goals had not been reached, and the government began a series of reforms with the explicit aim of improving the health...
of the population and addressing health inequalities. Pursuit of access equity has in recent times been given greater prominence on the world stage under the rubric of Universal Health Coverage, with its goal of ensuring that all people obtain the health services they need without suffering financial hardship when paying for them. The detailed understanding of what universal coverage means in practice is currently being debated, and considerable gaps remain in the knowledge base informing its measurement.

One way to gain insight into a health system's performance is to explore the interface between primary care and secondary health care. The New Zealand Ministry of Health conducts a continuous survey of health service utilisation and unmet need for primary care. The hospital system reports on hospital admissions by Diagnostic Related Groups and, from this information, generates reports on ASH, an important indicator of primary care access and effectiveness. In New Zealand ASH measures unplanned admissions that are potentially preventable by appropriate health services delivered in community settings, including through primary care, and hospital ambulatory services such as outpatient and dental services. Ambulatory sensitive hospitalisations are defined as hospitalisations of people less than 75 years old resulting from diseases sensitive to prophylactic or therapeutic interventions that are deliverable in a primary care setting. This specific focus on primary care and ambulatory services, can be contrasted with amenable mortality which is a measure of whole-of-system performance in terms of coverage and quality of health care, and includes ASH. ASH rates provide an indication of access to, and the effectiveness of, primary care, as seen at the interface between the primary and secondary health services. If there is good access to effective primary care, then it is reasonable to expect that ASH will be low, and there will not be big differences in rates between population groups. Consequently, ASH rates are recognised internationally as a useful indicator of a health system's responsiveness to health need and inequity. A narrowing of ASH between populations with high needs and the general population would indicate an improvement in system responsiveness to health need, and an improvement in the health system in addressing health inequalities.

Indicators of primary care access equity in New Zealand’s Health System

New Zealand has a primary care-oriented system, with general practitioners acting as gatekeepers to secondary services. A key principle underpinning New Zealand health policy in the last decade has been the importance of reducing inequalities in health outcomes between populations as a means of improving the overall health of New Zealanders.8,12,13

However, the priority given to this principle, and the approach to investment and monitoring has varied over the past decade. In 2001, the New Zealand health sector identified the need to address health inequalities as a major priority and between 2001 and 2008 developed policies and programmes to address them. A key policy was the Primary Health Care Strategy which sought to reduce health inequalities by improving access and quality of care for disadvantaged populations with the poorest health. Support for reducing inequalities has been increasing among health service personnel in recent years, culminating in the statement on equity by the New Zealand Medical Association, reflecting wide acceptance by the health sector of equality of health outcomes across all groups as a priority and a value.

New Zealand has four main ethnic groups, people of European (74%), Māori (15%), Asian (12%) and Pacific Island (7%) descent. Note that people may belong to more than one group. Disadvantaged populations and high-needs patients include people from all ethnic groups, but Māori and Pacific Island populations are over-represented. The term ‘Other’ in this analysis is used to describe the non-Māori, non-Pacific population, as in addition to those of European ancestry, this category includes many ethnicities, including Asian populations. Disadvantaged populations are particularly concentrated within some
geographical areas. These populations are identified, for administrative and funding purposes, by the New Zealand Deprivation Index (NZDep), using Census data on income and access to other resources.

This paper uses ASH to explore the relationship between successive governments’ policy approach to access to primary care and trends in access inequalities in the New Zealand health system over time. The validity of ASH admissions as an indicator of primary care access has been analysed previously in the US.

A recent systematic review of ASH studies across several countries confirmed the expected inverse association between accessibility to primary care and the risk of hospitalisation for ASH in most but not all studies. The review also noted the important impact of socio-economic factors to be considered in interpretation of ASH studies, and variations due to types of health systems.

**Method**

To examine the impact of the policy shifts on access inequalities, data on hospital discharges from 2001/02 to 2013/14 were purchased directly from New Zealand Ministry of Health's National Minimum Data Set. The data was extracted by Analytical Services, Ministry of Health (MOH), using the same publicly funded hospital discharges with a primary diagnosis (ICD-10-AM-II) as stated in the “ASH Events” list in the MOH workbook.

Accordingly, the same exclusion rules listed below were followed:
- Age at admission >74
- Age at admission <29 days
- DHB of domicile = 999 (overseas and undefined)
- Short stay ED events (specialty code = M05-M08, LOS = 0 or 1 days)
- Palliative care specialty (specialty code = M80 or M81)

Data were analysed by funding year 1 July–30 June. All cases, regardless of Casemix funding, are included as separate analysis of Casemix status by ethnicity and NZDep suggests that there is no noticeable variation by excluding Casemix status. The direct standardisation method was used on age in 5-year groups, using MoH population projections 2001–2025, fitted to WHO standard population distribution. This approach is consistent with the standardisation method used by MoH.

The prioritised ethnicity classification was used as described in the Ministry of Health Ethnicity Data Protocols for the Health and Disability Sector (2004). It should be noted that the analysis for this paper has included the ASH events for all Pacific people, whereas the MOH calculation has been restricted to the Pacific ASH events for the seven DHBs with the highest Pacific populations (namely Auckland, Waitematā, Counties Manukau, Waikato, Capital and Coast, Hutt and Canterbury).

This analysis depends on the accuracy of hospital discharge coding which is considered to be high in New Zealand. The 2014 data may not yet be complete, with some events being reported after the end of the data collection period. Missing data would increase the ASH rates.

The denominator is based on the population projections produced by Statistics New Zealand according to assumptions specified by the Ministry of Health. Note that the MOH uses the Primary Health Organisation (PHO) enrolled population not the Census projected total population. The MoH approach may lead to an over estimate of the Māori population ASH rate, as 12% of Māori were not enrolled in a PHO in 2014. The ASH rate changes over time are also influenced by changes in the PHO enrolment rate when using the MoH method. Māori enrolment has been increasing over this period. This will result in apparent lowering of the ASH rate when the PHO population is used as the denominator.

Because no individuals were affected by this research, and anonymised data was analysed, ethics approval was not sought.

**Results**

**National Age standardised ASH rates 2002 to 2013**

The population groups in the study are all people aged 0–74, and the sub-groups of children 0–4 years, children 0–14 years and adults 45–64 years. These years were chosen in the adult population as they are critical years for interventions to address the early
onset of non-communicable diseases, and to reduce disparities in amenable mortality.26,27

The results presented in the graphs have included the 95 percent confidence interval on each ASH rate.

Figure 1 shows the national trends between 2002 and 2014 by ethnicity. This shows increasing inequalities of access for the Pacific population, starting in 2006, when compared to Māori and 'Other'. The Māori population shows steady improvement since 2010, with inequalities reducing. The 'Other' population shows a steady decrease in ASH over the period.

In contrast, Figure 2 shows a very consistent improvement in the 0-4 age group across all populations beginning in 2004. This improvement is most marked for Māori and Pacific populations, leading to a significant decrease in inequalities between these two groups and 'Other'. Inequalities between Māori and Pacific 0–4 populations remain stable.

The trends observed for the population aged 0–4 are replicated in the 0–14 year age group, but with less intensity. Figure 3 shows improvement since 2004, across the three ethnic groups. The reduction in inequalities remains significant, however it is not as marked as in the younger age group.

These positive trends in children were not reflected when selected groups within the adult population were examined. Figure 4 shows significant deterioration in ASH rates for Pacific peoples aged 45 to 64, from 2003 onwards. Over the same period, there was a modest reduction in ASH for Māori. ASH inequalities increased significantly for
Figure 3: National ASH Trends by ethnicity for 0–14 years

Figure 4: National ASH Trends by ethnicity for 45–64 years

Figure 5: National ASH Trends by Deprivation for 0–74 years old
The ASH rates are calculated from the Ministry of Health’s data collection for hospital discharges (NMDS data).

Figure 6: National ASH Trends by Deprivation for 0–4 years old

Figure 7: National ASH Trends by Deprivation for 45–64 years old

Pacific as compared with the whole population, and remain unchanged over the decade for Māori when compared with the ‘Other’ population.

To explore the influence of deprivation, ASH rates were examined with respect to the degree of deprivation of the patients’ area of residence. For the whole population aged 0–74, the improvement in ASH rates was greatest for the most deprived group, with the improvement beginning in 2008. However, a large disparity remains between the most deprived and least deprived groups. The three least deprived groups showed minimal change in the ASH rates over the period.

An exploration of the relationship with deprivation in the different age groups finds a difference in impact between child and adult populations. Figure 6 shows that for the 0–4 age group, children from the most deprived group showed consistent and marked improvement in ASH rates, beginning in 2004, with a marked reduction in ASH inequalities, such that the rates for the two most deprived groups are similar, and both are reducing.

These improvements, which are also seen in the 0–14 age group, are not reflected in the adult population. Figure 7 shows a very modest reduction in ASH inequalities for the 45–64 year age group, with very marked health inequalities remaining between the less deprived and most deprived groups.
Table 1. Key policy initiatives aiming to increase access to primary care and reduce inequalities over the period 2000–2014.

<table>
<thead>
<tr>
<th>Policy Initiative</th>
<th>Year of introduction</th>
<th>Policy intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>The New Zealand Health Strategy(^2)</td>
<td>2000</td>
<td>‘Tackling inequalities’ a particular priority; and timely and equitable access for all New Zealanders, regardless of ability to pay, a key principle. To reduce inequalities: ensure accessible and appropriate services for Māori, Pacific peoples and people from lower socioeconomic groups. Primary health care identified as a priority.</td>
</tr>
<tr>
<td>The Primary Health Care Strategy(^25)</td>
<td>2001</td>
<td>Identified a strong primary health care system as central to improving health for all New Zealanders and tackling inequalities in health. Establishment of Primary Health Organisations (PHOs), funded on the basis of enrolled populations. Expected to reduce barriers, particularly financial barriers, for the groups with the greatest health need. Substantial funding increase from 2002 for primary care, and introduction of capitation funding.(^2) Increased funding, starting with PHOs with &gt;50% Māori, Pacific, low income populations but eventually all PHOs on same funding formula. First contact’ funding formula factors in age/gender but no weighting for ethnicity, deprivation, or unmet need. Smaller amount of additional funding for “Services to Improve Access” (SIA) – some recognition of ethnic and socioeconomic disparities in SIA funding formula. Agreements/monitoring annual increase in patient co-payment over baseline, (but no limit on baseline).</td>
</tr>
<tr>
<td>High User Health Card(^29)</td>
<td>1990s</td>
<td>The High User Health Card (HUHC) entitles high users of services to higher subsidies GP consultations. A large number of services (at least 12 consultations in a year) need to have been received/paid for before a patient becomes eligible for a HUHC. Pre-dates PHOs but maintained.</td>
</tr>
<tr>
<td>He Korowai Oranga –Māori Health Strategy(^27)</td>
<td>2002</td>
<td>Focus on broader values/ direction to improve Māori health. Whānau Ora concept introduced. Recognised primary health care as crucial to reducing inequalities. Accompanying action plans Whakatātaka,(^2) and Whakatātaka Tuarua 2006–2011.(^2) DHBs expected to direct resources to areas of greatest need, report to MOH on the prioritisation and allocation of funding, and the effectiveness of services for Māori.</td>
</tr>
<tr>
<td>Care Plus(^25)</td>
<td>2003/4</td>
<td>Additional funding to general practices to improve chronic care management, reduce inequalities, and reduce the cost of services for high-need patients. Generally involves a Care Plan and 4 GP and/or nurse visits per year at reduced or no cost. Funding allows for 5% of a PHO population to be Care Plus patients, give or take a small margin, regardless of the number of high needs patients.</td>
</tr>
<tr>
<td>Very Low Cost Access Funding (VLCA)(^34)</td>
<td>2006</td>
<td>Additional funding for general practices willing to limit co-payments. In 2013, this required visits for children under 6 to be free, visits for children 6 to 17 years less than $11.50 and for adults less than $17.50.</td>
</tr>
<tr>
<td>Introduction of targets(^25)</td>
<td>2007</td>
<td>2007 targets emphasised population health objectives, including reducing ASH. In 2009 targets revised with a reduced emphasis on population health and a greater emphasis on hospital services and specialist waiting times. ASH targets were replaced with targets for ED waiting times.(^36,37)</td>
</tr>
<tr>
<td>Better Sooner More Convenient (BSMC)(^38)</td>
<td>2009</td>
<td>Focus on ‘integration’ of care, through co-location of general practice and other services in Integrated Family Health Centres, and ‘alliancing’ within DHB areas to improve cross-sector planning. Nine business cases funded. Alliancing concept introduced more broadly.</td>
</tr>
<tr>
<td>Whanau Ora(^29)</td>
<td>2010</td>
<td>Broader implementation of Whānau Ora policy and approach. 25 provider collectives comprising around 160 providers of primarily health and social services funded to provide whānau-centred services, and support a Whānau Ora approach.</td>
</tr>
<tr>
<td>Free under 6s(^10,41)</td>
<td>2006</td>
<td>Free consultations for under six year olds implemented through Very Low Cost Access scheme – limited to practices/PHOs with &gt;50% high needs population, willing to limit fees to agreed levels. Free standard consultations for children under six implemented more widely through Zero Fees for Under 6s. Increased funding. After hours consultations included.</td>
</tr>
<tr>
<td>Ala Mo’ui: Pathways to Pacific Health and Well-being 2010-2014(^46)</td>
<td>2010</td>
<td>Aims for service delivery to Pacific peoples to respect Pacific culture, value family, and provide seamless care. The principles emphasise access, equity, cultural competence, safety, effectiveness, efficiency and patient-centeredness. Emphasis on developing Pacific workforce.</td>
</tr>
</tbody>
</table>
Policy initiatives potentially impacting on primary care access over the period

A range of policy initiatives and legislation has been introduced since 2000, aiming to reduce health inequalities, and with implications for primary care service delivery, configuration, access and priorities. Table 1 summarises key policy developments directed at improving access to primary care and reducing disparities for Māori, Pacific and low income populations.

The policy documents over this period recognised the importance of access to primary care in addressing health inequalities, however the extent of targeted funding to achieve this and accountability for results related to equity varied considerably. The Very Low Cost Access and Zero Fees for Under 6s were very specific in terms of expectations of providers and came with ring-fenced funding to achieve the policy goal. Other policy initiatives, like Care Plus, were less clearly defined in terms of the populations expected to benefit from the additional funding attached.

Discussion

The relationship between specific policies and changes in access in the busy policy milieu described in Table 1 is inevitably one of association rather than causal. However the divergent ASH rates for children compared with those for Pacific adults is striking. On the one hand, the relative inequalities in access for children were very significantly reduced, on the other hand, in the same health system and in the same general practices, inequalities in access for Pacific adults significantly increased. The policies dealt with these two populations differently. While they shared the same policy intent, the funding incentives and accountability for results diverged significantly.

The positive trend for Māori and Pacific children and those living in the most deprived areas began in 2003, around the time that the Primary Health Care Strategy implementation started to gain traction, and has continued unabated since then.

Successive policy initiatives, particularly Very Low Cost Access, Zero Fees for Under 6s and free after-hours care, are likely to have strengthened this trend, and with the imminent introduction of free care to those under 13, this trend should continue. The Minister’s targeting regime also impacted on children, with a focus on immunisation coverage. Māori ASH rates for children improved faster than Pacific rates. This difference in children, and the slight improvement in ASH for Māori as a whole, may be due to Māori-specific policy initiatives, the growth of Māori providers and active monitoring of investment and results for Māori at national, DHB and PHO levels over this period.

While inequalities were reducing in children, inequalities in the adult population remained relatively unchanged for Māori and increased for the Pacific population. This negative trend for Pacific adults began between 2003 and 2005. The policies, as they affect the adult population, did not eliminate the financial barriers to care, and the dropping of ASH as a Ministerial target would have weakened the accountability focus of DHBs on access barriers for adults later in the decade. ASH as an indicator is influenced by primary care effectiveness, but also co-morbidities, environmental and social factors.

Changes that occurred during this period in the wider social determinants of health will also have impacted on ASH for these groups. The employment rate, the median weekly income, housing affordability and housing overcrowding all showed increasing relative disadvantage for Pacific and Māori populations, with the greatest increase in inequality impacting on Pacific peoples. The environmental and social conditions are unlikely to diverge between adults and children, suggesting the ASH results seen in these populations are primarily due to primary care access changes.

Evidence from the most recent New Zealand Health Survey shows that both affordability and service availability are creating significant unmet need for Māori, Pacific and high deprivation groups. One in four adults (27%) and one in five children (21%) reported unmet need for primary care in the past year. Neighbourhood
deprivation and ethnicity were strongly related to unmet need for primary care. 35% of adults living in the most deprived areas had experienced unmet need in the past year, compared with 23% in the least deprived areas. 48% of Māori women and 37% of Pacific women experienced unmet need during the period. The survey data support the contention that there are real challenges remaining in primary care access, and these go part way to explaining the ASH differences being observed.

The limitations to the use of ASH as an indicator include its reliance on accurate diagnosis, recording and reporting of hospital activity, including domicile and ethnicity information. Changes in any of these dimensions will impact on the ASH rate. In addition, ASH is but one indicator of primary health care system performance. Other indicators such as morbidity, mortality, disability and self-assessed health status also need to be considered to provide a wider context for ASH results. The full breadth and depth of the impact of primary health care services and community-based interventions are not fully reflected in ASH.

The past decade has demonstrated the New Zealand health system has the capability to substantially reduce inequities in primary care access as observed through these changes in ASH. To make further progress, and to reverse the negative trends observed for the Pacific adult population, policy attention will need to focus on both supply and demand barriers to access, as well as ensuring changes in the wider social environment are mediated, and not intensified, as they impact on health and health care access. Future policy in New Zealand to improve access equity should include a focus on the doctor/nurse patient ratio for specific communities. Changes in the wider social conditions can be mediated somewhat by ensuring financial and availability access barriers are reduced when social conditions deteriorate, but the main focus should remain on addressing the social conditions themselves.

In summary, the policy implications of this paper’s findings are that reducing cost barriers to primary care works to reduce avoidable hospital admissions; and continued exploration of the remaining access and other barriers for children has potential to eliminate the remaining equity gap. For adults, reducing the price barriers and increasing service availability in deprived areas, and for high-need Māori and Pacific populations is required as a matter of urgency to stem rising health inequalities.

For the health system, collection and analysis of evidence regarding access barriers, followed by timely intervention, is required in order to move towards Universal Health Coverage. Changes in external social conditions need to be met with immediate changes to improve primary care access if health consequences are to be ameliorated.
REFERENCES:


34. Croxson B, Smith J, Cumming J. Patient fees as a metaphor for so much more in New Zealand's primary health care system. Wellington: Health Services Research Centre; 2009.


45. Ministry of Health. Whakatātaka, Māori Health Action Plan 2002-2005. Wellington: Ministry of Health; 2002. This included targets for increased investment in Māori health and led to strengthened Māori specific requirements in District Annual Plans, the DHB Operating Policy Framework and PHOs.


Paediatric empyema in New Zealand: a tale of two cities
Cameron Burton, Tony Walls, Neil Price, Tamsin Glasgow, Cameron Walker, Spencer Beasley, Emma Best

ABSTRACT
AIMS: We aimed to identify the causative organisms and sensitivities in community-acquired paediatric empyema at Starship Children's Hospital and Christchurch Hospital and to determine if current antibiotic recommendations are appropriate.

METHODS: Retrospective analysis was undertaken of all cases with clinical, radiological, and microbiological evidence of empyema at Starship Children's Hospital and Christchurch Hospital between June 2009 and March 2013 (3.8 years), and January 2009 and May 2014 (5.4 years) respectively.

RESULTS: Ninety-eight children were managed with empyema at Starship Children's Hospital and 30 children at Christchurch Hospital. Staphylococcus aureus was the most common pathogen identified at both sites followed by Streptococcus pneumoniae. A significant proportion had no pathogen identified. Amongst S.aureus isolates, 1/5th were methicillin-resistant, contributing 8% of all culture positive empyema cases. Māori and Pacific groups were over-represented. Cases occurred more often in boys and those <5 years. Blood cultures and S.pneumoniae pleural antigen were important in diagnosis.

CONCLUSIONS: Our audit confirms the important role of S.aureus in paediatric empyema in New Zealand and a high rate of this disease, particularly in the North Island. Antimicrobial susceptibilities of the pathogens of empyema demonstrate current initial antibiotic recommendations at both centres would cover more than 80% of pathogens, although MRSA is a significant contributor.

Introduction
Empyema thoracis (empyema) is an accumulation of infected fluid in the pleural space complicating less than 1% of childhood pneumonia. There is a reported incidence of 0.7–3.3 per 100,000 worldwide, however studies suggest the incidence of paediatric empyema in Western nations has increased since the mid-1990s. Although mortality is low in developed countries, childhood empyema can lead to significant morbidity and place strain on health resources. The most common causative pathogens described are Streptococcus pneumoniae, Streptococcus pyogenes and Staphylococcus aureus, including methicillin-resistant Staphylococcus aureus (MRSA). In indigenous populations, and in New Zealand, very high rates of invasive staphylococcal infections have been reported. Significant geographic variation has been seen with S.aureus infection, with a ‘North–South’ gradient observed. This may be due to differing population groups, but other geographic factors such as healthcare, vaccination access, and climatic difference may be important.

Starship Children's Hospital (SCH) is Auckland's tertiary paediatric hospital, receiving patients for medical and surgical management of paediatric empyema from within the Auckland District Health Board catchment area, as well as referrals for surgical management from Counties-Manukau, Waitemata and Northland. Additional tertiary and quaternary referrals are received from outside these DHBs.

Christchurch Hospital (CCH) is the South Island's largest tertiary hospital, receiving patients for management of paediatric empyema from within the Canterbury District Health Board catchment area, as well as referrals to paediatrics surgery for surgical management from across the South Island.
Since 2011 Starship Children’s Hospital clinical guidelines have recommended use of either amoxicillin/clavulanic acid or cefuroxime as first-line empiric antibiotic for empyema treatment. Christchurch Hospital’s paediatric empiric antimicrobial guidelines currently recommend cefotaxime plus flucloxacillin as first-line therapy.

The Thoracic Society of Australia and New Zealand (TSANZ) recommend that initial empirical choice of antibiotics must cover S. pneumoniae and S.aureus, either through benzylpenicillin with the addition of flucloxacillin or through amoxycillin/clavulanic acid or a cephalosporin, such as cefotaxime or ceftriaxone, with the addition of flucloxacillin.

The primary aim of this study is to identify the causative organisms and susceptibilities in community-acquired empyema managed at Starship Children’s Hospital and Christchurch Hospital, to determine if current antibiotic recommendations are appropriate.

Secondary aims included investigation of seasonal trends, demographic factors, and presentation of paediatric empyema at each centre, and to examine the diagnostic yield of blood cultures and S. pneumoniae antigen testing.

**Methods**

Retrospective analysis was undertaken of all cases with clinical, radiological, and microbiological evidence of empyema at Starship Children’s Hospital and Christchurch Hospital between June 2009 and March 2013 (3.8 years), and January 2009 and May 2014 (5.4 years) respectively. Starship Children’s Hospital typically accepts children up to age of 16 and Christchurch Hospital accepts referrals for children aged less than 18 years.

Data from children resident in the greater Auckland and Northland DHBs were analysed together, as well as combined data from children from across the South Island in order to examine differences between north and south.

Case finding was via hospital discharge coding data with search terms including key clinical diagnoses and associated surgical procedures. Data were obtained from electronic hospital records and clinical notes review.

**Inclusion criteria**

All empyema cases admitted to Starship Children’s Hospital or under Christchurch Hospital’s Department of Paediatric Surgery between the specified time periods and satisfying at least one of the following criteria:

1. Patients with microorganism cultured from the pleural space and/or lung tissue
2. The presence of pus in the pleural space as demonstrated on microscopy of pleural fluid or gross findings on operative procedure
3. Fibrinopurulent material seen in the pleural space on ultrasound and/or CT

**Exclusion criteria**

Empyema cases secondary to surgical complications, iatrogenic causes, or malignancy were excluded.

Uncomplicated parapneumonic effusion, lung abscess (unless complicated by a bronchopleural fistula and empyema), or empyema only at a source other than the pleural cavity eg, pericardial were not included.

Organisms isolated from non-sterile sites, such as sputum or broncheoalveolar lavage, were not included. Typical blood culture contaminants (such as S.epidermidis) were excluded.

Ethics approval was sought from Health and Disability Ethics Committees but was deemed unnecessary (ref 14/STH/124).

**Results**

Ninety-eight children were treated for community-acquired empyema at Starship Children’s Hospital between June 2009 and March 2013, an average of 26 cases per year for children aged 0-18 years (rate 5.8/100,000). Thirty children were treated for community-acquired empyema at Christchurch Hospital between January 2009 and May 2014, an average of six cases per year (rate 2.2/100,000). Paediatric empyema occurred 1.2–2.8 times more commonly in the Auckland and Northland region, compared with the South Island (p-value 0.0023).

Empyema occurred more commonly in children aged <5 years (71% total; 73% SCH; 63% CCH) with more than half of cases aged
< 2 years (54% total; 56% SCH; 47% CCH) (Figure 1). Cases occurred more commonly in boys compared with girls in both centres (63% male).

In Auckland and Northland, 42% of empyema cases were children of Pacific ethnicity. Census data from 2013 shows Pacific groups comprise 12% of Auckland/Northland population. Children of Māori ethnicity comprised 28% of empyema cases (Auckland Northland region census data shows 13% Māori), European 20% (61% census data), Asian 7% (21% census data), and Other 3% (2% census data) (Figure 2).

In the South Island, 73% of empyema cases occurred in children identifying as Europeans (compared with census data showing European to be 88% of South Island population), followed by Māori 13% (9% census data), Pacific 10% (2% census data) and Asian 3% (6% census data) (Figure 2).

Seasonal trends
The number of cases of empyema fluctuated over the course of the year with both centres experiencing peaks in winter and spring months (38% and 28% respectively) and less cases presenting in the summer months (Figure 3).

Mode of infection
Community-acquired pneumonia was the most common mode of infection (95% total; 93% SCH; 100% CCH), followed by disseminated sepsis (primary source other than lung) (5% total; 7% SCH; 0% CCH).

Microbiology
A total of 109 organisms were isolated from sterile sites (85 SCH; 24 CCH) (Figure 4, Table 1). Serology confirmed an additional 4 cases (3 of Mycoplasma pneumonia, 1 of Chlamydophila pneumonia).

Staphylococcus aureus was the most common organism isolated (42% total; 46%...
SCH; 30% CCH), followed by *Streptococcus pneumoniae* (28% total; 31% SCH; 19% CCH), and *Streptococcus pyogenes* (11% total; 8% SCH; 19% CCH).

Of the 48 *Staphylococcus aureus* isolated, 38 (79%) were methicillin-sensitive (80% SCH; 75% CCH) and 10 (21%) were methicillin-resistant (20% SCH; 25% CCH).

Overall, MRSA comprised 9% of all organisms detected (9% SCH; 8% CCH) and was present in 8% of all cases.

Five of 7 cases of disseminated sepsis were due to *S.aureus*.

Of the 128 community-acquired cases, 32 (25%) had no pathogen identified with culture, antigen detection, or nucleic acid detection from sterile sites (23% SCH; 30% CCH).

There was no significant difference between centres in the rates of causative empyema pathogens.

**Diagnosis**

Blood culture was performed in 96% of cases (97% SCH, 93% CCH). At least one blood culture was positive in 27% (29% SCH; 21% CCH) of cases and amongst new positive cultures, 83% (86% SCH; 67% CCH) were considered clinically relevant.

*S. pneumoniae* pleural antigen testing was performed in 26% (33/126) of patients who had pleural samples (30% SCH; 13% CCH). The antigen was positive in 4 of 4 culture-proven pneumococcal cases and confirmed an additional 9 cases where all other sterile site cultures were negative. An additional case was confirmed from CSF antigen, where pleural fluid was not sampled.

**Discussion**

We present the first national data on the microbiology of paediatric empyema.
Only one prior publication has examined paediatric empyema in New Zealand reviewing surgical management at a single centre prior to 2008.\textsuperscript{10} International trends show that paediatric empyema is increasing and a recent review of South Auckland paediatric empyema data also shows a clear and dramatic increase in rates over the last 15 years.\textsuperscript{12,13} Our reported rates of 2.2 to 5.8 per 100,000 for children up to 18 years are high compared to other developed countries. National discharge data from the United States reported incidence of paediatric empyema in children aged up to 18 years had risen from 3.8 to 5.5/100,000 and in UK for children aged <15 years, empyema incidence is reported as 3.7/100,000. Australia has reported a lower rate of only 1/100,000 for children aged <18yrs.\textsuperscript{14-18}

Our review shows \textit{Staphylococcus aureus} (\textit{S.aureus}) was the most common organism implicated in community-acquired paediatric empyema, which contrasts with other developed countries, where \textit{Streptococcus pneumoniae} (\textit{S.pneumoniae}) is most common.\textsuperscript{17-19} An Australian study using blood and pleural fluid samples to identify empyema pathogens with both culture and PCR identified \textit{S. pneumoniae} as the most common empyema organism accounting for 52% of cases whilst \textit{S.aureus} was detected in only 10%.\textsuperscript{19} However, New Zealand rates of invasive \textit{S.aureus} sepsis, which includes sepsis with a respiratory focus, has been described as amongst the highest in the world.\textsuperscript{9} We found \textit{S.aureus} as the major causative pathogen of paediatric empyema in both the North and South islands, with no statistically significant difference. The proportion of \textit{S.aureus} isolates that were methicillin-resistant (MRSA) was 20%, which represents 8.8% of all organisms detected (9.2% SCH; 7.7% CCH). The one

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline
Organism & Number of Isolates (SCH) N=87 & Number of Isolates (CCH) N=26 & SCH Empyema Guidelines & CCH Empyema Guidelines & TSANZ Empyema Guidelines \\
& & & Amoxicillin/ clavulanate & Cefuroxime & Cefotaxime AND Flucloxacillin & Penicillin AND Flucloxacillin \\
\hline
Methicillin sensitive \textit{Staphylococcus aureus} & 32 & 6 & S & S & S & S \\
Methicillin resistant \textit{Staphylococcus aureus} & 8 & 2 & R & R & R & R \\
\textit{Streptococcus pneumoniae} & 27 & 5 & S & S & S & S \\
\textit{Streptococcus pyogenes} & 7 & 5 & S & S & S & S \\
Oral flora & 4 & 1 & S & V/S & V/S & V/S \\
Coagulase negative staphylococci & 0 & 4 & V & V & V & V \\
\textit{Mycoplasma pneumoniae} and \textit{Chlamydia pneumoniae} & 2 & 2 & R & R & R & R \\
\textit{Anaerobes} & 1 & 1 & S & R & R & R \\
\textit{Haemophilus influenzae} & 2 & 0 & S & S & S & S \\
\textit{Pseudomonas aeruginosa} & 2 & 0 & R & R & R & R \\
Other & 2 & 0 & R & R & R & R \\
\hline
Proportion Susceptible to Guideline Recommendations & 81 – 84% & 74 – 82% & 74 – 82% & 74 – 82% & \\
\hline
\end{tabular}
\caption{Organisms identified in paediatric empyema cases from Starship Children's Hospital (June 2009 to March 2013) and Christchurch Hospital (January 2009 to May 2014); Empiric coverage from recommended treatment guidelines}
\end{table}

\textit{S} = Susceptible, \textit{V} = Variable, \textit{R} = Resistant
prior study of paediatric empyema in New Zealand, between 2003-2008 at SCH, showed similar high rates of *S. aureus* (24/46 positive cultures, 52%; our data 48/113, 42%). However, MRSA isolates comprised only 2/46 (4%) isolates in this prior audit. Our data show MRSA may be an increasingly important proportion of New Zealand paediatric empyema. In contrast, national data showed between 2001 and 2011 MRSA did not appear to increase, remaining as a proportion of 12% of *S. aureus* infections in the face of clear increases overall in invasive MSSA infections.\(^7\)

Current empiric antimicrobial protocols at both hospitals are aligned with Thoracic Society of Australia and New Zealand guidance, and provide good coverage against the range of pathogens we have identified causing empyema. With MRSA causing less than 10% of paediatric empyema at present neither site specifically recommends initial antibiotics to cover MRSA. Clinicians need to be aware of MRSA infection and potential risk factors (eg previous infection with MRSA in child or family member) and consider MRSA infection if there is a lack of response to empiric antimicrobial therapy, disseminated infection at presentation, or when blood cultures are flagging Gram-positive cocci.

Children of Māori or Pacific ethnicity were over-represented in cases of empyema. Children of Māori ethnicity, despite representing less than 13% of the Auckland/Northland population and less than 9% of South Island population, made up 28% of cases at SSH, and 13% in CCH.\(^11\) Children identifying as Pacific constitute over 13% of Auckland and 2% of the Canterbury population, yet this group was 42% of cases at SCH, and 10% in CCH.\(^11\) Children identifying as Pacific constitute over 13% of Auckland and 2% of the Canterbury population, yet this group was 42% of cases at SCH, and 10% in CCH.\(^11\) Although ethnicity data collected by health records can be misclassified,\(^21\) our data support prior evidence that show high rates of admission for respiratory disease in children in New Zealand compared with other developed countries, including Australia.\(^22\) There is substantial ethnic inequality in rates of respiratory infectious disease admissions, and this is most apparent in the youngest age groups.\(^23,24\) Differences in risk factors for infectious diseases, such as over-crowding, poor housing, and passive smoke exposure, are likely to play a key role, but also aspects such as poor access to primary health care for these groups.\(^25,26\)

In empyema it appears that blood cultures played an important role in diagnostics and were positive in 27% of patients. This is in contrast to uncomplicated pneumonia, where blood culture yield is typically poor.\(^27\)

Use of rapid antigen methods on pleural fluid are increasingly recognised for diagnosis in pleural empyema. Our audit shows that both major paediatric centres are using ‘Binax NOW’ *Streptococcus pneumoniae* antigen test (Binax, Portland, USA) as a diagnostic tool. International literature supports this, with results from ‘Binax’ comparable in sensitivity (>80%) and specificity to pneumococcal PCR.\(^28-31\) Detecting pneumococcal antigen in pleural fluid by rapid test is easy, quick, and enables early rationalisation to appropriate narrow-spectrum antibiotics, particularly in the context of prior antibiotics where culture negativity of pleural fluid is more likely. A significant proportion of our empyema cases remain without a pathogen identified. Methods such as molecular techniques and pneumococcal antigen tests on pleural fluid can enable the pathogens of empyema and their true burden to be elucidated. *S. pneumoniae* is the pathogen most often identified in culture-negative pleural specimens when molecular diagnostic tools are applied,\(^31\) which is important in understanding the impact of conjugate pneumococcal vaccines (PCV), particularly newer generation PCV13 which covers ‘empyema’ serotypes (serotypes 1,3 and 19A).\(^17,19,32\)

Several childhood vaccines have the potential to prevent respiratory infections that can lead to empyema. These include *Haemophilus influenzae* type b (Hib) and the new PCV13, both funded for New Zealand children with high coverage rates across the country. There were only two cases of *Haemophilus influenzae* seen in our audit, both nontypable. Seasonal influenza vaccine has been funded in Canterbury for all aged less than 18 years since 2011, however the uptake of this vaccine has remained below 30% in this population. Elsewhere in NZ influenza vaccine is only funded for children aged less than 5 years who have a history of significant respiratory illness. The majority of cases...
of empyema are seen in children aged <5 years and the increases in empyema admissions observed elsewhere are most marked in this age group. Targeting vaccination strategies such as access to influenza vaccination for all children under 5 years are important strategies to address this vulnerable age group.

As an audit our data has several limitations including the retrospective nature of the data and reliance on hospital records. Our data collection spans 2009 when pandemic H1N1 influenza caused significant respiratory illness burden across New Zealand. However, we provide an important snapshot into the nature of empyema across two centres in New Zealand and raise important questions. For both the North and South island, S.aureus is the dominant pathogen in paediatric empyema, accounting for over one third of culture-positive cases. Current empiric antibiotic guidelines cover this important pathogen, however MRSA coverage may be needed for some—particularly those most unwell or with disseminated sepsis, more indicative of S.aureus disease. Recently introduced PCV13 is expected to have better coverage of empyema caused by S.pneumoniae, although emergent invasive serotypes are still possible and improved diagnostic testing of empyema can help to clarify the ongoing role of S.pneumoniae. A Paediatric Surveillance Unit study is currently looking at all hospitalisations for paediatric empyema in New Zealand and will prospectively collect information on current management and incidence to compare with data such as ours. Questions remain as to whether empyema is increasing across the country or only in certain population groups, and the impact of recent changes to pneumococcal vaccination. For New Zealand, where dominant pathogens are different from other developed countries, important issues around the best surgical management, as well as long-term outcome from childhood empyema, are also raised.

Competing interests: Nil

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Retention on anti-tumour necrosis factor therapy: the Waikato experience
Ken Ip, Lorraine Hartley, Kamal Solanki, Douglas White

ABSTRACT
AIM: To investigate the retention on anti-TNF agents used in a real-world setting, and determine the factors predicting retention on drug.

METHOD: Patients starting anti-TNF therapy were recorded prospectively on the departmental database. Medical records of all patients commenced on anti-TNF therapy between 2006 and 2013 at the Rheumatology Department, Waikato Hospital, Hamilton, were retrospectively reviewed to obtain details of their course on biologic therapy.

RESULTS: 183 patients were identified. 139 (76.5%) were commenced on adalimumab. The predominant indication was rheumatoid arthritis (52.5%). 60 patients (32.8%) discontinued their initial anti-TNF agent. Of these, 31.7% were due to primary failure, 36.7% due to secondary failure and 25% due to adverse events. At 5 years, retention on agents was: adalimumab (77.2%), etanercept (69.6%) and infliximab (16.7%). Retention on adalimumab was significantly higher than infliximab (p<0.001), but did not differ between adalimumab and etanercept, or etanercept and infliximab.

CONCLUSION: In a real-world setting, retention on infliximab was significantly lower than adalimumab.

The advent of biological disease-modifying anti-rheumatic drugs (bDMARDs) has revolutionised the management of chronic inflammatory arthropathies. In particular, tumour necrosis factor (TNF) antagonists are now recommended as first-line biological therapy for the management of rheumatoid arthritis (RA) recalcitrant to conventional DMARDs such as methotrexate.\(^1\)

TNF, formerly TNF-α, is an inflammatory cytokine produced by both immune and non-immune cell types. At low concentrations, TNF exerts a beneficial effect through the initiation and augmentation of host defence mechanisms against local injury or infection.\(^2\) In the context of autoimmune inflammatory diseases however, the high concentrations of TNF induced by unknown stimuli triggers a cascade of cellular responses which ends in apoptosis and up-regulation of inflammatory genes.\(^2\) The importance of TNF in the pathogenesis of inflammatory diseases is evident through the broadening of indications for anti-TNF therapy, since their original development, to include psoriasis, inflammatory bowel disease, ankylosing spondylitis and anterior uveitis.

In New Zealand, three anti-TNF agents are subsidised by the Pharmaceutical Management Agency (PHARMAC) for use in the management of rheumatic disease. Adalimumab was first to become funded in 2006 for RA. The indications were extended in 2009 to include psoriatic arthritis and ankylosing spondylitis. Etanercept has been available since 2004 for juvenile idiopathic arthritis, with access widened in 2009 to include RA, psoriatic arthritis and ankylosing spondylitis. Infliximab became available in 2013, but had previously been approved for in-hospital use via individual District Health Board's medicines and therapeutics committees.

Infliximab and adalimumab are monoclonal antibodies directed against TNF, whereas etanercept is a fusion protein that binds both TNF and lymphotoxins (formerly TNF-β).\(^2\) They differ in their pharmacokinetic properties, dosing regimens and route of administration. Of note, infliximab is...
administered by intravenous infusion, while adalimumab and etanercept are administered as subcutaneous injections. Although no head-to-head randomised controlled trials are available, meta-analyses have failed to demonstrate any significant differences in efficacy between these three anti-TNF agents in the management of RA.3,4 The incidence of adverse events associated with each anti-TNF agent has also not been shown to differ.3 Accordingly, the European League against Rheumatism (EULAR) considers anti-TNF agents to have similar efficacy and safety in their latest recommendations.1 Differences do exist in the treatment of other diseases however, with etanercept failing to demonstrate efficacy in the treatment of Crohn’s disease compared to infliximab.5

In the absence of differences in risk-benefit profiles through randomised controlled trials, drug retention data can be used as an additional measure to aid clinical decisions on choice of initial anti-TNF agent. A recent study based on the Swedish Biologics Register between 2003 and 2011 found that 18.7% of patients discontinued their initial anti-TNF agent in the treatment of rheumatoid arthritis, primarily owing to inefficacy (51%) or adverse events (36%).6 In this cohort, retention over up to 5 years’ follow-up was greatest with adalimumab (81.2%), followed by etanercept (64.3%) and infliximab (49.7%).6 These findings are consistent with those based on other European biologics registries, including those from the United Kingdom, Switzerland and Denmark.7-9

To date, no studies have been performed to assess the retention on anti-TNF agents in the management of rheumatic diseases in New Zealand. The initiation of adalimumab or etanercept for RA requires the presence of active erosive disease with intolerance or failure of methotrexate alone and in combination with sulphasalazine and hydroxychloroquine, followed by ongoing disease after a trial of at least 3 months of methotrexate in combination with lefunomide, cyclosporine or intra-muscular gold. For psoriatic arthritis, adalimumab and etanercept are available if disease activity persists despite a trial of methotrexate and either lefunomide or sulphasalazine. For ankylosing spondylitis, patients must have sacroiliitis, restricted spinal movement and on going disease activity after a trial of physiotherapy and two anti-inflammatory agents. Initiation of infliximab requires failure of adalimumab or etanercept secondary to intolerable side effects, or failure to meet the renewal criteria following at least 4 months’ therapy. We set out to review our use of anti-TNF and to explore the factors that predicted retention on these agents.

**Method**

All patients commencing anti-TNF therapy at the Rheumatology Department, Waikato Hospital, Hamilton, were recorded in the department database. As specialist authority is required prior to commencement of bDMARDs for rheumatic indications, this database was deemed to be complete for those starting biologic therapy within the public health system.

The electronic and paper clinical records of each patient starting bDMARD between 2006 and 2013 were retrospectively reviewed. Data was collected on date of commencement on bDMARD, duration of therapy, reasons for cessation of therapy, indication for anti-TNF therapy, concurrent conventional DMARD use, as well as demographic variables. Primary failure was defined as lack of clinical improvement after 3 months, at the discretion of the rheumatologist. Secondary failure was defined as loss of efficacy on subsequent clinic visit following an initial response to anti-TNF therapy.

Kaplan-Meier analysis was used to evaluate discontinuation rates of each anti-TNF agent. Log-rank test was performed to analyse differences in discontinuation rates between different anti-TNF agents. Statistical analysis was performed using SPSS version 22. A p-value of <0.05 was considered statistically significant.

**Results**

Demographic variables are presented in Table 1. A total of 183 patients had been commenced on anti-TNF therapy by rheumatologists at Waikato Hospital between 2006 and 2013. This cohort comprised 59% women with a mean age of 50.8 years (range 10 to 79 years). 10.4% were commenced
ARTICLE

on infliximab as the initial anti-TNF agent, 13.1% etanercept and 76.5% adalimumab. The indications for initiation of anti-TNF therapy are presented in Table 2. The predominant diagnoses were rheumatoid arthritis (52.5%), ankylosing spondylitis (25.1%) and psoriatic arthritis (13.7%).

Eligibility criteria for public healthcare funding are such that all patients must have inadequate disease control in spite of conventional therapy. 66.1% received concomitant conventional DMARDs through the course of their anti-TNF therapy. Of these, 39.9% were receiving therapy with a single agent. Mean retention on anti-TNF therapy with concomitant DMARD was 145 weeks, compared to 127 weeks when administered without. However, this did not reach statistical significance.

Reasons for discontinuation of initial anti-TNF agent are presented in Table 3. Overall, 60 patients (32.8%) discontinued their first anti-TNF agent. Across the three agents, 19 (31.7%) discontinuations were due to primary failure, 22 (36.7%) due to secondary failure, and 15 (25%) due to adverse events. Of note, the rates of primary and secondary failure were almost equal. Within each agent, rates of secondary failure and adverse events were greatest for infliximab (26.3%, 26.3%), as compared to adalimumab (9.4%, 5.8%) and etanercept (16%, 8%).

Table 1: Patient characteristics at initiation of anti-TNF therapy at Waikato Hospital, Hamilton (n = 183)

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>%</th>
<th>Mean age (yr)</th>
<th>Range (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>75</td>
<td>41</td>
<td>48</td>
<td>10-75</td>
</tr>
<tr>
<td>Female</td>
<td>108</td>
<td>59</td>
<td>53</td>
<td>19-79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>n</th>
<th>%</th>
<th>Location</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ European</td>
<td>133</td>
<td>72.7</td>
<td>Hamilton</td>
<td>150</td>
<td>82</td>
</tr>
<tr>
<td>Other European</td>
<td>15</td>
<td>8.2</td>
<td>Thames</td>
<td>20</td>
<td>10.9</td>
</tr>
<tr>
<td>Māori</td>
<td>10</td>
<td>5.5</td>
<td>Tokoroa</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>Indian</td>
<td>5</td>
<td>2.7</td>
<td>Te Kuiti</td>
<td>5</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Table 2: Indications for initiation of anti-TNF therapy

<table>
<thead>
<tr>
<th>Indication</th>
<th>Adalimumab</th>
<th>Infliximab</th>
<th>Etanercept</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>82</td>
<td>2</td>
<td>0</td>
<td>96</td>
</tr>
<tr>
<td>AS</td>
<td>27</td>
<td>12</td>
<td>7</td>
<td>46</td>
</tr>
<tr>
<td>PsA</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>JIA</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
<td>19</td>
<td>25</td>
<td>183</td>
</tr>
</tbody>
</table>

RA, rheumatoid arthritis; AS, ankylosing spondylitis; PsA, psoriatic arthritis; JIA, juvenile idiopathic arthritis

Table 3: Reason for discontinuation of initial anti-TNF agent. Data are presented as n (%)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Primary failure</th>
<th>Secondary failure</th>
<th>Adverse event†</th>
<th>Difficult IV access</th>
<th>Patient request</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adalimumab</td>
<td>14 (10.1)</td>
<td>13 (9.4)</td>
<td>8 (5.8)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>35 (25.2)</td>
</tr>
<tr>
<td>Infliximab</td>
<td>2 (10.5)</td>
<td>5 (26.3)</td>
<td>5 (26.3)</td>
<td>3 (15.8)</td>
<td>1 (5.3)</td>
<td>16 (84.2)</td>
</tr>
<tr>
<td>Etanercept</td>
<td>3 (12.0)</td>
<td>4 (16.0)</td>
<td>2 (8.0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>9 (36.0)</td>
</tr>
<tr>
<td>Total</td>
<td>19 (10.4)</td>
<td>22 (12.0)</td>
<td>15 (8.2)</td>
<td>3 (1.6)</td>
<td>1 (0.5)</td>
<td>60 (32.8)</td>
</tr>
</tbody>
</table>

†Adverse events included: Recurrent infections (3), rash (3), palmoplantar pustulosis (2), anaphylaxis (1), breast cancer (1), headache (1), injection site reaction (1), miliary tuberculosis (1), peripheral neuropathy (1) and pneumonitis (1).
Figure 1: Retention of anti-TNF agent by year

![Graph showing retention by year for different anti-TNF agents](image1)

Table 4:
Pairwise comparison of retention between anti-TNF agents assessed by Log-rank test.

<table>
<thead>
<tr>
<th>First anti-TNF agent</th>
<th>Adalimumab</th>
<th>Infliximab</th>
<th>Etanercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>X²</td>
<td>p</td>
<td>X²</td>
<td>p</td>
</tr>
<tr>
<td>Adalimumab</td>
<td></td>
<td>24.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Infliximab</td>
<td>24.6</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Etanercept</td>
<td>1.29</td>
<td>0.256</td>
<td>3.13</td>
</tr>
</tbody>
</table>

Figure 2: Kaplan-Meier analysis of retention on anti-TNF agent. Retention on adalimumab was significantly higher (p<0.001) than etanercept or infliximab.

![Graph showing Kaplan-Meier analysis](image2)
For those experiencing primary failure, the mean time until discontinuation was 34.5 weeks, compared to 147.2 weeks for those experiencing secondary loss of effect. At 52 weeks, retention of individual anti-TNF agents was 61.1% for infliximab, 82.61% for etanercept and 85.29% for adalimumab (Figure 1). This trend was maintained at 5 years, with retention rates of 16.7%, 69.6% and 72.2% respectively (Figure 1).

Of the variables considered, choice of initial agent was the only statistically significant factor predicting anti-TNF therapy survival (p<0.001 by log-rank test) (Figure 2). Pairwise comparisons between agents demonstrates a significant difference in retention only between adalimumab and infliximab (p<0.001) (Table 4). Demographics, indication and concomitant use of conventional DMARDS were not significant in this cohort.

**Discussion**

This retrospective cohort study has demonstrated a statistically significant difference in survival of the three anti-TNF agents publically funded in New Zealand, when prescribed for rheumatic indications. As the initial anti-TNF agent, infliximab has the poorest retention rate as compared to adalimumab and etanercept.

Our real world data has shown longer retention rates on biologics than reported in other biologics registries. Arora et al recently published a systematic review of European national drug registers. They reported 60-month pooled drug retention rates in biologic-naive rheumatoid arthritis patients as adalimumab 47.5%, etanercept 52.2% and infliximab 37.1%. Our corresponding figures at 60-months were 77.2%, 69.6% and 16.7%. Shorter drug retention on anti-TNF agents in Europe may reflect greater serum concentrations and heightens risk of an infusion reaction. The rate of infusion reactions, a well described adverse effect of infliximab, is reported to occur in up to 8.6% of infusions. However, as no patients discontinued as a result of infusion reaction, this explanation does not appear applicable to our cohort. It may be that the availability of other agents available by subcutaneous mode of administration and greater patient convenience may also be a driving factor.

An alternative explanation for infliximab's inferior survival is its greater immunogenic potential. Infliximab is a chimeric antibody, which is more immunogenic than the humanised antibodies like adalimumab. However, the clinical significance of the formation of anti-drug antibodies remains unclear. Anti-infliximab antibodies have been reported in up to 11% of patients who discontinued therapy within 30 weeks. Paradoxically, an even greater number of patients (28%) receiving adalimumab developed anti-adalimumab antibodies after 3 years in a prospective cohort study which found a statistically significant association between anti-adalimumab antibody and failure to sustain adequate disease control. No commercial tests for these anti-drug antibodies are available and it is not possible to assess this in our cohort.

The development of anti-drug antibodies is reduced with concurrent immunosuppressive therapy such as methotrexate. Additionally, longer retention on leflunomide compared to international data has also been previously demonstrated in an environment where biologic therapy was not yet available.

Consistent with a number of European drug registries, our findings highlight that infliximab has a significantly lower retention compared to adalimumab. Our data did not find a statistically significant difference between retention on infliximab and etanercept, perhaps reflecting the relatively low numbers of patients receiving these agents. Previous studies postulate the higher retention on the subcutaneous agents may be due to infliximab’s dosing regimen, potentiated by its mode of administration by infusion, which produces greater serum concentrations and heightens risk of an infusion reaction. The rate of infusion reactions, a well described adverse effect of infliximab, is reported to occur in up to 8.6% of infusions. However, as no patients discontinued as a result of infusion reaction, this explanation does not appear applicable to our cohort. It may be that the availability of other agents available by subcutaneous mode of administration and greater patient convenience may also be a driving factor.
and radiographic outcomes. In our cohort, use of concomitant conventional DMARD extended the mean survival of anti-TNF agent by 18 weeks, although this did not reach statistical significance.

To our knowledge, this is the first study investigating the survival of anti-TNF agents in a New Zealand cohort. As an observational study, it has merits in considering the use of bDMARDs in a ‘real world’ setting with an extended follow-up period. However, the main limitations are the retrospective nature of the data collection and the lack of a standardised protocol definition of primary and secondary failure of the medications.

We conclude that in this regional cohort of biologic-naïve patients, significant differences in the survival of initial TNF antagonists were observed. Treatment retention was shorter for patients commenced on infliximab than those commenced on adalimumab or etanercept. These findings are in keeping with those of European drug registries, but cannot be accounted for by infusion reactions unique to infliximab’s intravenous administration, as postulated by previous studies.

Competing interests: Nil
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Two major international trade agreements, very similar in nature, are currently being negotiated, the Trans-Pacific Partnership Agreement (TPPA) and the Transatlantic Trade and Investment Partnership (TTIP). The TPPA involves the USA and New Zealand and 10 other Pacific-Rim countries including Australia. The TTIP is between the USA and the European Union. The potential adverse effects of the proposed TTIP agreement have been reviewed by Hilary, and a similar review of the TPPA has recently been published in Australia. Monasterio and Gleeson described the increased influence the TPPA could give pharmaceutical companies in New Zealand, thus reducing the effectiveness of PHARMAC. However, the proposed TPPA could have an adverse impact on many New Zealand health systems, not just in pharmaceuticals.

TPPA negotiations have been conducted in secrecy and the details may not be revealed even after they have been signed. Publicly accessible information has, to date, come from leaks. These factors have made it difficult to have an informed discussion of the pros and cons of the proposals. Even democratically elected members of the UK and New Zealand Parliaments, and Congress in the USA, may know little or nothing about the current content of the TPPA. By contrast, many of the major American-based multinational companies have been closely involved in their development.

There are good reasons to be concerned about these secret negotiations, and it is important to try to assess how they might affect our health systems. The points listed below illustrate how changes aimed at improving the health of the New Zealand population may be prevented by the current TPPA proposals.

The TPPA could enable multinational corporations to maintain their profits at the expense of the individual countries who sign the agreement. If the profits of these multinational companies are reduced by the actions of any individual country, then that country could be sued by the company to recover their lost earnings.

Any legal action of a company against a country will be heard outside that country’s legal system, by a group of corporate-appointed lawyers. This system is called Investor-State Dispute Settlement (ISDS). It is a crucial part of the proposed TPPA, and
would allow corporations to sue governments before an ISDS-type arbitration panel. Hearings are conducted in secret. No one else has any representation, and their conclusions cannot be challenged. This system was originally introduced to protect multinational companies when setting up a business in third world countries that lacked any established legal system. It is inappropriate for something like ISDS to be used in countries like New Zealand and Australia whose sophisticated legal and regulatory systems are quite capable of settling any disputes.

The USA can withhold the final steps required to bring a trade agreement into force until the other country has changed its laws in a manner the USA deems suitable under that trade agreement. This is referred to as ‘Certification’ and has significant practical implications.

The secrecy surrounding the TTIP negotiations has caused outrage in Europe. In response, the European Commission has released details of some of these discussions. The New Zealand government has currently declined to release any negotiating information relating to the TPPA.

In many of the above situations, the sovereign power of a country to manage its own affairs will therefore be transferred to an overseas multinational company whose existence depends on maximising profits.

The following examples illustrate how the TPPA could affect New Zealand health services, and shows how New Zealand may lose the ability to introduce quite simple measures that would improve public health.

**Tobacco**

Tobacco use causes lung cancer, and increases the risk of chronic lung disease, heart attack and stroke. Even the tobacco companies have given up contesting these facts. Australia and Uruguay both decided to introduce plain packaging of cigarettes to reduce smoking and save lives. Philip Morris, a US tobacco company, has taken both countries to an ISDS-type court under previous trade agreements in an attempt to recover lost earnings. So any action by a country that reduces tobacco use under TPPA could face litigation from tobacco companies. The more effective such action, the greater the payment to the company.

**Alcohol**

Alcohol abuse causes significant health and social damage in New Zealand. Attempts to reduce alcohol intake, and thereby improve our health, have not been successful. Under TPPA, multinational companies might be able to sue for loss of earnings if effective ways of controlling alcohol use are introduced. Efforts by a country to reduce tobacco and/or alcohol consumption, clearly desirable outcomes, could be inhibited by the mere threat of litigation.

**Obesity**

The causes of the obesity epidemic, a global health problem, includes high calorie fast foods and drinks with a high sugar content. If New Zealand managed to control obesity by reducing the consumption of such foods and drinks, then the relevant multinational companies could sue for loss of earnings.

**Access to medicines and medical devices**

Monasterio and Gleeson reviewed the likely effects a TPPA agreement might have on the pharmaceutical industry in New Zealand. PHARMAC controls the purchase and subsidies on medicines and vaccines on behalf of the Government. Over the past decade it has made significant savings for the country, despite opposition from the pharmaceutical industry. These actions by PHARMAC are inconsistent with the principles of the TPPA, and would be threatened unless some exclusion arrangements were made. PHARMAC also controls the purchase of medical devices such as stents, heart valves, and pacemakers for heart disease, as well as artificial joints and lenses for cataract surgery, and these too could be affected. The purchase of generic drugs would be more difficult, and could be delayed by making it easier to for drug companies to extend patents on proprietary medicines. Some drugs might become unaffordable.

**Public safety issues**

TPPA could reduce the effectiveness of Government bodies whose function is to
protect the health of the public, such as the Health Promotion Agency. Canada and the USA are linked by a trade agreement called NAFTA. A fuel additive, methylcyclopentadienyl manganese tricarbonyl (MMT), was banned by the Canadian Government because it was considered to be a risk to public health. The Ethyl Corporation, the American company who produces MMT, sued Canada and were awarded millions of dollars in damages by an ISDS type court. Canada rescinded the ban.1

In conclusion, the TPPA could dramatically affect the way we organise our health systems, and could affect the ability of New Zealand to formulate its own future health policies. If the leaked information is correct, it is possible that the TPPA could interfere with our democratic processes, and consequently the sovereignty of our country.


6. Pattemore P and Monasterio E The public has a right to know on TPPA. The Christchurch Press 23rd February 2015.


How well does your healthcare system perform?
Tracking progress toward the triple aim using system level measures

Fiona Doolan-Noble, Mataroria Lyndon, Sybil Hau, Andrew Hill, Jonathan Gray, Robin Gauld

Background

Since the delivery of the World Health Organization (WHO) 2000 report on health system performance improvement, there has been increasing international interest in health systems and their assessment. The WHO defined a health system as, "...all the activities whose primary purpose is to promote, restore or maintain health". For New Zealand, and many other developed countries, there is a growing acceptance that health systems, as a whole, have to change to meet the changing healthcare needs of their populations, who are ageing and increasingly likely to be burdened with chronic conditions. To meet these changing demands there is an increasing focus on integration of services at all levels and across all sectors, including social services.

Against this backdrop, policy makers and health care managers, therefore, are keen to determine how well their system is responding to changing health care needs in their area, but also how well their health system compares with others.

At the international level, organisations such as the WHO, the Organisation for Economic Cooperation and Development, and the Commonwealth Fund, have taken a lead in developing methods for comparing health systems. The work of such agencies is useful for national policy-makers in particular, for highlighting performance of their health systems at a relatively abstract level and for cross-national learning in key areas such as quality of care, expenditure and workforce. Beyond this level, the usefulness of such data are limited. Indeed, within a country it is difficult for national or regional health system stakeholders to obtain information meaningful to their organisation from such general level data. Consequently, performance benchmarking at a national level has commenced, providing insights into health system performance within individual countries. Various approaches are emerging, including the development of a national health system performance scorecard for New Zealand. However, scorecards give an overall snapshot of the health system and the New Zealand scorecard requires further development to enhance its utility at the local District Health Board (DHB) level.

Answering the question of how well an individual DHB performs is far from straightforward. This is partly due to the complexity and scope of DHB activity, but also a historical lack of investment in composite measures for performance measurement along with the range of central agencies monitoring and reporting on different aspects of performance. Moreover, most DHBs gather and report a
range of data from the various components of the local health system—from primary care through to individual hospital and health services. While the measurement challenge is one that an impending national Integrated Performance and Incentive Framework (IPIF)⁹ seeks to address, some DHBs have sought to develop their own measures, including Counties Manukau Health (CMH). This should not ultimately result in a duplication of effort, as the development of the IPIF and CMH’s approach, as described below, has been an interactive process; each has informed the other, aided by involvement of some CMH staff in the IPIF development.

This brief article describes the process undertaken by CMH to develop a set of system-level measures. It aims to raise interest across the DHB sector, both locally and internationally, in performance measurement, using routinely collected data. In doing so, we seek to fill a gap in the field in New Zealand.¹⁰

CMH is one of 20 DHBs in New Zealand whose legislated role involves the improvement, promotion, and protection of the health and wellbeing of the people in the communities they serve. CMH funds and provides health and disability services for some 500,000 people living in the southern third of Auckland City and in neighbouring Franklin and Papakura districts.

Similar to other DHBs in New Zealand, and health systems in many developed countries, CMH currently has to contend with multiple health care challenges, including an ageing population and increasing chronic illness, resulting in a pressurized health care budget. CMH, however, faces the additional challenges of high population growth (between 2-3% annually), the highest birth rate in the country and a very young population with 24% aged 14 years or under.¹¹,¹² Māori and Pacific people make up a significant proportion of the population compared to many of the DHBs, with 17% and 23% respectively, and 34% of the population live in areas of deprivation.¹³ CMH, therefore, faces a situation of being doubly disadvantaged, in that it has to meet the needs of an older population burden by chronic illness, as well as the health care needs of a younger population.

In response, CMH has committed to an integrated health system and services development agenda, and identified a mission “to be the best healthcare system in Australasia by December 2015”. Their intent is to embed a broader range of services within the community via four primary care ‘locality clinical partnerships’. Thus, the DHB’s goal is to build a ‘whole of system’ approach to service delivery that meets the needs of all members of the population, irrespective of health need or disability. Yet to date, how well their health system as a whole meets the diverse pressures it faces and how well the whole of system approach to service delivery is performing is largely unknown. In response, CMH has developed a series of System Level Measures (SLMs) to assess the effectiveness and overall performance of their health system. The SLMs aim to assess performance in relation to health care quality, the integration of care and health care outcomes. They are not intended to induce competition, but rather, help the DHB track its performance on a journey of continual improvement in intentionally selected and measured aspects of the aforementioned dimensions.

System Level Measures: what are they and why use them?

Two organisations have driven the increasing use of quality indicators in health care, The Institute of Medicine (IOM) and the Institute for Healthcare Improvement (IHI).¹³ These organisations have both advocated for and advanced the area of performance reporting systems in healthcare.¹³ The IHI was responsible for developing a system of metrics known as Whole System Measures (WSMs)¹⁴ which the CMH SLMs are based on. These measures aim to be indicators that are easy to capture and are designed to provide organisational leaders with data that:

- Show performance of the health system over time
- Allow the organisation to compare its performance relative to strategic improvement plans.
- Allow the organisation to compare
itself to similar organisations.

- Contribute to ongoing strategic quality improvement planning.

The WSMs align with the six dimensions of quality identified by the Institute of Medicine. These are that care should be safe, effective, patient-centred, timely, efficient and equitable, as well as reflecting care in different sites across a continuum of care. In addition, WSMs link to the Baldrige Health Performance Excellence Framework, which is recognised as a robust method for evaluation of health care systems. WSMs are macro-level measures or ‘big dots’, such as Hospital Standardised Mortality Rate (HSMR) and Acute Readmissions to Hospital, and are designed to provide a comprehensive overview of a health systems overall quality and performance. These ‘big dots’ are underpinned by specific measures (‘little dots’) captured at different levels of the system, and known to contribute to the performance of the WSMs. Hence, ‘big dots’ can be decomposed to ‘little dots’ to determine what is influencing performance. The IHI’s WSMs are not a static collection of metrics but are designed to be modified to reflect an organisation’s vision and strategies, as well as its current priority areas.

The journey so far for CM Health

Using SLMs for internal improvement monitoring and external comparison purposes is not unique to CMH. Numerous healthcare organisations internationally, large and small, collect data to measure their performance using WSMs. Examples of organisations applying SLMs include Jönköping county in Sweden, Public Health Wales, and Cincinnati Children’s Hospital in the United States. With the appointment of a director with previous experience of using WSMs to Ko Awatea, CMH’s education and health system innovation and improvement centre, came the opportunity for CMH to utilise this improvement and performance measurement approach.

The journey has three distinct phases. Phase one involved a review of the literature and national and international system level quality frameworks including:

A. IHI Whole System Measures
B. New Zealand Health Quality and Safety Indicators
C. Jönköping County System Measures
D. Public Health Wales System Level Improvement Measures
E. Cincinnati Children’s Hospital Medical Centre System Level Measures
F. The Commonwealth Fund Score Card.

This process assisted in the selection of potential SLMs. The eventual SLMs were chosen based on their ability to inform the monitoring of progress towards CMH’s strategic ‘Triple Aim’ of improved health and equity for all populations, improved quality, safety and experience of care and best value for public system resources, as well as ability to have a clear logical link to CMH’s strategic objectives. Furthermore, the utility of the SLMs to support monitoring of performance over time, comparisons with other organisations and reinforcement of improvement planning were critical considerations, as was the feasibility of utilising existing data collections within CMH. Basing the selection of the SLMs within these criteria has ensured that all major areas of the health system are covered. There was also an endeavour to ensure that the chosen measures complemented one another; in other words, each is not an isolated metric, but related to multiple other measures. In doing this, CMH can monitor how change in one SLM, for example PHO enrolment rates, contributes to increases or decreases in acute hospital readmissions or the rate of childhood immunisations. To date, a suite of 16 SLMs have been selected and their utility and validity assessed. These measures and their interrelationship are presented in Figure 1 (below) and examples of how they relate to the Triple Aim outlined in Table 1.

Some of the SLMs chosen by CMH are more overtly related to its own controllable actions than others. CMH does, however, have an influence on all the chosen measures including life expectancy and ambulatory sensitive hospitalisations. While the ability to determine exactly the influence of CMH on some measures is more challenging than others, the ability to drill down from the ‘big dots’ to their contributory factors, as discussed next, does allow CMH to uncover potential reasons...
**Figure 1:** CMH’s system level measures across the continuum of care  
(Adapted from the IHI Whole System Measures)  

![Diagram of system level measures](image)

**Table 1:** Examples of SLMs and their relationship to the Triple Aim

<table>
<thead>
<tr>
<th>SLMs</th>
<th>TRIPLE AIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un-enrolled Health Service Utilisation*</td>
<td>Population Health: Un-enrolled Health Service Utilisation Rate of Adverse Events Healthcare Cost per Capita</td>
</tr>
<tr>
<td>Ambulatory Sensitive Hospitalisations</td>
<td>Patient Experience of Care: Acute Readmission to Hospital within 28 Days Workforce Retention</td>
</tr>
</tbody>
</table>

*Un-enrolled refers to those in the population who use in-patient services but are not enrolled in a Primary Health Organisation

**Figure 2:** Terminology related to SLMs

- **System measurement framework:** a measurement framework based on the ‘Triple Aim’ that reflects the overall quality and performance of a healthcare system.
- **System Level Measures:** these are a set of system measures that aim to evaluate performance on quality and value across a whole system, thereby providing input into strategic quality improvement planning.
  - **‘Big dots’:** these are the system level measures and these equate to core processes or functions of the organisations in the system. They are not programme, unit, or disease specific.
  - **‘Little dots’:** these are process and outcome indicators at a programme or unit level.
- **Scorecard:** reports on a defined number of measures providing managers with information on the performance of the organisation.
- **Dashboard:** unlike a scorecard which is a snapshot in time, a dashboard uses real time data to assist decision making.
- **Benchmark:** the best result previously achieved by an organisation or department. A benchmark can be used in conjunction with other comparative data to interpret and evaluate performance and set goals.
for changes in the measures overtime. In addition, the drill-down process highlights potential caveats on the data, as well as areas for further research.

Phase two is (at the time of writing in December 2014) underway and ongoing. This phase involves the careful consideration and identification of robust contributory measures ('little dots') for each SLM. This process of 'drilling down' on each SLM enables identification of measures that influence SLM performance. The on-going nature of this phase is necessary to allow enough time to develop certainty around the appropriateness of the contributory measures chosen. In addition, a dashboard (see Figure 2 for a descriptor of a dashboard and other SLM terminology) has been developed, providing senior managers at CMH a real-time snapshot of the systems performance across the measures selected.

In May 2014 phase three commenced. This phase is being undertaken collaboratively with researchers commissioned by Ko Awatea. This third phase has multiple objectives, including the identification of potential health care systems to compare CMH to and establishing appropriate benchmarks. This phase of the project contains various challenges which are discussed next.

Challenges, methodological and operational

Although cross-country comparisons of health system performance have the potential to enhance cross-country learning, there are some well recognised difficulties which make comparisons, particularly international ones, intrinsically difficult. These include population variations, definitional issues and coding differences, to name a few. However, strategies are available to address these methodological challenges, such as age and sex standardisation of populations, and the use of indicators using internationally standardised definitions for coding.

There are also innate tensions in deciding which SLMs to collect: ones that allow for cross-country comparisons or ones that are strongly aligned with organisational priorities, or a mixture? Essentially, this is a question of breadth or depth of performance comparison. Another tension arises between the need for consistency of definitions, numerators and denominators, yet accepting of a level of flexibility to accommodate comparison with different countries. Furthermore, there is also a potential for unintended consequences to emerge when using SLMs to guide performance or even quality improvement. For example, there is a possibility that the focus on the specific SLMs diverts attention and possibly finance from other parts of the system, potentially resulting in misprioritisation. However, CMH’s SLMs are philosophically based on an improvement, not a performance judgement, framework. As as the name suggests, they focus on the system. A performance framework, such as the IPIF, tends to use financial and other incentives, such as increased DHB autonomy, to enhance performance in discrete areas. Such approaches can, therefore, result in unfairly focusing attention on a service, process or health outcome.

Closer to home the challenges relate more to operational issues. These include whether the organisation has the technical capability to capture and retrieve the data related to the SLMs of interest. These data frequently come from a variety of repositories, so data linkage can be challenging. In addition, analysis of these data requires an understanding of the origins and any related limitations linked to the data, for example, their reliability and the extent to which the data have been validated, before they can be utilised effectively. The need for a person to lead a team of data analysts and provide strong data collection oversight is, therefore, an essential prerequisite in assuring data quality over time. In addition to operational issues, there were also the usual challenges for CMH in terms of deciding which measures to include in a multidimensional framework. These were handled through an iterative and consultative developmental process within CMH’s SLM development group, meaning that there was considerable scope for wide-ranging discussion around measures that were and were not included.

While the literature contains information regarding some of the challenges and unintended consequences, less is written...
regarding potential supplementary benefits of undertaking this type of initiative. In their article regarding the ancillary benefits of clinical performance measurement, Powell et al drew attention to benefits that may equally be related to the implementation of a system of SLMs. These include an increase in the pride with which staff view the organisation, increased motivation and increased confidence that the care provided is evidence based. The authors also mention patient benefits, such as increased patient satisfaction, which again may also be an unintended benefit of a health care system monitoring SLMs.

**Next steps**

The immediate next steps involve collaborating with countries considered appropriate for comparison to assess the feasibility of data comparisons. Once it has been established that data are comparable between health systems, a pilot comparison of one or two SLMs will be conducted and assessed, prior to comparing a larger group of SLMs. It is anticipated that these comparisons will be on-going, assisting learning and quality improvement in all sites.

**Conclusion**

A core component of any high-performing health system is the employment of a comprehensive measurement system to advance quality improvement. Focusing on SLMs will provide CMH with robust information on the quality and safety of their health services, inform performance improvement strategies within the system and support progress towards the ‘Triple Aim’. As a result, this health system will be one where quality is the result of conscious and responsive design with indicators intended to reflect the core strategic focus of the organisation.

By aiming to compare with other similar health systems internationally, CMH will be provided with opportunities for mutual learning and networking with system performance experts, which is crucial for stimulating improvement. Moreover, by comparing with a similar but acknowledged high-performing sub-national health system, such as Jönköping in Sweden, could allow CMH to develop aspirational benchmarking targets in relation to specific SLMs that are relatively easy to compare. Examples include childhood immunisations status and hospital standardised mortality rates. The leadership at CMH is committed to openly sharing experiences and lessons learned along the way, as well as providing leadership to the wider health sector in New Zealand on the development of SLMs. This work also enables the organisation to contribute to the literature in the field of quality improvement, measurement and evaluation of health systems. It is now time for other DHBs, alliances and other health care providers in New Zealand, to similarly focus their efforts on system improvement aided by system-wide measurement.

**Competing interests:** Nil

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REFERENCES:


18. Veillard JHM. Performance management in health systems and services: Studies on its development and use at international, national/jurisdictional, and hospital levels. Amsterdam: University of Amsterdam; 2012.


Systemic capillary leak syndrome: a case-report

Thomas E Manning, Anna E Manning, Patrick J Manning

ABSTRACT

We report a case of a patient presenting with episodic hypotension, tachycardia and oedema, with an elevated serum IgG kappa paraprotein level. She was diagnosed as having systemic capillary leak syndrome and upon commencing oral theophylline has had no further presentations. The patient has since progressed to multiple myeloma.

Case Description

A 53-year-old woman was first admitted with a 5-day history of upper respiratory tract symptoms and a 1-day history of diarrhoea. At presentation she was alert and oriented with a pulse rate of 120 per minute and a systolic blood pressure of 85 mmHg. She developed progressive oedema to her mid-calves. The haemoglobin was 182 g/L with a haematocrit of 0.53. Initially her serum albumin was 37 g/L but fell over 2 days to 22 g/L. Her troponin was negative, ECG normal and echocardiogram revealed normal left ventricular function. The CRP was 15 mg/L and screen for sepsis was negative. Her serum creatinine was 225 µmol/L and she had 1+ protein in her urine with large numbers of hyaline casts. She had a low urine output. She was given 16 L of intravenous crystalloid solution over a period of 4 days with slowly improving blood pressure and urine output. She made a full recovery and was discharged 6 days after admission. No specific diagnosis was established.

Over the next 7 years the patient had 3 further admissions with profound hypotension, tachycardia and oedema, usually following trivial infections. The last of these admissions required a prolonged stay in the intensive care unit with intubation, ventilator and inotropic support, and transient dialysis. During each admission she was haemoconcentrated, hypoalbuminaemic and with evidence of pre-renal acute kidney injury. There was never any evidence of acute sepsis contributing to these events. Adrenal function was normal. Repeated echocardiograms showed normal systolic function. Serum protein electrophoresis showed the presence of an IgG kappa paraprotein with an estimated density of 3 g/L.

Based on the clinical features of the patients repeated presentations, a diagnosis of systemic capillary leak syndrome was made and the patient was commenced on oral theophylline. Over the subsequent 3 years she has had no further presentations with this disorder but has progressed to having multiple myeloma.

Discussion

Systemic capillary leak syndrome (SCLS) is due to recurrent episodes of generalised increased capillary permeability. This results in the rapid accumulation of fluids and proteins into the extravascular space, causing a rapid fall in blood pressure and subsequent hypovolemic shock. Episodes of SCLS are characterised by generalised
oedema associated with an elevated haematocrit (haemoconcentration) and hypoalbuminaemia, usually in the absence of albuminuria.²

The progression of a typical episode of SCLS can be divided into three phases: prodromal, acute leak and late post-leak phases.³ During the prodromal phase, individuals often complain of weakness, malaise, myalgias and abdominal pain, which can last hours to days. This is followed by the leak phase, during which marked hypoperfusion, hypotension and oedema occur as a result of extravasation of fluid and protein. This typically lasts several days. The post leak phase occurs after the repair of capillary barrier function and involves the restoration of intravascular volume via reabsorption of extravasated fluids and proteins, and subsequent diuresis.³

Capillary permeability is normal during quiescent periods.⁴ Although the precise mechanism behind the increased capillary permeability has not yet been established, several hypotheses have been proposed. These include activation of the classical complement pathway, endothelial damage due to cytokines such as interleukins 2 and 6, interferon gamma and tumour necrosis factor alpha and raised plasma concentrations of vascular endothelial growth factor.⁴

SCLS is a clinical diagnosis and requires the exclusion of other conditions that can result in increased capillary permeability, such as sepsis. The majority of patients with SCLS also have a monoclonal gammopathy present and testing for this can be useful when the condition is suspected. During quiescent periods this is generally the only notable laboratory abnormality.⁵ The class of this paraproteinaemia is predominantly IgG with either kappa or gamma light chains.

During an acute episode, careful use of intravenous fluid support is recommended to maintain adequate perfusion of the kidneys, brain, and other vital organs. However sufficient fluids to normalise blood pressure often exacerbates the oedema and can predispose the patient to pulmonary oedema.⁴ During the post-leak phase there is mass reabsorption of extravasated fluids and proteins. This can result in acute intravascular fluid overload if the patient's kidneys are unable to compensate via diuresis. Therefore it is important that clinicians recognise the switch from the leak phase to the post-leak phase so they may alter patient management accordingly. This can be achieved with the use of loop diuretics if renal function is intact, otherwise haemodialysis or haemofiltration can be utilised.⁴

While no curative treatment exists for SCLS, several therapies have shown some success. Treatment with selective β₂ stimulants (terbutaline) has been shown to inhibit the histamine and bradykinin-dependent macromolecular capillary leakage during acute episodes.⁶ In addition, combination treatment with theophylline and terbutaline reduces the incidence of, or completely abates, acute episodes of SCLS. More recently treatment with intravenous immunoglobulins has been used successfully as a prophylactic treatment.⁷ Several cases of SCLS-diagnosed patients progressing to multiple myeloma, as seen in our patient, have been described and therefore referral to a haematologist for surveillance is advised.⁸
CLINICAL CORRESPONDENCE

Competing interests: Nil

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CLINICAL CORRESPONDENCE

Retinitis Pigmentosa
Habib ur Rehman

A 66-year-old woman presented with a 6-month history of unsteadiness of gait. She had tunnel vision due to retinitis pigmentosa diagnosed at age 36. Her father, one paternal uncle, three sisters and one brother also had retinitis pigmentosa. Her grandparents and both children were unaffected as were the children of her siblings. Visual acuity and visual fields were not tested. Small muscles of the hand were weak and wasted on the left side. Rest of the neurological examination was unremarkable. Nerve conduction studies were normal, as were the results of lipoprotein electrophoresis and serum phytic acid. MRI of cervical spine showed Luschka spurring and disc bulging, lateraliased towards left, resulting in moderate left foraminal narrowing.

Retinitis pigmentosa is a set of hereditary disorders of retina that feature degeneration of rod and cone photoreceptors. The disease is usually confined to eyes and may be inherited as autosomal dominant, autosomal recessive, or X-linked trait. 20–30% of patients have the disease as a part of syndrome where it is associated with non-ocular disease. Examples are Bardet-Biedl syndrome, Usher’s syndrome, Refsum’s disease, Kearns-Sayre syndrome and abetalipoproteinemia. Difficulties with dark adaptation and night blindness are the usual symptoms at the onset of the disease. Peripheral vision is lost and eventually patients develop tunnel vision as the disease progresses. It is important to know that posterior subcapsular cataracts and cystoid macular edema may be associated (two treatable causes of visual loss in these patients with otherwise irreversible disease). Most patients are legally blind by age 40. On slit-lamp examination and on ophthalmoscopy retinal vessels appear attenuated. Intra-retinal pigmentation appears as bone-spicule deposits in the periphery of the fundus. These pigmentary deposits are due to the migration of the pigment cell layer into the neural retina due photoreceptor-cell death.

Figure 1:
Bone spicule deposits in the periphery of fundus
Figure 2: Pigmentary changes of retinitis pigmentosa

Competing interests: Nil
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Suboptimal smokefree signage at some hospitals: Field observations and the use of Google Street View

Nick Wilson, George Thomson

Introduction

Hospitals were one of the first settings in New Zealand to adopt indoor smokefree policies, and they have also been leaders in making their grounds smokefree as well. Given the healthcare orientation of hospitals, these facilities are likely to provide both an educative role and a norm-setting role towards a smokefree society—the New Zealand Government’s goal for 2025. However, no surveys of hospital outdoor smokefree signage have yet been conducted in this country—and so we aimed to address this deficit.

Such research can now potentially benefit from the use of Google Street View (GSV), which is being increasingly used in research around built environments. Studies of the validity of data from GSV compared to field observations are generally favourable, albeit with some problems with differing image dates on intersecting streets.

Methods

The first step was a convenience sample of 10 public hospitals that were located between Wellington and Gisborne in the lower North Island of New Zealand (road trips in both January and March 2015). The hospitals were identified from a list of 86 public hospitals detailed on the Ministry of Health website. They ranged from having 3 to 369 beds (median: 56.5) and covered five different District Health Boards (DHBs). Data collection included the presence or not of smokefree/non-smoking signage that was visible anywhere from the campus perimeter (ie, excluding roading that was internal to the hospital campus as revealed by the colour shading on Google Maps). Half of the observations were made jointly by two observers (NW and GT) and the rest by the first author (with both authors having experience in studying such signage). The same facilities were then examined using Google Street View (GSV) by an independent observer not involved in the field work (AT—see acknowledgements). This was after training in using GSV with a sample of hospitals elsewhere in the country.

The second step was to study a random sample of 20 public hospitals from around New Zealand (a 26% sample from the list of 86 hospitals, and excluding the 10 hospitals sampled above, and using the random number function in Excel). The selected hospitals ranged from having 8 to 863 beds (median: 70) and covered 12 DHBs. These hospital sites were then examined, using GSV, for smokefree signage at the main driveway entrance (by NW in April 2015). See Table 1 for additional definitions and other details.

Results

In the field observations (Table 1), 90% of hospitals had smokefree signs at the main entrance, and 90% had at least one such visible sign anywhere else on the premises when walking around the perimeter (on stand-alone sign posts, fences or buildings).
The average number of signs observed per hospital was 8.6 (range: 0–27; total: 86). But field observation found that only 40% of hospitals had any signs that stated that the ‘grounds’ were smokefree.

The comparable figures from the independent observer using GSV were: 90% at the main entrance, 90% for any other signs, and the average number of signs was 3.5 (range: 0–21; total: 35). Only 40% of hospitals studied with GSV had any observed signs that stated that the ‘grounds’ were smokefree.

Assuming that all the field observations were ‘correct’, the observations using GSV had very good sensitivity, specificity and other characteristics (Table 1), albeit somewhat less favourable for signs mentioning ‘grounds’.

The random sample of 20 hospitals nationally using GSV indicated that only half (10/20) had any visible smokefree signage at the main entrance (Table 2). Only around a third (35%; 7/20) had smokefree signage that included words relating to the ‘grounds’ being smokefree.

Discussion

This small pilot study suggests that GSV is a reasonably valid tool for studying

<table>
<thead>
<tr>
<th>Performance characteristic of GSV vs field observations</th>
<th>Any smokefree signs at main entrance*</th>
<th>Any other smokefree signs on premises</th>
<th>At least one smokefree sign mentions smokefree ‘grounds’ (or site or campus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>True positives (number) [A]</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>True negatives (number) [B]</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>False positives (number) [C]</td>
<td>0</td>
<td>0</td>
<td>1**</td>
</tr>
<tr>
<td>False negatives (number) [D]</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total (number)</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Sensitivity [A/(A+D)] 100% 100% 75%
Specificity [B/(B+C)] 100% 100% 83%
Positive predictive value [A/(A+C)] 100% 100% 75%
Negative predictive value [B/(B+D)] 100% 100% 83%
* That is within 10 metres either side of the edges of the main entrance (defined as the main driveway for all 10 hospitals in this sample) and including blurred signs based on these being likely (50%+ probability) to be smokefree signs when considering colour and shape to the experienced and trained observers. Blurring could be due either to distance or sometimes to the automatic blurring function used by GSV for vehicle number plates.
** This result might not have been a problem with GSV based observations, but rather the field observers may have missed a sign saying "grounds”.

Table 2:
Smokefree signage at the entrance to a random selection of 20 public hospitals in New Zealand (sampled out of all n=86 public hospitals in New Zealand, but excluding the 10 hospitals reported on above)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of hospitals</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any smokefree signs at the main entrance*</td>
<td>10</td>
<td>50%</td>
</tr>
<tr>
<td>Other smokefree signs that were visible when the GSV image was centred on the main entrance</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>Any smokefree signs mention ‘grounds’, ‘site’ or ‘campus’</td>
<td>7</td>
<td>35%</td>
</tr>
</tbody>
</table>
* That is within 10 metres either side of the edges of the main entrance (focusing on the main driveway into the hospital campus (n=19) but if the main entrance was directly onto the street (n=1) then this was used instead). There were a total of 14 signs observed at these entrances.
LETTER

basic aspects of smokefree signage on hospital grounds. It performs slightly less well in terms of detailed signage wording (the wording around ‘grounds’) and quite notably poorer in terms of the total number of observable signs. However, the latter limitation could have been reduced further with more training of the independent observer and more time spent using GSV for observations.

Given these results (and other literature—see Introduction), combined with how efficient it is to use GSV for data collection (ie, no travel time or costs required), it is probably desirable for more studies to make use of this tool. That is, it could be used for studying smokefree signage in childrens’ playgrounds, parks, campuses, shopping streets and other outdoor settings.

The results of both the convenience and random samples also suggest that there is scope for improvements in increasing the number of smokefree signs at the main entrances to hospitals. Furthermore, there is an opportunity in many places for signs to clearly state that the grounds are smokefree and to make signs larger, as many were quite small and combined with many other different signs at the same spot. Therefore potential responses are that:

1. Tobacco control workers could encourage DHBs to do qualitative upgrades to their signage eg, adopting the large stand-alone signs used at Wellington Hospital that clearly mention ‘grounds’ (Figures 1 and 2) and that violators will be ‘asked to move on’ (Figure 2). Some signage could also refer to smoking cessation support (again, there are examples from Capital and Coast DHB, Figure 2).

2. The next upgrade to the Smoke-free Environments Act could ensure that all New Zealand public hospitals are required to have signage at their main road and main pedestrian entrances with signs meeting minimum specifications for size, the use of the word ‘grounds’, and how violators will be dealt with.

Such changes would probably be very cost-effective approaches to better promoting smokefree hospital settings and hence make an additional contribution towards achieving the Government’s Smokefree Nation 2025 goal.

Figure 1: Example of a large smokefree sign mentioning both “buildings” and “grounds” (Wellington Regional Hospital, Capital & Coast DHB)
Figure 2: Example of a ‘no smoking’ sign that mentions “grounds”, the response to violators, and also provides smoking cessation information (Wellington Regional Hospital, Capital & Coast DHB)

Competing interests: Nil

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Clindamycin versus Trimethoprim-Sulfamethoxazole (TMP-SMX) for Uncomplicated Skin Infections

This report concerns a multi-centre randomised trial in the USA. Patients with uncomplicated skin infections were randomised to 10 days of treatment with either clindamycin or TMP-SMX. 524 patients, including 155 children, were involved in the study.

280 patients had cellulitis. 160 had an abscess and 82 had a mixed infection. All of the abscesses were incised and drained. *S. aureus* was isolated in 217 patients and in 77% of these, the organism was identified as being a methicillin resistant *S. aureus*. The conclusions reached were that there was no significant difference between clindamycin and TMP-SMX, with respect to either efficacy or side-effect profile, for the treatment of uncomplicated skin infections, including both cellulitis and abscesses.


Exercises to improve function of the rheumatoid hand

Disease-modifying biological agents and other drug regimens have substantially improved control of disease activity and joint damage in people with rheumatoid arthritis of the hand. However, commensurate changes in function and quality of life are not always noted.

This study concerns a randomised trial to evaluate whether tailored hand exercises might provide additional improvements.

490 patients were randomly assigned to usual care or tailored exercises involving strengthening and stretching hand exercises. Using a standard outcome questionnaire at 12 month follow-up, the researchers report a very significant difference in overall hand function favouring the exercise group.

*Lancet* 2015; 385:421-29

Hypomagnesaemia linked to depression?

Magnesium is a coenzyme for more than 300 intracellular reactions and it has been proposed that hypomagnesaemia might be associated with significant adverse impacts on the central nervous system, leading to depression.

Several studies have looked at this possibility, but the results have been conflicting. Hence this meta-analysis.

Six relevant observational studies involving 19,137 patients have been reviewed. The pooled relative risk of depression in patients with hypomagnesaemia was 1.34. However, the researchers conclude that their meta-analysis, at best, demonstrates an association but not a causal relationship.

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Despite the fact that the great war overshadows the land and preoccupies the mind, the Annual Meeting of the Association in Christchurch was very successful, and it is well that, as far as possible, everyday affairs should run their usual course. Some obvious reflections on these meetings may not be out of place. Their value can best be appraised if we consider what would be the state of medical men in New Zealand if no Medical Association existed. In the first place, under such conditions, we should never meet each other except as competitors, or occasionally in consultation. The voice of the profession on public questions would never be heard. The discussion of medical subjects would be almost unknown, and opportunities for making in our own calling would be only locally possible. The social side of these meetings, is only secondary to their scientific value.

As a rule, twenty or more medical men live together for a week under the same roof, and it is not only medical matters that are discussed. The doctor who has no interest in life beyond his own practice is a creature to be pitied, or even to be despised. Medical “greatest study of mankind is man.” The various kinks of character are well revealed in one of ourselves, for an optimism engendered by the sight of much nobility in the sick and sad, to whom we minister, is dashed with a cynicism born of ingratitude, and forgetfulness. In other words, we feel inclined sometimes to hate our fellows, and sometimes to love them. A medical man is trained to voice his opinions independently, and gives his judgment on most matters without hesitation, whereas the view of men of other callings is inclined to be that common to their class. This is well exemplified in any discussion at a medical meeting, for there are usually as many opinions as there are speakers. We hold the view of Irishmen that you cannot in the fullest sense respect a man until you have either fought with him or had some sort of a serious difference. The medical meetings provide for this necessity.

With regard to the more serious work of the meetings, that is, the reading and discussion of papers on medical subjects, there is yet not a great deal of originality, and we are bound largely by the authority of the leaders of the profession in older and more populous countries, but only lapse of time can cure this defect. Our work, too, is not split up into various sections, and this has, at least, one great advantage, for a well-equipped general practitioner can take a broad, and we believe, a sane view of most of the problems that confront us in our fight against disease.

We urge upon every member of the Association the practice of attending as many as possible of the annual gatherings, for the good or the profession as a whole and for his own marked benefit. They are both a recreation and an education.

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