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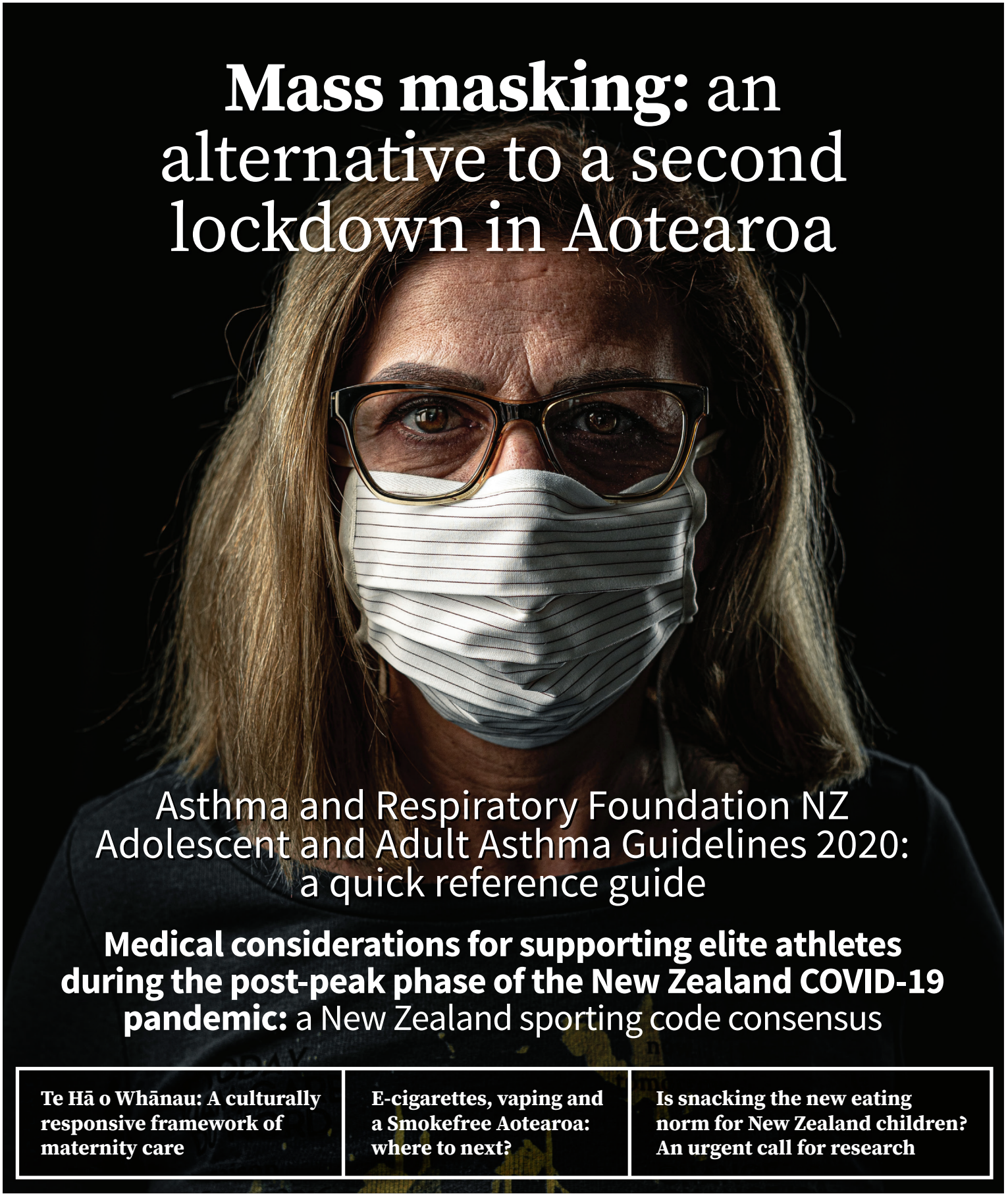

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Social consequences of assisted dying: a case study

Rhona Winnington, Roderick MacLeod

This paper discusses the potential effects of assisted dying (AD) legislation beyond the relief of individual suffering. AD is when an individual chooses that they wish to die and either self-medicate to end their life under clinical supervision, or clinicians administer the medication for them. This paper focuses on potential family/whānau and community consequences should we introduce such legislation into New Zealand culture, highlighting that family members whose loved one has had an assisted death are feeling obligated to also consider dying in this way as their health fails. Furthermore, we highlight that even when AD is a legal option, all those involved in the assisted death remain secretive about what has occurred due to a fear of being judged by others. Finally, we offer insight into a concerning potential side-effect of AD legislation; that is that when individuals are exposed to someone considering an assisted death, they too will also consider using this legislation. This participant describes the effect of AD legislation as being infectious.

Demographics of New Zealand women with vulval lichen sclerosus: is specialist care equitable?

Harriet S Cheng, Coco Kerckhoffs, Nicky Perkins, Lois Eva

Vulval lichen sclerosus is an autoimmune skin condition which can cause inflammation, scarring and increased risk of cancer in genital skin. Around 1% of women are affected. This study examined cases of lichen sclerosus seen by dermatology, gynaecology and sexual health at Auckland District Health Board. We found most women seen were of New Zealand European ethnicity and compared with Census data for our region, European women were over-represented. Māori, Pacific and Asian women were under-represented. Causes for this inequitable ethnic representation may include sociocultural beliefs, variations in access to care or ethnic differences in the prevalence of lichen sclerosus. Further study is required to deepen our understanding and allow work to reduce inequity.

Performance of CVD risk equations for older patients assessed in general practice: a cohort study

Sue Wells, Romana Pylypchuk, Suneela Mehta, Andrew Kerr, Vanessa Selak, Katrina Poppe, Corina Grey, Rod Jackson

Cardiovascular disease (CVD) is the leading cause of preventable health loss for older people, many of whom are still engaged in the workforce and physically active. The current Ministry of Health CVD guidelines recommend that GPs consider doing a routine heart check using New Zealand CVD risk equations for healthy people over 75 years and discuss the same management options as for people under 75 years of age. However, risk assessment and management is more complex for older age groups as health status varies greatly. The risk of other long-term conditions increases with age and this in turn is associated with complicated medication regimens. As a first step, we investigated how well current CVD risk equations (developed for people 30–74 years) performed for over 40,000 older people for whom GPs considered suitable for routine preventive CVD risk assessment. We found current CVD risk equations underestimated five-year CVD hospitalisations or deaths for women from 75 years and men from 80 years.

Surveillance for dysplasia in patients with inflammatory bowel disease: an updated national survey of colonoscopic practice in New Zealand

Tamara Glyn Mullaney, Andrew McCombie, Christopher Wakeman, Timothy Eglinton, Richard Gearry

Inflammatory bowel disease patients are at a higher risk of developing colorectal cancer and so undergo surveillance endoscopy to identify the changes (dysplasia) at an early stage. In the past, it has been difficult to see all these changes (and sometimes even cancers), so we have tended to treat these patients (even with early changes) by removing their large bowel. Current techniques are more accurate at identifying the changes and this survey suggests New Zealand endoscopists are using them appropriately, however we are possibly still recommending removal of the large bowel more often than is necessary. Perhaps some of these patients will be able to be managed with the advanced techniques safely and avoid the need to their remove their bowel at this stage.

Te Hā o Whānau: A culturally responsive framework of maternity care

Kendall Stevenson, Sara Filoche, Fiona Cram, Beverley Lawton

This paper shares a nuanced healthcare framework that aims to make the maternal-infant healthcare system more accessible and culturally responsive for Māori. There are stark health inequities between Māori and non-Māori, with Māori women and their babies more often becoming ill and/or dying than their non-Māori counterparts. The proposed healthcare framework, named Te Hā o Whānau, aims to guide culturally responsive maternal and infant healthcare, and thereby address the present inequities.

Asthma and Respiratory Foundation NZ Adolescent and Adult Asthma Guidelines 2020: a quick reference guide

Richard Beasley, Lutz Beckert, James Fingleton, Robert J Hancox, Matire Harwood, Miriam Hurst, Stuart Jones, Susan Jones, Ciléin Kearns, David McNamara, Betty Poot, Jim Reid

The updated Adolescent and Adult Asthma Guidelines, published in the New Zealand Medical Journal today, recommend a fundamental change in asthma management, to use a single two-in-one inhaler containing both a steroid ('preventer' to reduce airways inflammation) and a beta agonist ('reliever' to relax airway muscles) as needed to relieve symptoms, rather than a beta-agonist alone. This recommendation is based on clinical trials, which showed that the combination budesonide/formoterol (Symbicort) inhaler, taken as needed to relieve symptoms, reduces the risk of a severe asthma attack by between 30 and 60%, compared to usual beta-agonist reliever therapy. Recalling patients who just use a beta-agonist reliever inhaler and replacing it with the Symbicort inhaler should be the immediate priority for health professionals in New Zealand.

Human lungs are created to breathe clean air: the questionable quantification of vaping safety "95% less harmful"

Kelly S Burrowes, Lutz Beckert, Stuart Jones

The New Zealand government is aiming for Smokefree Aotorea; electronic cigarettes, also known as e-cigarettes or vaping devices, may be one tool to help meet this target, but how safe are they? While they have shown promise in smoking cessation studies and are probably safer than conventional cigarettes, there is mounting evidence that they are not without harm and their long-term health impacts are not known. A Public Health England report coined the now well-known quantification that "e-cigarettes are 95% less harmful to your health than normal cigarettes". In this article, we argue that this is an unfounded quantification because the data required to make this quantification are not yet available. To quote the European Respiratory Society in relation to the use of e-cigarettes, "The human lungs are created to breathe clean air, not 'reduced levels of toxins and carcinogens'".

Medical considerations for supporting elite athletes during the post-peak phase of the New Zealand COVID-19 pandemic: a New Zealand sporting code consensus

Bruce Hamilton, Lynley Anderson, Nat Anglem, Stuart Armstrong, Simon Baker, Sarah Beable, Peter Burt, Lynne Coleman, Rob Doughty, Tony Edwards, Dan Exeter, Mark Fulcher, Stephen Kara, John Mayhew, Sam Mayhew, Chris Milne, Brendan O'Neill, Hamish Osborne, Melinda Parnell, Jake Pearson, Karen Rasmussen, Judikje Scheffer, Martin Swan, Mark Thomas, David Gerrard

Like many sectors of the community, elite athletes have particular circumstances that may make them particularly susceptible to the impact of COVID-19. With the Olympic Games and other professional sport competitions being postponed or cancelled in 2020, many athletes' career plans and aspirations will have decimated, with consequences for both their physical and mental wellbeing. This manuscript addresses some of the broad areas that medical practitioners should be considering, to ensure the optimal support of elite athletes through the pandemic.

Mass masking: an alternative to a second lockdown in Aotearoa

Amanda Kvalsvig, Nick Wilson, Ling Chan, Sophie Febery, Sally Roberts, Bryan Betty, Michael G Baker

Aotearoa New Zealand succeeded in eliminating COVID-19, but this success has been challenged by poor management of cases at the border in mid-June 2020. Elimination status for the country may remain fragile given likely increases in arrivals from countries where COVID-19 is circulating, especially if border restrictions are eased further. In this editorial, we explore how outbreak prevention could be strengthened via universal (mass) masking. We describe why New Zealand needs to adopt mass masking in certain high-risk settings immediately, how to build mask use into a revised Alert Level system, and why it is important to make masks an acceptable part of respiratory hygiene practice. These challenges are urgent because universal adoption of non-medical masks may be an essential intervention to prevent lockdown in the event of future COVID-19 outbreaks (the so-called 'second wave').

COVID-19 infection and mass masking: where are we now?

Mass masking refers to the use of face coverings to prevent the spread of respiratory infections in non-medical settings. This practice has been well-established in Asian societies for many years due to previous experience with significant epidemics and pandemics, but until very recently there has been reluctance in Western countries to use masks in public places. The COVID-19 pandemic has provoked considerable debate about mass masking. Much of the difference of opinion has arisen from confusion between mass masking and medical masking (discussed in a later section of this article), as well as conflicting interpretations of the research evidence.

The updated World Health Organization (WHO) advice on masks[1] of 5 June 2020 has provided welcome clarity on the issue. The report presents an updated review of evidence about COVID-19 transmission and medical and non-medical mask use, and provides detailed guidance for policy makers. The major change from WHO's previous stance on mask use is expressed in the statement that *"to prevent COVID-19 transmission effectively in areas of community transmission, governments should encourage the general public to wear masks in specific situations and settings as part of a comprehensive approach to suppress SARS-CoV-2 transmission"*. Similar advice is given by the Centers for Disease Control and Prevention (CDC).[2] In the following sections, we consider what this new guidance means for Aotearoa New Zealand.

COVID-19 transmission and risks to elimination status

Aotearoa New Zealand has adopted an elimination strategy to control the COVID-19 pandemic.[3] Arrival of new cases through the borders has the potential to introduce new transmission chains into a national population that is immunologically naïve and thus highly susceptible to COVID-19 infection.

All of the COVID-19 control measures employed in this country to date work in one of two ways: either they reduce the probability of close contact between infectious and susceptible individuals (eg, border controls, quarantine, isolation and physical distancing [lockdown]) or they reduce the probability of viral transmission during close contact (eg, cough etiquette, respiratory and hand hygiene).

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Preventing spread of this highly transmissible infection is challenging. The pandemic virus, SARS-CoV-2, replicates in the upper respiratory tract[4] and the major routes of transmission are by larger particles (>5 microns; also referred to as droplets) and small particles (<5 microns; also referred to as aerosols) generated by breathing, talking and coughing.

A single individual in an enclosed space can trigger a cascade of infections within a short space of time by spreading virus to distances well over two metres.[5] The risk of super-spreading is thus highest in crowded, closed spaces with poor ventilation, where individuals are in close contact, eg, when speaking loudly in social settings.[6,7] Pre-symptomatic individuals present a substantial risk of SARS-CoV-2 transmission as they can be highly infectious in the two days before experiencing symptoms[8] while not being aware of the need to isolate themselves from others.

In the time period since New Zealand's stringent lockdown was lifted, measures for preventing transmission in public spaces have included physical distancing (maintaining a 1–2m distance in Alert Level 2), respiratory and hand hygiene, and cough etiquette. All have limitations. In particular, physical distancing is not feasible on aircraft; hand hygiene can be difficult to achieve on suburban buses and trains; and coughing into an elbow may not be highly effective in preventing viral spread.

Large viral-laden droplets that are expelled by an infectious individual quickly evaporate into smaller particles that stay suspended for longer periods, travel further on air currents, can be inhaled into the alveoli and are hard to contain unless they are blocked at source by covering the mouth and nose. This type of protection is known as 'source control'. In optimal conditions, a multi-layered cloth covering can block over 99% of speech droplets.[9] The principle of mass masking is that each mask wearer protects those around them. Mass masking thus works particularly at a population level to control COVID-19 transmission,[10] although such masks also provide some individual protection for the wearer.[11]

Using mass masking to maintain elimination

Border controls such as quarantine are not failsafe, as some of us have shown with modelling work for Australia to New Zealand travel.[12] This modelling work also suggests that masks are likely to have an important role in reducing the risk of transmission on aircraft and for preventing pre-symptomatic spread by incoming travellers (eg, use in the first two weeks after arrival). Even with quarantine measures in place, infectious individuals may be released into the community if these measures are not strictly applied, as happened in New Zealand in June 2020. Should border controls fail and there is an outbreak of COVID-19 in the community, we would lose our elimination status and increasing alert levels (lockdowns) could be necessary.

A logical approach to using non-medical masks to reduce the risk of such transmission is to consider settings where:

- There is increased risk of infectious individuals being present;
- Multiple individuals from different households are in close contact in an enclosed space for prolonged periods; and
- Other transmission protection measures may be less effective as outlined above.

Settings that meet these criteria and therefore have increased transmission risk include (but are not limited to):

- International flights, airports and border control facilities for quarantine and isolation;
- Domestic travel settings (airplanes, trains, buses and ferries); and
- Interfaces between public and medical spaces where physical distancing cannot be maintained and ventilation may be poor, eg, general practice waiting rooms, emergency departments of hospitals, and residential care homes (Table 1).

In the event of a border control failure causing an outbreak, intensive testing and contact tracing would be implemented. At this point Aotearoa New Zealand would

Table 1: Recommended mandated mask use requirements at different Alert Levels.

New Zealand-related setting	Alert level where masks use should be mandated
Inbound international flights and airport terminals, quarantine and isolation facilities (staff and passengers)	All levels (airlines required to provide the masks on the aircraft for free)
Domestic transport (flights, trains, buses and ferries)	Level 2 and above (airlines, train, bus and ferry companies all required to provide the masks to passengers for free) *
Health worker/public interface settings (medical waiting rooms, care homes)	Level 2 and above *
Indoor public settings (workplaces, educational facilities, shops etc)	Level 2 and above
Outdoor public settings (gatherings and events with more than 10 people)	Level 3 and above

*There is an argument for mask use during winter at all levels in these settings as part of routine infection control and to increase public familiarity with mask wearing, ie, establish a mask-using culture.

need to consider additional measures to regain pandemic control, notably re-imposing lockdown at a regional or national level, or controlling viral spread using mandatory universal mass masking (Table 1). In such situations, universal mask adoption—a 'mouth and nose lockdown'—could help to avoid the need for another 'full body lockdown'.[13]

Mass masking versus medical masking

There has been widespread confusion between the use of face coverings in community settings and the use of medical masks as a component of personal protective equipment (PPE) in healthcare settings. The latter settings serve to protect health workers from patients' droplets so correct 'donning' and 'doffing' techniques are essential. These techniques do not apply to the public using mass masking as source control to prevent their own droplets from infecting others: effective mass masking in populations can be implemented using home-made equipment with straightforward instructions for correct use. Table 2 lists some key differences between mass masking and medical masking.

Implementation of mass masking

Aotearoa New Zealand is not able to draw on wide population experience with mass masking and currently only a minority are likely to own a mask. We therefore need to act now to establish a mask culture so that this key respiratory hygiene measure is available for widespread use if required to control future COVID-19 outbreaks. Unfortunately, previous public messaging about mask use in this country has been negative or at best ambivalent. As a result, additional effort by the government will be necessary to implement masking as an effective component of the COVID-19 elimination strategy. Key steps include:

- **Mandating mask use for border control settings**, notably international flights, airports, transport to quarantine locations, and within quarantine facilities themselves. This measure should happen immediately.
- Developing and disseminating **accessible, clear information** about all aspects of mass masking. WHO has produced resources that can provide a useful basis for communication. Information should include why and where masks should be worn; recommended types; how to obtain or make them; how to use them; and how to dispose of them appropriately after use.
- Ensuring **wide availability** of masks. Masks may be supplied in different ways depending on the context (mass masking in high-risk settings or universal adoption). Both cost and

Table 2: Comparison between mass masking and medical masking for preventing transmission of COVID-19 infection.

Characteristics	Mass masking	Medical masking
Goal	To support COVID-19 pandemic control by reducing the probability of transmission during close contact in public spaces	To support COVID-19 pandemic control by preventing cross-transmission between patients and the health workforce in healthcare settings
Implemented by	The population as a whole	The health sector
Who is protected	Primarily protects the people around the mask wearer (ie, it is source control), although the wearer may be protected to some extent	Protects both the wearer (source control) and healthcare workers (prevention of cross-transmission)
Compliance	May be voluntary or mandatory (but mandatory is probably necessary in the context of the COVID-19 pandemic)	Strict guidelines usually in place as part of infection prevention and control and health and safety requirements
Instructions for use	Ministry of Health guidance on mask use and mandated settings	Local and international infection prevention and control guidance
Types of mask	A variety of face coverings may be used, including disposable or reusable (cloth) masks. However, use of disposable medical masks may deplete medical stocks and is less sustainable	Masks are regulated medical devices and must comply with New Zealand standards; surgical masks or respirators may be used depending on context
Procedure after each use	Safe disposal or domestic washing	Safe disposal or specialised reprocessing procedures
Effectiveness at preventing dispersal of respiratory virus into the environment	Variable filtration efficiency, pressure drop and filter quality factor (see Table 3 in the WHO guidelines for current evidence on different textiles). However, the potential for effective infection prevention and control is high, if correctly constructed and used	Generally higher performance than non-medical masks with well-defined standards (eg, at least 95% initial filtration)

convenience may be limitations. In some settings (or universally) they should be provided free at the point of use to ensure wide uptake (Table 1). The New Zealand Government should consider the approach of Hong Kong in supplying free masks to all its citizens (eg, if the country returned to Alert Level 2). Mass purchasing of masks can get costs down to around US$0.2 per mask, ie, 20 cents per mask). There is an immediate need to develop sources and stocks. A range of sizes will be required.

- Consulting key groups to identify and address the **equity implications** of mass masking. Two key aspects include cost (as above) and those for whom mask wearing may introduce difficulties. For individuals who cannot mask up, eg, close contacts of those who depend on lipreading for communication or others (particularly young children and those with breathing difficulties) who will be challenged by wearing masks, there can be medical electronic certificates allowing them freedom from masking. Additional strategies

include adaptations to masks, for example incorporating transparent panels into mask design to facilitate communication.

- **Promoting sustainability**. Single-use disposable masks are a poor option for mass masking as they incur a significant environmental cost. Cloth masks are effective and have the added advantage of preserving single-use mask stocks for medical use. Consideration should be given to supporting local industry by obtaining masks in New Zealand rather than outsourcing production overseas.

Conclusions

Active risk reduction is required to maintain New Zealand's elimination status while COVID-19 remains a global health threat. Emerging evidence strongly supports the value of mass masking as a pandemic control measure. Mask use can provide another barrier to reduce the risk of importing this infection through airports and seaports. International airlines, border control settings and quarantine facilities should have mask wearing mandated immediately. This multi-barrier approach is a key feature of health protection systems for diverse hazards including waterborne, foodborne and biosecurity hazards.

In the event of border control failures and COVID-19 outbreaks in this country, mandatory mass masking (a 'mouth and nose lockdown'[13]), in addition to other hygiene measures, may help to avoid the need for the 'full-body lockdown' the country experienced earlier in 2020. Preventing a 'second wave' in this way would require universal adoption of masks within days of identifying the threat; there is now an urgent need for policy makers and the public to prepare for this eventuality. Key next steps include updating the Alert Level system to include mandatory mask provisions, and ensuring that each person in Aotearoa has a mask and knows how it must be worn.

Competing interests:
Nil.

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REFERENCES:

1. World Health Organization. Advice on the use of masks in the context of COVID-19 (Interim guidance, 5 June 2020). Geneva: World Health Organization.
2. Centers for Disease Control and Prevention (CDC). Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission 2020. Updated 3 April 2020. Available from: http://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html
3. Baker M, Kvalsvig A, Verrall A, et al. New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work. N Z Med J. 2020; 133(1512):10–4.
4. Wolfel R, Corman VM, Guggemos W, et al. Virological assessment of hospitalized patients with COVID-2019. Nature. 2020.
5. Setti L, Passarini F, De Gennaro G, et al. Airborne Transmission Route of COVID-19: Why 2 Meters/6 Feet of Inter-Personal Distance Could Not Be Enough. Int J Environ Res Public Health. 2020; 17(8).
6. Adam D, Wu P, Wong J, et al. Clustering and superspreading potential of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in Hong Kong. PREPRINT (Version 1) available at Research Square [http://doiorg/1021203/rs3rs-29548/v1]. 2020.
7. Kenyon C. The prominence of asymptomatic superspreaders in transmission mean universal face masking should be part of COVID-19 de-escalation strategies. Int J Infect Dis. 2020.
8. He X, Lau EHY, Wu P, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. Nat Med. 2020; 26(5):672–5.
9. Anfinrud P, Stadnytskyi V, Bax CE, Bax A. Visualizing Speech-Generated Oral Fluid Droplets with Laser Light Scattering. N Engl J Med. 2020; 382(21):2061-3.
10. Howard J, Huang A, Li Z, et al. Face Masks Against COVID-19: An Evidence Review. Preprints. 2020. http://www.preprints.org/manuscript/202004.0203/v1
11. Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet. 2020.
12. Wilson N, Baker M, Eichner M. Estimating the impact of control measures to prevent outbreaks of COVID-19 associated with air travel into a COVID-19-free country: A simulation modelling study. medRxiv 2020. http://www.medrxiv.org/content/10.1101/2020.06.10.20127977v2
13. Kai D, Goldstein G-P, Morgunov A, et al. Universal masking is urgent in the COVID-19 pandemic: SEIR and agent based models, empirical validation, policy recommendations. arXiv 2020;(22 April). http://arxiv.org/abs/2004.1355

E-cigarettes, vaping and a Smokefree Aotearoa: where to next?

Richard Edwards, Janet Hoek, Andrew Waa

This edition of the *Journal* includes a commentary by Burrowes et al[1] discussing the validity of the claim that e-cigarettes are 95% safer than smoking. The commentary is highly topical as legislation to introduce a regulatory framework for these and related products is (finally) before Parliament. It is thus timely to take stock and discuss outstanding issues, including next steps and priorities, both with the current Bill and the Smokefree Aotearoa 2025 goal of minimising use and availability of smoked tobacco products for all peoples.

Debate about the impacts of vaping and how it should be regulated have been fuelled by uncertainty about three key points. First, the harmfulness of vaping (as highlighted by Burrowes et al).[1] Second, the balance between the potential positive (eg, supporting smokers to switch from smoking to (less harmful) vaping, or helping smokers quit smoking and nicotine use completely) and negative impacts (eg, initiation of vaping among non-smokers and a possible 'gateway' effect in youth by increasing subsequent smoking uptake). Third, impacts on reducing health inequalities, a major consideration given the huge disparities in smoking and in the physical, social and economic harms it causes Māori and Pacific peoples. Philosophical differences in the priority accorded to protecting children compared to helping smokers stop smoking add further complications.[2]

Internationally approaches to regulation of vaping products vary. Some countries, like Australia have highly restrictive policies on availability, marketing and use while others, such as the UK, fully embrace harm reduction approaches and have much more permissive regulatory environments.

The urgency of introducing a regulatory framework in New Zealand increased recently. First, in March 2018 a court judgement determining that heated tobacco products could be legally sold in New Zealand led to a rapid and largely unregulated increase in the availability and marketing of nicotine-containing vaping products. Second, some school principals began reporting concerns about increases in vaping among pupils and ASH Year 10 data showed trial and regular use of vaping products was growing among adolescents.[3,4]

In February of this year the Smokefree Environments and Regulated Products (Vaping) Amendment Bill (henceforth the 'Bill') was introduced to Parliament. Key provisions include:

- Sale of vaping devices and e-liquids allowed only to adults (≥18 years) at:
  - registered specialist R18 stores (full range of flavours available)
  - non-specialist stores (mint, menthol and tobacco flavours only)
- Prohibition of advertising and sponsorship of vaping products
- Prohibition of vaping in legislated smokefree areas, except for trying products in specialist stores
- Systems for product notification and early warning of adverse effects
- Director General can issue warnings, recall or cancel product notifications, and prohibit constituents

The Health Select Committee reported on the Bill on 2 June and was largely supportive.[5] Recommended amendments included reducing the proportion of sales from vaping products required to be designated a specialist store, and some additional exemptions to the restrictions on advertising and marketing of vaping products.

At least one proposed amendment appears problematic. The Select Committee proposed deleting a clause that allowed specialist vaping store staff to provide advice and recommendations about vaping products to their in-store customers. The Committee's logic is difficult to follow as one of the justifications for having different regulations for specialist and non-specialist retailers is that the former usually have greater expertise, and hence are better positioned to advise smokers new to vaping about the most suitable products.

However, assuming the current Bill passes into law largely unchanged, what should be the next steps?

Firstly, some of the Bill's provisions require consultation and development of regulations. For example, regulations will specify packaging, flavour descriptors and warning label requirements. Regulations will also set out product safety standards for allowed constituents and flavours and maximum concentrations where these are specified.

Key issues to resolve include whether to introduce a maximum nicotine concentration for e-liquids, as occurs in the European Union and the UK; and whether vaping products should have warnings labels and be sold in standardised (plain) packaging, like smoked tobacco products. Another will be whether regulations should vary between product types. For example, heated tobacco products are likely to be more harmful than vaping products,[6] and sleek, discreet, high nicotine content 'pod' devices may appeal particularly to adolescents.[7] More stringent regulations for packaging, warning labels and maximum nicotine content for these products seems sensible.

Secondly, comprehensive monitoring and rigorous and ongoing evaluation and review of the Bill's implementation and impact should occur. Thorough evaluation of major policy and legislative interventions is vital to generate evidence about feasibility, effectiveness and possible unintended consequences. The findings will inform decision-making in other jurisdictions and in New Zealand should help determine whether to continue, discontinue or change policy. Such monitoring, evaluation and review is especially important for vaping regulation given the dynamic market, rapidly evolving technologies, and uncertain and contested impacts. Unfortunately, New Zealand Governments have a lamentable record of evaluating new policies. For example, the Government evaluated neither the 2012 point-of-sale tobacco product display ban nor the introduction of standardised packaging and revised pictorial warning labels for smoked tobacco products in 2018.

Surveillance is also required to monitor the actions and tactics of the tobacco industry. The New Zealand vaping product market currently comprises independent manufacturers and retailers, and the tobacco companies. However, recent advertising blitzes for tobacco industry vaping products (eg, Vype, BAT), and strenuous efforts to promote heated tobacco products (eg, IQoS, Phillip Morris International), suggest the tobacco companies are striving to gain greater market share. A key concern is that the tobacco industry will focus on promoting heated tobacco products, where their profit margin is greatest and they can monopolise the market.[8] Another concern is the tobacco industry's long history of duplicity and deceit, particularly over promotion of its products to youth.[9]

A third priority is to build on the opportunity that the Bill creates to implement complementary interventions targeting smoked tobacco products. Crucial initiatives would see smoked tobacco products made much less available, as well as less appealing, palatable and addictive, for example, by prohibiting flavours and additives and minimising their nicotine content.[10] Widespread availability of vaping products makes it more feasible to strengthen the regulation of smoked tobacco products, and may increase the impact of such measures in reducing smoking prevalence, by providing smokers with an acceptable and accessible alternative to smoking. For example, mandated denicotinisation of tobacco products would 'push' smokers away from smoking, as cigarettes with no or minimal nicotine content are much less satisfying,[11] and 'pull' them towards vaping products which deliver nicotine effectively.

Finally, the Bill will create some perplexing anomalies that will need addressing. For example, dairies, gas stations and supermarkets will only be

able to sell a restricted range of flavoured vaping products but any flavour of smoked tobacco product. Specialist vaping stores will have to be registered and provide the Government with product sales data, but stores selling much more harmful smoked tobacco products will not. The principle of proportionate regulation in relation to harm espoused by the Ministry of Health[12] surely dictates that the most harmful nicotine delivery products are the most tightly regulated, not the reverse?

In conclusion, although the vaping Bill probably satisfies few people completely, it is undoubtedly much better than the current unregulated free-for-all that key stakeholders, except possibly the tobacco companies, agree is untenable. Once the Bill and its associated regulations are finalised, an immediate priority should be to introduce a robust monitoring and evaluation framework. The Government and the smokefree sector should then focus on developing and implementing the promised Smokefree 2025 action plan,[13] including a comprehensive set of measures to encourage and support all smokers to quit and discourage young people from starting to smoke. In the longer term, it is important to recognise the that Māori leaders who paved the way for the Smokefree 2025 goal envisaged a Tupeka Kore Aotearoa, where the harm caused by tobacco use has been eliminated and the social and economic harm that nicotine addiction causes no longer exists.

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Nil.

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REFERENCES:

1. Burrowes KS, Beckert L, Jones S. Human lungs are created to breathe clean air: the questionable quantification of vaping safety "95% less harmful". N Z Med J. 2020; 133(1517):100–106.
2. Fairchild AL, Bayer R, Lee JS. The E-Cigarette Debate: What Counts as Evidence? Am J Public Health. 2019; 109:1000–6.
3. Walker N, Parag V, Wong SF, et al. Use of e-cigarettes and smoked tobacco in youth aged 14–15 years in New Zealand: findings from repeated cross-sectional studies (2014–19). The Lancet Public Health. 2020; 5:e204–e12.
4. Hoek J, Edwards R, Gendall P, et al. Is Youth Vaping a Problem in New Zealand? Public Health Expert. Wellington: Department of Public Health, University of Otago, 2019. Available at: http://blogs.otago.ac.nz/pubhealthexpert/2019/12/02/is-youth-vaping-a-problem-in-new-zealand/ (Accessed June 22 2020).
5. New Zealand Parliament. Smokefree Environments and Regulated roducts (Vaping) Amendment Bill Government Bill: As reported from the Health Committee. Wellington: New Zealand Parliament, 2020.
6. Jankowski M, Brozek GM, Lawson J, Skoczynski S, Majek P, Zejda JE. New ideas, old problems? Heated tobacco products - a systematic review. Int J Occup Med Environ Health. 2019; 32:595–634.

7. Lee SJ, Rees VW, Yossefy N, Emmons KM, Tan ASL. Youth and Young Adult Use of Pod-Based Electronic Cigarettes From 2015 to 2019: A Systematic Review. JAMA Pediatr. 2020.
8. Robertson L, Hoek J, Gilmore A, Edwards R, Waa A. Regulating vaping and new nicotine products: Are tobacco companies' goals aligned with public health objectives? Public Health Expert. Wellington: Department of Public Health, University of Otago, 2019. Available at: http://blogs.otago.ac.nz/pubhealthexpert/2020/05/29/how-the-tobacco-industry-targets-young-people-to-achieve-a-new-generation-of-smokers/ (Accessed June 20 2020).
9. Ling P, Glantz SA. Why and how the tobacco industry sells cigarettes to young adults: evidence from industry documents. Am J Public Health. 2002; 92:908–16.
10. Thornley L, Edwards R, Waa A, Thomson G. Achieving Smokefree Aotearoa by 2025 (ASAP). Wellington: University of Otago (ASPIRE 2025), 2017.
11. Donny EC, Walker N, Hatsukami D, Bullen C. Reducing the nicotine content of combusted tobacco products sold in New Zealand. Tob Control. 2017:e37–e42.
12. Ministry of Health. Ministry to consider risk-proportionate regulation for vaping and heated tobacco products. Wellington: Ministry of Health, 2018. Available at: http://www.health.govt.nz/news-media/news-items/ministry-consider-risk-proportionate-regulation-vaping-and-heated-tobacco-products (Accessed June 20 2020).
13. Thomas R. No room for complacency if we are to kick smoking by 2025, Helen Clark says. Wellington: Stuff, March 27 2018. Available at: http://www.stuff.co.nz/national/102608415/no-room-for-complacency-if-were-to-reach-kick-smoking-by-2025-helen-clark-says (Accessed June 20 2020).

Social consequences of assisted dying: a case study

Rhona Winnington, Roderick MacLeod

ABSTRACT

AIM: To consider the possibility of consequences beyond the alleviation of perceived individual suffering, for families left behind, communities and society as a whole should the End of Life Choice Act gain public support in the September 2020 referendum in New Zealand.

METHOD: This study used the Yin case study approach to undertake a single semi-structured in-depth interview with a participant who self-identified as having first-hand experience of assisted dying from a relative's perspective (in a country where this is legal). Thematic analysis was used to identify themes and trends from the interview transcript.

RESULTS: Three key themes emerged from the interview: the potential for assisted dying becoming an expectation for others to pursue when unwell and possibly facing a life-threatening illness; the notion of stigma being associated with the individual using assisted dying legislation and the family left behind; and that there may be the potential for such legislation to produce a contagion effect.

CONCLUSION: The introduction of assisted dying legislation into New Zealand culture provides a potential hotspot for family, community and social discord that may not be easily remedied. Further study in New Zealand is required to investigate whether a contagion effect of assisted dying is possible, and how as a society, we negotiate what could become a conflicted pathway potentially complicated by prejudice, judgement and stigma.

The End-of-Life Choice Bill has now passed its third reading in the New Zealand Parliament, which takes the final decision on this divisive legislation into the public arena as the End of Life Choice Act (EoLCA).[1] An individual's choice to die should not be dismissed in terms of self-determination at this point in their life; however, concerns arise when families, healthcare practitioners and communities experience social consequences of actions taken.

The overriding discourse in countries where assisted dying (AD) is legal or under consideration concerns individual emancipation from the perspective of human suffering.[2,3] Although the use of AD legislation may liberate individuals from perceived suffering, it is necessary to consider the impact embracing a new means of dying may have on families and the wider community.[3] This case study interview of a self-identified individual who had experienced AD from a family perspective (in a country where it is legal) exposes a range of issues that require further debate that go beyond the rights of individuals to choose this option to relieve suffering. This paper focuses on three key concepts: that AD will become an expectation for others to pursue when unwell and potentially facing a life-threatening illness; stigma associated with using AD; and the potential for AD legislation to produce a contagion effect. The participant also raised problems with the process of AD, but this was outside the scope of this paper.

Background

The process of dying has become taboo for contemporary Western societies; it no longer naturally enters life's discourse and has become feared as a form of human failure.[4,5] This anxiety over death suggests that we have forgotten 'the majesty of death', in that lives that have been lived well should be rejoiced and celebrated.[6] However, in contemporary Western cultures, death remains invisible, until frail, older, disabled or unwell people

become a physical, social and financial burden on their communities.[3,4,7] The next cohort to die includes the baby-boomer generation. It has been suggested that this will change the landscape of how death will occur, as this generation has experienced life through the lens of individualism and perceived freedom of choice and may therefore expect death to be similar.[8]

Despite the prevalence of right-to-die narratives that support those who are concerned about loss of dignity and quality of life, medicine (in collaboration with law) has maintained an unwavering stance that the right-to-die produces a 'slippery slope' effect, whereby some patients may be obligated to terminate their lives prematurely.[9–11] This can be seen in the Netherlands, where one in 30 individuals died by euthanasia in 2012 compared with one in 90 in 2002.[3] Such changes could suggest that right-to-die campaigns, despite the potential to alleviate individual suffering, have the potential to turn death into a duty for those of frail status, perhaps pressuring some individuals into ending their lives prematurely to fit with societal expectations that caring for our dying is burdensome and pointless.[12]

Another emerging issue is that there is a real possibility of stigma in some cases where AD has been used.[13] More specifically, some family members found that disclosing use of AD as a mechanism for death was problematic, as they feared the reactions of other people and feeling judged.[13] However, such stigmatisation is not solely the domain of family members but is also relevant for clinicians, who may not discuss participation in AD services for fear of professional stigmatisation and conflict with colleagues (although the latter is not discussed in this paper).[14]

Despite the potential for those using AD legislation to be judged or stigmatised, there is further concern that AD may produce a contagion effect.[13–15] Jones and Paton observed that unlike some studies that perceived AD as providing a suicide-inhibiting effect, their results suggested that any inhibitory mechanisms were counteracted by "equal or larger opposite effects".[16–18]

The potential for a contagion effect is also a concern in the New Zealand context, particularly if legislative boundaries slip thereby easing restrictions around eligibility. Research suggests that globally, similar bills have initially restricted eligibility to those with terminal illnesses to make AD more palatable, but the eligibility criteria subsequently became more flexible.[19] Shariff suggested that a crucial aspect of such criteria is clear boundaries and limits that reflect the underlying justifications for assisted dying.[19] Therefore, it is important to maintain "robust safeguards [that do not] become ritualised practices of verification", and ensure compliance is not "reduced to ticking items off a checklist".[20]An example of how quickly the contagion effect can occur is the 14-year-old girl (Valentina Maureira) from Chile who used YouTube to request assisted suicide, and subsequently admitted she got the idea after hearing about the assisted death of Brittany Maynard in Oregon in 2014.[15] Therefore, the provision of positive role modelling of AD practices may normalise or even promote this means of death unless assisted deaths are protected by rigorous legislation that supports those involved. Such normative practices are evidenced in the Netherlands, where AD is now becoming the most prevalent mode of death for patients with cancer.[3]

Method

This study used the Yin case study approach to undertake a single semi-structured in-depth interview with a participant who self-identified as having first-hand experience of AD from a relative's perspective (in a country where this is legal).[21]

The case

This study examined a specific case of an individual whose relative had accessed and used AD in a country where it is legal.[21] The death occurred 12 months before the interview took place. The narrative depicted a situation where the individual concerned had a chronic and progressive illness, which had a mental health component. He was a highly educated scientist who was still relatively active and was able to mobilise around parks and reserves. Family members had noted some decline in his physical ability, but nothing unusual for the individual's age (mid 70s). Some family members lived close to the individual while others were located overseas. The news of the individual choosing AD had not been discussed, except with the spouse, before the announcement

of a date being set for the death, giving immediate family (spouse and siblings) only two weeks to prepare for the event. The interview participant was married to one of the siblings. The family of this individual, except for one child, all lived in the same country where AD is a legal option.

Data collection

The interview was conducted in a private setting to maintain confidentiality, and audio-recorded with the participant's consent (questions in Appendix). The audio recording was transcribed verbatim by the primary investigator (RW). All names and references that had potential to identify the participant were changed. The interview transcript was member-checked and agreed as being accurate before dissemination to the research team for analysis.

Data analysis

Thematic analysis was used to interpret the narrative and identify trends and patterns emerging from the data.[22] This was particularly pertinent given the conceptual nature of this study in an emerging field of research interest.[23,24] The interview transcript was read by RW and RM, and coded separately. Thereafter, coding was discussed among RW and RM to determine themes emerging from the research, with the triangulation between the two reviewers improving the study rigour.[25]

Ethical considerations

Ethical approval was obtained from the Auckland University of Technology Ethics Committee (AUTEC), reference number 19/170. Written and verbal consent was obtained from the participant.

Findings

This paper discusses three key themes that emerged from the interview: AD becoming an expectation for others to pursue when unwell and potentially facing a life-threatening illness; the notion of stigma associated with using AD legislation; and the potential for such legislation to produce a contagion effect.

Life value and expectation to use AD

In considering the burden and expectations with regard to AD legislation, there appeared to be a shift in terms of where the burden sits. Life value was questioned, with the notion of being burdensome transferring to those still living, in that AD may become a future expectation for them. This was evident when the participant said:

"[AD] sets a precedent around suffering and even the value of living and life…and in a family that has some individuals who have chronic health issues…I'm thinking of what they'll face years from now—they'll have to make a decision about what their value is to society. What is that going to mean…when I become disabled to the point where I can't do anything?…I think it means I'll have to [use AD] and if it came through and they thought it was the right thing to do, I would do it."

The participant had a chronic medical condition, and following the above comment, he was specifically asked "Do you feel like that's something you would have to consider?" He responded, *"I think it's in my future, I can see it now"*.

Stigma

Stigma can occur on both sides of AD legislation, with doctors and nurses being stigmatised whichever decision they make regarding service provision. The participant suggested that judgement exists even when the legislation is legal. He noted that despite a growing number of individuals using AD, they often fail to inform wider family and friend networks that they intend to use, or have used this legislation. For example,

"In terms of what it means for a family… is now…all this unspoken stuff happening. It's hard…you know when they asked their kids [sic] not to tell their spouses. They just wanted him to have [appeared to have] died [naturally]."

In this instance, the person's wife and siblings knew but were explicitly told to not tell anybody else, including partners, because

"…they were fearful of judgement…it might be legal but you know, so is marijuana now and there [is] plenty of society that thinks it's shameful."

The participant went on to note that two of his father's friends had used AD legislation in the same 12-month period. Despite having had a life-long close relationship with one particular friend, that friend did not want to talk to his father about AD:

"He didn't talk to my dad much, didn't wanna [sic] tell my dad what was happening [AD]. [He said] 'I don't wanna [sic] talk to

anybody, I don't wanna [sic] talk to you. I can't, I can't talk to you about this [AD] right now, I can't talk to you'. And hung up."

AD as contagion

The participant hinted that there may be a contagion effect at play, as he had known three extended family members use the legislation over a short period of time.

"I don't know if I told you this but two other extended family members have now gone through this [AD]."

He also noted that he was,

"...worried about my dad now, because he's now had two people close to him make the decision [to die] and he's like, I didn't even know that people make those decisions—now he knows...I guess I worry it's...I don't think cancer is the right word...but I worry that its infectious."

Discussion

In conducting this study, it was anticipated that social consequences of AD legislation may be present in terms of the slippery-slope discourse.[10,11] However, it was unexpected to obtain data that painted a distinct picture of how the slippery-slope effect was unfolding in a country where AD was legal. While the right of individuals to choose assisted dying in some instances may be appropriate, evidence from this study must be factored into the New Zealand debate before the referendum on the End of Life Choice Act in 2020.

This study clearly showed how experiencing AD through a relative's lens and by partial engagement with AD can impact broader family and friend networks, in a similar way to that observed by Gamondi.[13] This was witnessed through the identification of the burden shifting from the physical and financial dimensions of care, towards AD becoming a future expectation for extended family members. This potential consequence of AD legislation reduces our future existence to being considered only through the practical lens relating to the cost of care and reduces our life to having a dollar value, as opposed to AD alleviating the fear of indignity, pain and suffering at end-of-life.

The results highlighted how AD remains contentious, irrespective of legality, which was demonstrated through the secrecy surrounding the participant's relative's death in terms of not including extended family members in decision-making, and not informing family friends of the cause of death.[26] This family's behaviour was similar to that reported by Gamondi, thereby offering further real-world clarification that using AD can have a stigmatising effect.[13] However, despite such secrecy, the participant expressed concern that AD may be 'infectious'. This was consistent with Kheriaty, who observed that exposure to the idea of AD can lead others to seek such assistance, thus the effects of legislation will require close and transparent monitoring to avoid this outcome.[15]

With these indicative social consequences comes the concern that the legalisation for AD in New Zealand has potential to fracture family and community structures, and the fracturing of such social networks may be difficult to repair in the aftermath of AD. For example, the participant suggested that:

"There are going to be fractured families, where someone is feeling like they're a burden, they don't have the support of their family, so their likelihood of making a decision...I believe [it] will be much easier for them to say 'I'm alone anyhow, nobody cares...there are a lot of reasons to quit, a lot of reasons to go to sleep'."

Such a notion was also depicted by Hendin and Foley, who considered lack of family support was a contributing factor to using AD.[27] They described a case where 'the eagerness' of an older woman's daughter and son-in-law was thought to have possibly influenced her decision to take 'suicide pills'. Therefore, when considering such scenarios, we must also consider the potential of fracturing of our New Zealand communities and broader social settings. Even if we can 'fix' such fractures after AD is legislated and implemented, we may not be able to return them to their former status, thereby changing the supportive and intimate nature of the New Zealand social landscape. It is, therefore, imperative that should AD legislation be supported in the forthcoming referendum, it is introduced safely to support those who wish to access it, but simultaneously protects our vulnerable populations.

Conclusion

The introduction of AD legislation into New Zealand culture provides a potential hotspot for family, community and social discord that may not be easily remedied. There remains ongoing debate with regard to the slippery-slope effect of this legislation globally. However, this case study offers insight into some elements associated with slippage in terms of family members being expected to die when their care becomes too difficult or expensive. This study also suggests that as New Zealand moves forward with the EoLCA referendum in 2020, further study is required to investigate whether a contagion effect of AD is possible (or even probable), and how as a society, we negotiate what will be a conflicted pathway potentially complicated by prejudice, judgement and stigma for those who actively seek solace from indignity and suffering.

Although this is a singular case study, it exposes an individual's experience of AD in a country where it is legal, and the issues faced at a grass roots level. It offers some evidence as to what occurs in the reality of AD legislation, and how it impacts beyond the immediacy of relieving individual suffering, and extends that suffering into realms that have not yet been adequately investigated.

Appendix

Interview questions/structure

The phase one case study will comprise of a loosely semi-structured interview to allow for free-flowing information regarding this under-researched field of interest.

1. Tell me about your story of assisted dying (this is a broad introductory question to get a feel for what happened)
2. Why did your family member choose assisted dying?
3. What are your experiences of involvement with the decision-making process for your family member?
4. Tell me about the process that occurred when your family member actually went to the clinic for the assisted dying.
5. What happened after their death?
6. How do you feel now about assisted suicide?
7. How do you feel about the possibility of a bill supporting assisted dying being passed in New Zealand? (If appropriate).

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REFERENCES:

1. End of Life Choice Bill. In: Parliament NZ, editor. 2019.
2. Karsoho H, Fishman JR, Wright DK, Macdonald ME. Suffering and medicalization at the end of life: The case of physician-assisted dying. 2016. p. 188–96.
3. Wardle LD. A Death in the Family: How Assisted Suicide Harms Families and Society. Ave Maria Law Review. 2016:43.
4. Philippe A. Invisible Death. The Wilson Quarterly (1976). 1981; 5(1):105.
5. Gawande A. Being mortal : aging, illness, medicine and what matters in the end: Profile Books; 2014.
6. Kevin F. Qualified to speak: Rush Rhees on the (vexed) subject of euthanasia. Philosophy. 2013; 88(346):575.
7. Buckinx F, Rolland Y, Reginster J-Y, Ricour C, Petermans J, Bruyère O. Burden of frailty in the elderly population: perspectives for a public health challenge. Archives Of Public Health = Archives Belges De Sante Publique. 2015; 73(1):19.
8. Schuklenk U. Is Assisted Dying the Baby Boomers' Last Frontier? Bioethics. 2016; 30(7):470.
9. Hendry M, Pasterfield D, Lewis R, Carter B, Hodgson D, Wilkinson C. Why do we want the right to die? A systematic review of the international literature on the views of patients, carers and the public on assisted dying. Palliative Medicine. 2012; 27(1):13–26.
10. Pestinger M, Stiel S, Elsner F, Widdershoven G, Voltz R, Nauck F, et al. The desire to hasten death: Using Grounded Theory for a better understanding "When perception of time tends to be a slippery slope". 2015. p. 711–9.
11. Jackson E. Legalized Assisted Dying: Cross Purposes and Unintended Consequences. Dalhousie Law Journal. 2018(Issue 1):59.
12. Winnington R. Patient choice as illusion: Autonomy and choice in end-of-life care in the United Kingdom and New Zealand: University of Auckland; 2016.
13. Gamondi C, Pott M, Preston N, Payne S. Family Caregivers' Reflections on Experiences of Assisted Suicide in Switzerland: A Qualitative Interview Study. Journal of Pain & Symptom Management. 2018; 55(4):1085–94.
14. McDougall R, Hayes B, Sellars M, Pratt B, Hutchinson A, Tacey M, et al. 'This is uncharted water for all of us': challenges anticipated by hospital clinicians when voluntary assisted dying becomes legal in Victoria. Australian Health Review. 2019.
15. Kheriaty A. Social Contagion Effects of Physician-Assisted Suicide: Commentary on "How Does Legalization of Physician-Assisted Suicide Affect Rates of Suicide?". Southern Medical Journal. 2015; 108(10):605–6.
16. Jones DA, Paton D. How Does Legalization of Physician-Assisted Suicide Affect Rates of Suicide? 2015. p. 599–604.
17. Posner RA. Aging and old age. Chicago: Chicago University Press; 1997.
18. Assisted Dying Bill. Sect. Columns 775, 905 (2015).
19. Shariff MJ. Assisted death and the slippery slope-finding clarity amid advocacy, convergence, and complexity. 2012. p. 143–54.
20. Halliday S. Comparative Reflections upon the Assisted Dying Bill 2013: A Plea for a More European Approach. Medical Law International. 2013(Issue 2–3):135.
21. Yin RK. Case study research : design and methods. 5 edition. ed: SAGE; 2014.
22. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006; 3(2):77–101.
23. Corbin JM, Strauss AL. Basics of qualitative research : techniques and procedures for developing grounded theory. Fourth edition. ed: SAGE; 2015.
24. Holloway I. Qualitative research in nursing and healthcare. Fourth edition. ed: Wiley Blackwell; 2017.
25. Denzin NK. Triangulation 2.0. Journal of Mixed Methods Research. 2012; 6(2):80–8.
26. Dyer O, White C, Rada Aser G. Assisted dying : law and practice around the world. BMJ: British Medical Journal. 2015; 351.
27. Hendin H, Foley K. Physician-Assisted Suicide in Oregon: A Medical Perspective. Michigan Law Review. 2007(Issue 8):1613.

Demographics of New Zealand women with vulval lichen sclerosus: is specialist care equitable?

Harriet S Cheng, Coco Kerckhoffs, Nicky Perkins, Lois Eva

ABSTRACT

AIM: Vulval lichen sclerosus is an inflammatory genital skin condition associated with poor quality of life, sexual dysfunction and risk of squamous cell carcinoma. The aim of this study was to document the demographics of women with lichen sclerosus seen at specialist vulval clinics.

METHOD: We performed a retrospective review of women with lichen sclerosus seen at a tertiary combined gynaecology/dermatology vulval clinic over 12 months and Auckland Regional sexual health vulval clinics over five years. Data were collected for age, ethnicity, skin biopsy, treatment, referral source and time from symptom onset to diagnosis. Ethnicity was compared with Census data for the Auckland region.

DISCUSSION: Three hundred and thirty-five women were included; 273 from the gynaecology/dermatology clinic and 62 from sexual health. Women seen at sexual health were younger than those seen by gynaecology/dermatology (mean age 45 and 64, respectively; $p<0.0001$). Most referrals were from general practitioners (54%), although self-referrals made up 42% of sexual health consultations. The most common ethnicity was European (82%) followed by Asian (10%), Māori (4%) and Pacific Peoples (3%). Compared with Census data, European women were over-represented and Māori, Pacific and Asian women were under-represented.

CONCLUSION: We found inequitable ethnic representation of women with vulval lichen sclerosus seen at our institution. Causes may include sociocultural beliefs, variations in access to care or ethnic differences in the prevalence of lichen sclerosus. A deeper understanding of underlying issues would enable planning of initiatives to ensure equitable access to specialist care for all New Zealand women with vulval conditions.

Lichen sclerosus is a chronic, pruritic skin condition with autoimmune aetiology and is relatively common, affecting approximately 1% of women.[1] It has a predilection for genital skin, particularly the vulva in women. The cardinal features of the vulval form are skin whitening and atrophy, and eventually destruction of the normal architecture of the vulva. Bullae, ulceration and purpura may also be seen (Figure 1).[2] Common symptoms are itching, pain and dyspareunia.

In addition to scarring with irreversible loss of vulval architecture, lichen sclerosus has an association with differentiated vulval intraepithelial neoplasia (dVIN) and squamous cell carcinoma (SCC).[3] Regular maintenance treatment, most often with potent or ultrapotent topical corticosteroids is required and has been shown to reduce the risk of vulval carcinoma.[4] Due to risk of neoplasia, early diagnosis and long-term follow-up is advised.[5] Vulval disease in general is known to disrupt sexual function as well as normal daily activities, promote anxiety and have other negative psychological effects.[6]

Many women with lichen sclerosus feel embarrassed to seek advice or treatment and therefore typically present in the later stages of disease, often after a period of self-treatment.[7] Late presentation is of concern, because of the association with malignancy and potential for irreversible scarring which may lead to vaginal introital stenosis and sexual dysfunction. Complete fusion with urinary retention can occur.

Figure 1: Vulval lichen sclerosus.

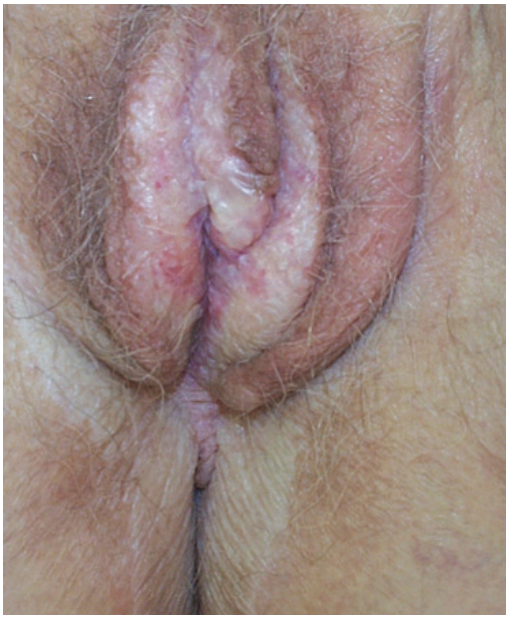


Image courtesy of DermNet New Zealand.

Other than age data, there is a significant lack of available literature on the demographic characteristics women with vulval lichen sclerosus and vulval skin disease in general. In New Zealand, there are a small number of observational studies on vulval skin conditions that include ethnicity data and suggest there may be inequitable ethnic representation. For example, a quality of life of life study in women with vulval dermatoses in Waikato, found none of the participants identified as being of Māori or Pacific ethnicity.[8]

Despite universal, tax-funded healthcare in New Zealand, there remains inequitable health outcomes and access to care between population groups, particularly for Māori.[9] The literature on cervical cancer screening in New Zealand has consistently documented ethnic disparity in screening uptake.[10] Māori, Pacific and Asian women are more likely to cite embarrassment when undergoing cervical screening.[11] This finding is likely relevant to external genital examination.

Anecdotally, it was noted that the majority of women seen with vulval complaints are of European ethnicity. We hypothesise that Māori and Pacific women are under-represented in the population of women presenting with lichen sclerosus. The aim of this study was to document demographics of women with vulval lichen sclerosus presenting to vulval skin clinics in Auckland.

Methods

We undertook a retrospective review of women with a specialist-diagnosis of lichen sclerosus seen at a tertiary combined gynaecology/dermatology vulval clinic at National Women's Health at Auckland City Hospital and the vulval clinic at Auckland Regional Sexual Health Service (SH), which has clinics in Central, North, South and West Auckland. The combined clinic requires referral from a primary care or specialist physician. In contrast, patients may self-refer to SH clinics.

All patients seen at the combined gynaecology/dermatology clinic over the 12-month period from 1 June 2017 to 1 June 2018 were included. A time period of five years from 2 July 2013 to 11 June 2018 was chosen for SH clinics in order to capture a sufficient number of women for comparison. Patient data collected included age, ethnicity, diagnosis, previous skin biopsy, treatment modality, referral source, date of symptom onset as well as date of specialist diagnosis (in order to calculate time from symptom onset to specialist diagnosis). This data was collected from electronic medical records.

Where possible, self-identified ethnicity was collected from patient registration forms and when not available, ethnicity data was collected from the electronic medical record. Both Level 1 and Level 2 ethnicity was recorded and ethnicity was outputted using the Ministry of Health prioritised output method.[12] If multiple ethnicities were identified for a single participant, the prioritised order was Māori, Pacific Peoples, Asian, European, Other. Level 1 ethnicity was additionally outputted using the Ministry of Health total output method (all ethnicities recorded for each participant) in order for comparison to be made against the reference population, the 2013 Auckland Census population.[13]

Data analysis was conducted using Microsoft Excel and IBM SPSS Statistics version 23. Significance for difference between means and confidence intervals was calculated using the two sample t test. Differences in proportions between the two clinics was calculated using Chi squared test (or Fisher's exact test for counts less than five). The significance level was set at α=0.05.

Table 1: Referral sources for women seen at vulval skin clinics.

Referral source	Clinic		Chi square or Fisher's exact p value	Total n=335 (%)
	Gynae/derm n=273 (%)	SH n=62 (%)		
General practitioner	157 (57.5)	24 (38.7)	0.012	181 (54.0)
Gynaecologist	65 (23.8)	0 (0.0)	<0.0001	65 (19.4)
Dermatologist	25 (9.2)	0 (0.0)	0.007	25 (7.5)
Self	0 (0.0)	26 (41.9)	<0.0001	26 (7.8)
Other medical specialist	8 (2.9)	7 (11.3)	0.010	15 (4.5)
Sexual health physician	9 (3.3)	1 (1.6)	0.694	10 (3.0)
Other/allied health	1 (0.4)	1 (1.6)	0.336	2 (0.6)
Unknown	8 (2.9)	3 (4.8)	0.434	11 (3.3)

Gynae/derm = combined gynaecology and dermatology clinic; SH = sexual health clinic.

Results

In total, 680 women were seen in the vulval clinics over the study periods. Of these, 335 (49.3%) had vulval lichen sclerosus and this was the most frequent diagnosis. Two-hundred and seventy-three were seen at the combined clinic and 62 at SH. The mean age of women with lichen sclerosus was 60 years (standard deviation [SD] 17.8, range 8–95). There was very strong evidence that women seen in SH clinics were younger than those seen by gynaecology/dermatology with mean ages of 45 and 64 years, respectively, and a mean age difference of 18 years (95% confidence interval [CI] 14–23, p<0.0001). The mean age of Asian (54 years), Māori (50 years) and Middle Eastern women (30 years) was younger than European women (62 years) and Pacific women (63 years) (p<0.0001).

The median time from symptom onset to diagnosis was 1.4 years (interquartile range [IQR] 2.6). We found very strong evidence that women seen by gynaecology/dermatology had a longer duration of symptomatology prior to diagnosis (3.6 years) compared with women seen at SH (1.1 years), with a mean difference of 2.5 years between the clinics (95% CI 1.5–3.5 years, p<0.0001). Vulval biopsy had been performed in 75% of women and 93% of biopsies confirmed the diagnosis of lichen sclerosus.

Most patients (53.4%) had been referred by their general practitioner (GP) (Table 1). Specialist referrals were most often from gynaecologists, followed by dermatologists and sexual health physicians. Self-referrals accounted for 42% of SH consultations and none of the gynaecology/dermatology consultations.

The most common ethnic group seen was European (82%) followed by Asian (10%), Māori (4%) and Pacific Peoples (3%). Detailed ethnicity data is shown in Table 2. Compared with Census data, European women were over-represented and Māori, Pacific and Asian women were under-represented (Figure 2). There were no significant differences between the clinics in the ethnicities of women seen (p=0.185, level 1, prioritised output).

Discussion

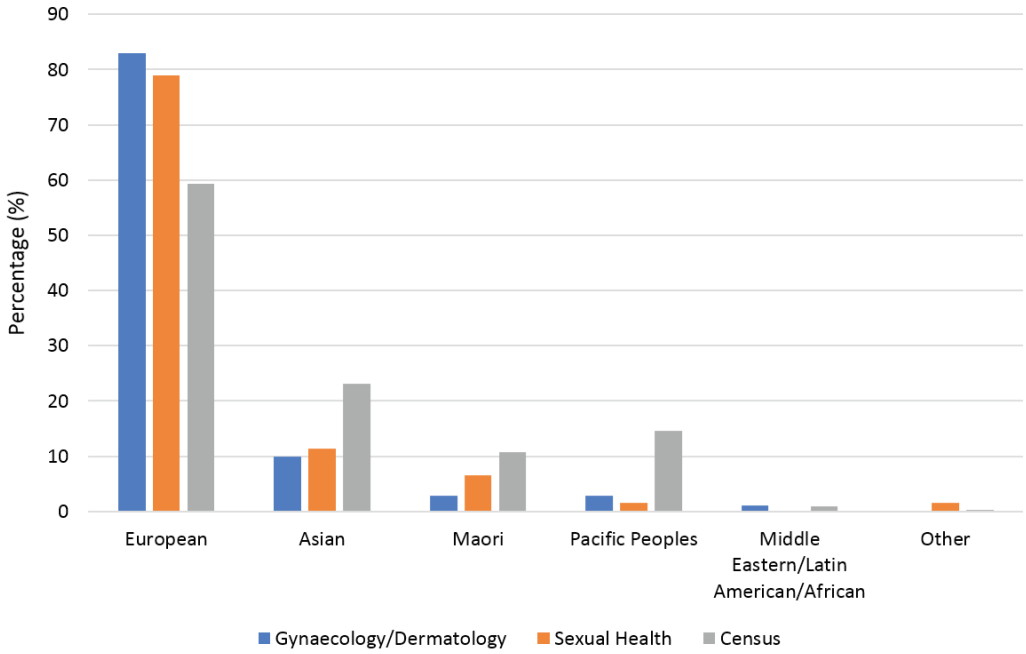
The mean age of women seen in our study was 60 years, in keeping with previous studies showing lichen sclerosus occurs predominantly in post-menopausal women.[14] Women seen in SH clinics were younger, reflecting the younger overall age of patients attending sexual health services. Women in this age group may be more likely to attribute vulval symptoms to sexually acquired infection and thus present to sexual health services for evaluation. In our community, Māori and Pacific women

Table 2: Ethnicity of women seen at vulval skin clinics with a diagnosis of lichen sclerosus (Level 2, prioritised output).

Ethnicity Level 2 – Prioritised output	Clinic		Chi square or Fisher's exact p value	Total n=335 (%)
	Gynae/derm n=273 (%)	Sexual health n=62 (%)		
New Zealand European	192 (68.1)	41 (66.1)	0.524	233 (67.7)
Other European	33 (11.7)	8 (12.9)	0.832	41 (11.9)
Indian	17 (6.0)	4 (6.5)	1.000	21 (6.1)
Māori	8 (2.8)	4 (6.5)	0.246	12 (3.5)
Chinese	9 (3.2)	1 (1.6)	0.695	10 (2.9)
Samoan	7 (2.5)	1 (1.6)	1.000	8 (2.3)
Other Asian	1 (0.4)	1 (1.6)	0.336	2 (0.6)
African	2 (0.7)	0 (0.0)	1.000	2 (0.6)
Southeast Asian	0 (0.0)	1 (1.6)	0.185	1 (0.3)
Middle Eastern	1 (0.4)	0 (0.0)	1.000	1 (0.3)
Fijian	1 (0.4)	0 (0.0)	1.000	1 (0.3)
Niuean	1 (0.4)	0 (0.0)	1.000	1 (0.3)
Latin American	1 (0.4)	0 (0.0)	1.000	1 (0.3)
Not stated	0 (0.0)	1 (1.6)	0.185	1 (0.3)
Total	**273**	**62**	-	**335**

Gynae/derm = combined gynaecology and dermatology clinic.

Figure 2: Ethnicity of women seen in vulval skin clinics with a diagnosis of lichen sclerosus (n=335) compared with 2013 Census data for Auckland Region (Level 1, total output).



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have a younger population distribution than European women, and given that lichen sclerosus most commonly affects women post-menopause the apparent incidence of lichen sclerosus may be falsely lowered by comparing groups by overall numbers of women. It was not unexpected that Māori women had a younger mean age in our cohort; however, interestingly Pacific women with lichen sclerosus had a similar mean age to European women. The overall numbers of Māori and Pacific women seen were too small to draw any firm conclusions, and it is not known how age may factor into cultural considerations that may prevent a woman from disclosing vulval symptoms and presenting to her health professional.

This study adds to the literature documenting the long period of symptomatology in women with vulval skin conditions prior to diagnosis and management.[1] This was longer for women seen by gynaecology/dermatology, which may be indicative of the older cohort of women seen in those clinics as it has been proposed that younger women seek health services at an earlier stage than older women.[15] The SH clinics accept self-referrals, which is also likely to allow earlier clinic review. However, even those seen at SH were symptomatic for more than a year before diagnosis.

Māori, Pacific and Asian women were under-represented in our clinics compared with census data. There is little New Zealand data on ethnicity and inflammatory vulval skin conditions for comparison; however, Pacific women were under-represented in a study of human papilloma virus (HPV)-related VIN (HSIL) spanning 41-years at National Women's Health published in 2005.[16] In an analysis for trends in vulval carcinoma at National Women's Health, authors found all women seen between 1965–1974 were European and in the later cohort (1990–1994) 53/57 were European; there were four Māori and one Pacific Island woman.[17]

Dass and Kuper-Hommel reported 47 women with vulval cancers from Waikato and found Māori women made up 19% of all cases and tended to present younger than European women.[18] This may be due to HPV-related cancers in younger women. Fifteen of these 47 women (31%) had lichen sclerosus. An American study also found ethnic disparity in women with vulval cancers with African, Asian and Pacific women more likely to have advanced stage disease.[19]

A Brazilian study of women seen in dermatology vulval clinics, where lichen sclerosus was the most common diagnosis, found 75% identified as Caucasian, 15% as Afro-Brazilian and 6% as mixed race.[20] The authors do not comment on this finding further, however according to 2010 Census data 66% of the San Paulo population are Caucasian. Interestingly, in men, an Army Medical Centre study found double the incidence of lichen sclerosus in black and Hispanic patients compared with white patients.[21] The authors propose that this may be explained by better access to medical care for minorities through the military.

The two clinics in our study demonstrated different referral pathways. We hoped this may provide information on the significance of physician referral as a barrier to care. The combined gynaecology/dermatology clinic is a tertiary referral clinic and received referrals from GPs as well as a variety of other specialists. In contrast, the majority of referrals for SH clinics came from GPs or patients self-presented. The differences in patient access to the clinics provides a useful comparison when considering potential barriers to care for women with lichen sclerosus. Although differences were not significant there was a higher proportion of Māori women seen in the SH clinic. It is known that access to care including transport and cost of primary care visits is a barrier for Māori.[22] It is important to note however, that despite the ability for patients to self-present, Māori and Pacific women with lichen sclerosus are still under-represented in SH clinics. This finding is particularly interesting given that Māori make up 22% and Pacific women 18% of all women presenting to sexual health (significantly higher than the proportions of these ethnic groups in the Census data). There are likely multiple additional factors, including cultural considerations pertinent to genital skin conditions.

The reasons for these ethnic disparities are unknown. Although there has been little exploratory work in vulval skin disorders, information can be gleaned from the literature on cervical cancer screening in New

Zealand. Since the inception of the National Cervical Screening Programme, Māori and Pacific women have been under-represented. Recent data shows that although coverage has improved for all ethnic groups, the coverage rate of Māori and Pacific women (67.8 and 70.7%, respectively) remains lower than for European women (78.5%).[10] Qualitative studies found Māori and Pacific women were more likely to be embarrassed and nervous about undergoing the smear procedure, with additional concerns over examination of a sacred body part involved with sexual intimacy and reproduction.[11] The study also conducted interviews with under-screened Chinese, Korean and European women, finding that European women were the only group of women who did not cite embarrassment or nervousness as a reason for their delay in seeking screening. A South Auckland study identified some Māori and Pacific interviewees had distrust of the medical system due to Western alignment.[23] This may mean that women of Māori, Pacific or Asian ethnicity are reluctant to present for evaluation of the genital symptoms of lichen sclerosus.

It is possible that Māori, Pacific and Asian women are at lower risk of lichen sclerosus and this may explain the lower numbers presenting. The Auckland Sexual Health data indicate that despite a relatively high proportion of Māori and Pacific women attending the service, these ethnic groups were still under-represented among women with lichen sclerosus compared to European women. This would support the hypothesis that women from these ethnic groups are at lower risk of lichen sclerosus. However, there may be other reasons for the under-representation, including access issues to general practitioners for referral, and the fact that lichen sclerosus is less prevalent in younger women commonly presenting to sexual health services.

Caution is required with the assumption that Māori, Pacific and Asian women are at lower risk of lichen sclerosus. A review of psoriasis cases from 2009–2014 in Auckland sought to test the hypothesis that psoriasis did not appear in Samoan patients, claimed by a previous review in the New England Journal of Medicine.[24] The Auckland review found that Māori and Pacific patients made up 26% of the cases of psoriasis seen at Auckland City Hospital, including Samoans whom represented 6% of all patients.[25] This demonstrates that autoimmune skin conditions like psoriasis are most definitely seen in Māori and Pacific patients, including Samoan patients. International studies have shown lower rates of psoriasis in indigenous populations. However, this may reflect lesser access to healthcare rather than a true reduction in incidence of psoriasis in these populations. In comparison to census population data, Māori and Pacific were seemingly overrepresented in the Auckland study, which may suggest that Māori and Pacific actually have a higher incidence of psoriasis. However, this study was limited by small sample size.

Our study has a number of limitations including the retrospective design. The number of women seen in SH clinics was relatively small reducing accuracy and increasing the chance of type II error when analysing ethnicity differences between the gynaecology/dermatology and SH clinics. Additionally, this study only examined women with lichen sclerosus seen in vulval skin clinics at our hospital and did not capture patients presenting elsewhere, such as to family planning clinics or primary care. It is known referral rates are generally lower for Māori. Ideally our findings require confirmation looking at these sites as well as data outside our region.

In conclusion, we found inequitable ethnic representation in women with vulval lichen sclerosus seen at our institution. Future study is imperative to further explore the true incidence of vulval lichen sclerosus in Māori, Pacific and Asian women and the cultural and other barriers to care, to ensure equitable specialist care for all New Zealand women with vulval conditions.

Competing interests:
Miss Kerckhoffs reports a grant from A+ Trust during the conduct of the study.

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REFERENCES:

1. Wallace HJ. Lichen sclerosus et atrophicus. Trans St Johns Hosp Dermatol Soc 1971; 57:9–30.
2. Lawton S, Littlewood S. Vulval Skin Conditions: Disease Activity and Quality of Life. J Lower Gen Tract Dis. 2013; 17(2):117–24.
3. Bleeker MC, Visser PJ, Overbeek LI, et al. Lichen sclerosus: Incidence and risk of vulvar squamous cell carcinoma. Cancer Epidemiol Biomark Prev 2016; 25:1224–30.
4. Lee A, Bradford J, Fischer G. Long-term management of adult vulvar lichen sclerosus: A prospective cohort study of 507 women. JAMA Dermatol. 2015; 151(10):1061–7.
5. Lewis F, Tatnall F, Velangi S, et al. British Association of Dermatologists guidelines for the management of lichen sclerosus 2018. Br J Dermatol. 2018; 178(4):839–53.
6. Cheng H, Oakley A, Conaglen JV, Conaglen HM. Quality of Life and Sexual Distress in Women with Erosive Vulvovaginal Lichen Planus. J Lower Gen Tract Dis. 2017; 21(2):145–9.
7. Neill S, Lewis F, editors. Ridley's The Vulva. 3rd ed. Chichester: Wiley-Blackwell; 2009.
8. Cheng H, Oakley A, Rowan D, Conaglen HM. Quality of life and sexual distress in women with vulval dermatoses. Australas J Dermatol. 2014; 55(4):
9. Goodyear-Smith F, Ashton T. New Zealand health system: universalism struggles with persisting inequalities. Lancet. 2019; 394(10196):432–42.
10. Ministry of Health. NCSP New Zealand All District Health Board Coverage Report: For the period ending 30 September 2018. Wellington: Ministry of Health.
11. Bonita R, Paul C. The extent of cervical screening in New Zealand women. New Zeal Med J. 1991; 104(918):349–52.
12. Ministry of Health. HISO 10001:2017 Ethnicity Data Protocols. Wellington (New Zealand): Ministry of Health; 2017.
13. Statistics New Zealand. 2013 Census QuickStats about a place: Auckland.
14. Wallace HJ. Lichen sclerosus et atrophicus. Trans St Johns Hosp Dermatol Soc 1971; 57:9–30.
15. Thompson AE, Anisimowicz Y, Miedema B, Hogg W, Wodchis WP, Aubrey-Bassler K. The influence of gender and other patient characteristics on health-care seeking behavior: a QUALICOPC study. BMC Fam Pract. 2016; 17(38).
16. Jones RW, Rowan D, Stewart A. Vulvar intraepithelial neoplasia: aspects of the natural history and outcome in 405 women. Obstet Gynecol. 2005; 106(6):1319–26.
17. Jones RW, Baranyai J, Stables S. Trends in squamous cell carcinoma of the vulva: the influence of vulvar intraepithelial neoplasia. Obstet Gynecol. 1997; 90:448–52.
18. Dass, Kuper-Hummel. A review of squamous cell vulvar cancers in Waikato region, New Zealand. NZ Med J. 2017; 130(1465):19–28.
19. Wu X, Matanoski G, Chen VW, et al. Descriptive epidemiology of vaginal cancer incidence and

survival by race, ethnicity, and age in the United States. Cancer Supplement. 2008; 113(S10):2873–82.

20. Goncalves DLM, Romero RL, Ferreira PL, et al. Clinical and epidemiological profile of patients attended in a vulvar clinic of the dermatology outpatient unit of a tertiary hospital during a 4-year period. Int J Dermatol. 2019. doi: 10.1111/ijd.14442.

21. Kizer WS, Prarie T, Morey AF. Balanitis xerotica obliterans: epidemiologic distribution in an equal access health care system. South Med J. 2003; 96(1):9–11.

22. Primary Health Care. Ministry of Health NZ. 2013/14 New Zealand Health Survey, Ministry of Health. Available at health.govt.nz. Accessed on 5/09/19.

23. Ratima K, Paul C, Skegg DC. Cervical smear histories of Māori women developing invasive cervical cancer. New Zeal Med J. 1993; 106(969):519–21.

24. Schön MP, Boehncke WH. Psoriasis. N Engl J Med. 2005; 352(18):1899–912.

25. Lee M, Lamb S. Ethnicity of psoriasis patients [letter]. New Zeal Med J. 2014; 127(1404):73.

Performance of CVD risk equations for older patients assessed in general practice: a cohort study

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ABSTRACT

AIMS: To investigate how well the New Zealand PREDICT-CVD risk equations, derived in people aged 30–74 years and US Pooled Cohort Equations (PCEs) derived in people aged 40–79 years, perform for older people.

METHODS: The PREDICT cohort study automatically recruits participants when clinicians use PREDICT software to conduct a CVD risk assessment. We identified patients aged 70 years and over, without prior CVD, renal disease or heart failure who had been risk assessed between 2004 and 2016. Equation performance was assessed in five-year age bands using calibration graphs and standard discrimination metrics.

RESULTS: 40,161 patients (median 73 years; IQR 71–77) experienced 5,948 CVD events during 185,150 person-years follow-up. PREDICT-CVD equations were well calibrated in 70–74 year olds but underestimated events for women from 75 years and men from 80 years. Discrimination metrics were also poor for these age groups. Recalibrated PCEs overestimated CVD risk in both sexes and had poor discrimination from age 70 years for men and from age 75 years for women.

CONCLUSIONS: While PREDICT-CVD equations performed better than PCEs, neither performed well. Multimorbidity and competing risks are likely to contribute to the poor performance and new CVD risk equations need to include these factors.

Cardiovascular disease (CVD) is the leading cause of potentially preventable global health loss and demand for health and disability services for older people.[1] There is evidence that reducing smoking,[2] blood pressure (BP)[3] and lipids[4] is associated with reduced fatal and non-fatal CVD for adults at any age, and the benefits are largely determined by patients' pre-treatment CVD risk. As older people are more likely than younger people to be at high CVD risk, they are also likely to benefit most from CVD risk-reducing medications.[1] A recent individual person meta-analysis of 28 statin trials found that treatment produced a similar reduction in major vascular events per mmol/L reduction in low-density lipoprotein (LDL) cholesterol *irrespective of age,* although findings were more attenuated for those over 75 years without established CVD.[4] In the case of BP-lowering, the benefits of treatment accrue even among the very old. In a meta-analysis involving only octogenarians from seven clinical trials, BP-lowering medications were associated with lower rates of stroke (34%), heart failure (39%) and major CVD events (22%) than those not receiving treatment.[5] Despite these findings, most CVD risk management guidelines are vague about how to manage older people. In New Zealand, for example, CVD risk assessment and management guidelines recommend a formal quantitative CVD risk assessment for people aged 30–74 years,[6] but once a person turns 75 years of age, risk assessment is 'at the discretion' of

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the clinician. General practitioners (GPs) are given general advice to use clinical judgement taking into account the results of a risk assessment, the likely benefits and risks of treatment and patient preferences.

We have identified an increasing number of New Zealanders aged 75 years and over receiving formal quantitative CVD risk assessments in routine primary care and have generated a cohort of these older people as part of our ongoing PREDICT-CVD risk prediction cohort study.[7] Given the clinical relevance of accurate assessment of CVD risk in older people, we aimed to investigate how well the recently developed PREDICT-CVD equations[8] (derived in people aged 30–74 years), performed in older people. As a comparison, we also assessed the performance of the relatively similar US Pooled Cohort Equations (PCEs),[9] derived in people aged 40–79 years. We hypothesised that these CVD risk equations should perform reasonably well in the subgroup of older patients who GPs considered suitable for routine preventive CVD risk assessment.

Methods

Study population

The PREDICT study has been described in full elsewhere.[7] In brief, patients are automatically recruited to this prospective open cohort study when primary care clinicians undertake standard quantitative CVD risk assessments using the PREDICT web-based decision support programme. Over one-third of GPs use PREDICT software, which is integrated into their electronic patient management systems. An encrypted version of each person's unique national health identifier (National Health Index number, eNHI) is used to anonymously link patients' risk profiles to national and regional health datasets, including all community pharmaceutical dispensing, all community laboratory testing, state-funded hospitalisations and all deaths.[10] Over 98% of New Zealanders have an NHI number,[10] allowing identification and linkage of multiple health contacts, augmentation of risk factor data (prior hospital admissions, pharmaceutical dispensing, laboratory test results) as well as health outcome ascertainment (fatal CVD events in-hospital and out-of-hospital and non-fatal hospital admissions for acute CVD events) during follow-up. Over 95% of CVD hospitalisations occur within our state-funded health services.[11]

For the purposes of this study, eligible patients were those who had a first (baseline) CVD assessment from 31 October 2004 to 30 December 2016 and were aged 70 years or older, unless they met any of the following exclusion criteria: prior history of ischaemic CVD, heart failure, renal disease or missing risk factors needed for CVD risk prediction models. In addition, to emulate the cohort used to develop the PREDICT CVD equations,[8] patients were excluded if their self-identified ethnicity was recorded as Middle Eastern, Latin American, African or recorded as 'other' or 'unknown'. The rationale for this exclusion was that these ethnic groups were too heterogeneous to combine into one category and too few in numbers to disaggregate into meaningful subgroups.

A history of prior CVD was classified according to an International Classification of Diseases, version 10 Australian Modification (ICD-10 AM) for hospitalisations or primary care clinical diagnosis at the time of CVD risk assessment for angina, myocardial infarction (MI), percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), ischaemic stroke, transient ischaemic attack (TIA), or peripheral vascular disease (PVD). The capture of a patient's history of a hospitalised event used data available from 1 January 1988. (Appendix contains full list of ICD-10 codes) Patients who were dispensed anti-anginal medications on at least three occasions up to five years prior to their baseline visit were also excluded. Renal disease was determined either by an estimated glomerular filtration rate (eGFR) of less than 30ml/min per 1.73m^2, an ICD-10 AM hospitalisation for renal dialysis, prior renal transplantation or a recording of diabetes with nephropathy at the time of CVD risk assessment. Heart failure diagnoses were based on ICD-10 AM hospitalisation code for heart failure or if participants had been dispensed a loop diuretic three or more times in the preceding five years.

Ethnicity classification was based on a nationally agreed prioritisation algorithm when individuals identified with more than one ethnicity[12] in the following order; Māori, Pacific, Indian, Chinese/other Asian and European. Socio-economic status was

assessed using the NZ Deprivation Index (NZDep), a measure assigned to patients according to the deprivation score of their area of residence.[13] For these analyses, NZDep was divided into quintiles from 1 (least deprived) to 5 (most deprived).

Smoking status was defined as either current smoker (including recently quit in the last 12 months) or non-smoker. Diabetes status was classified according to ICD-10 hospitalisation with diabetes and/or dispensing of at least one diabetes medication in the last six months and/or recorded as such by their primary care clinician at the time of CVD risk assessment.

The Charlson comorbidity index is a weighted scoring system that assesses the degree of previously hospitalised comorbidity burden. It is based on 12 conditions that predict one-year survival and has been adapted for use with hospitalisation data using a well-validated ICD-10 coding algorithm.[14] Comorbidities were identified from hospitalisations up to five years prior to the first CVD risk assessment.

The pharmaceutical collection (PHARMS) is a national database of community pharmaceutical dispensing. Reliable identification of dispensing episodes by eNHI has increased over the last decade from 64% in 2004, to 92% in 2006 and over 96% from 2009 onwards.[7] PHARMS was used to identify patients who were dispensed one of the following medications on at least one occasion in the six months prior to the baseline CVD risk assessment: BP-lowering, lipid-lowering and antiplatelet/anticoagulant medications (henceforth termed antithrombotic medications). All these medications are government subsidised. (CVD medications are listed in the Appendix).

Outcomes during follow-up

CVD outcomes for the PREDICT-CVD equations[8] were defined as ICD-10-AM coded hospitalisation or death from ischaemic heart disease, ischaemic or haemorrhagic cerebrovascular events (including TIA), PVD or heart failure. CVD outcomes for the American PCE Equations[9] (termed hard atherosclerotic CVD) are a subset of the former and include fatal or nonfatal MI, fatal or nonfatal stoke, or CHD death (Appendix contains ICD-10-AM codes for both sets of outcomes). Time on study was the time from baseline CVD risk assessment to the first of the following: hospital admission or death related to CVD, death from other causes or end of follow-up.

Statistical analysis

The distributions of CVD risk factors, event rates and follow up were investigated for the total population and by five-year age groups; 70–74 years, 75–79 years, 80–84 years and 85 years and over. Calibration was tested separately for PREDICT-CVD[8] and the PCE models[9] by five-year age groups using equation-specific outcomes. The PREDICT-CVD risk models include age, ethnicity, deprivation, diabetes status, history of atrial fibrillation, smoking status, systolic blood pressure (SBP), the ratio of total cholesterol (TC) to high-density lipoprotein (HDL) cholesterol (TC/HDL) and prior dispensing of BP lowering, lipid lowering and antithrombotic medications. The PCEs include age, TC, HDL, smoking and diabetes status, SBP and treated SBP. Calibration was assessed graphically by categorising participants into deciles of predicted five-year CVD risk and plotting mean predicted five-year CVD risk against observed CVD events at five years of follow up, obtained by the Kaplan-Meier method.[15] For PCEs we used recalibrated models where the baseline survival values were estimated by fitting Cox models with the prognostic index from the PCE model (offset term) in the PREDICT-CVD dataset.[16] Discrimination was assessed using Harrell's C statistic and Royston and Sauerbrei's D statistic.[17,18] The proportion of outcome variation explained by PREDICT-CVD and PCEs was assessed using Royston and Sauerbrei's R^2 statistic.[18] All analyses were performed using Stata 15.0 software.[19]

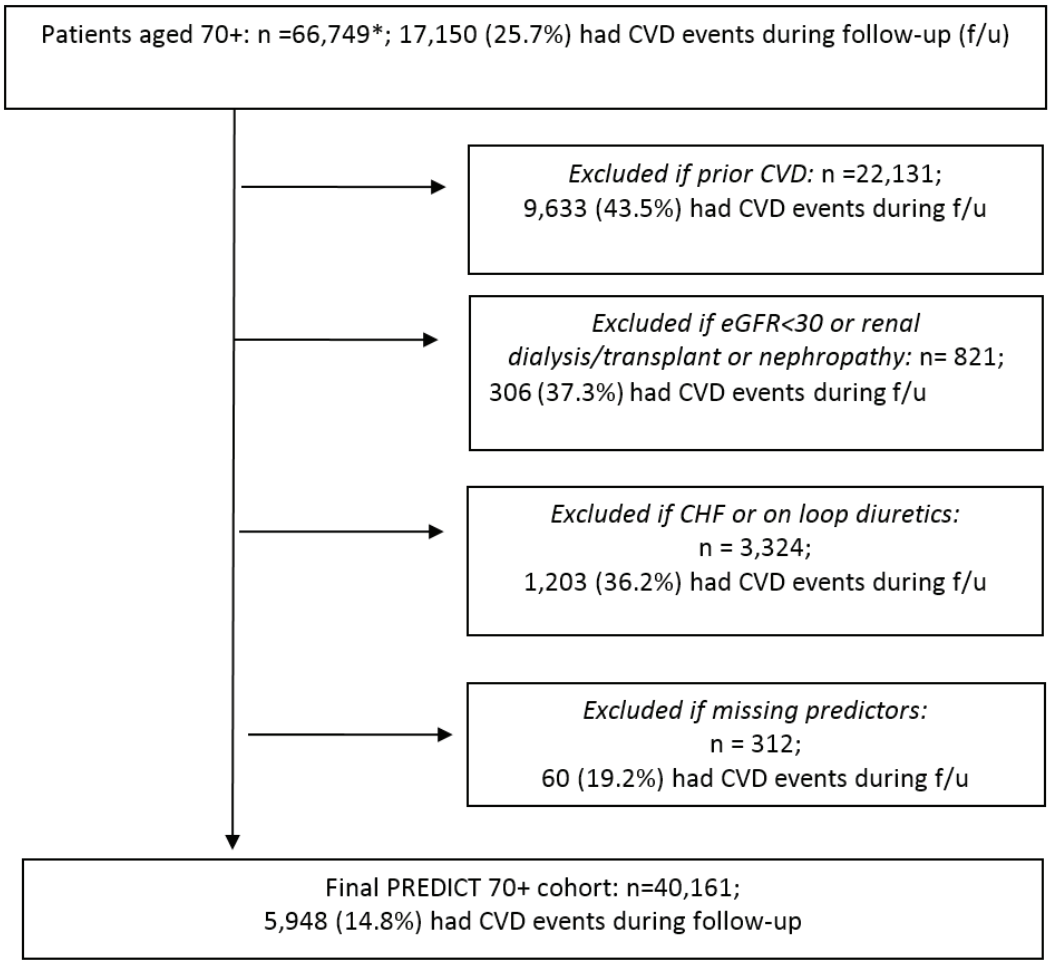
Ethics approval

Approved by the Northern Region Ethics Committee Y in 2003 (AKY/03/12/314) with subsequent annual approval by the National Multi Region Ethics Committee since 2007 (MEC07/19/EXP).

Results

After applying exclusion criteria, 40,161 participants aged 70 years or over had a baseline CVD risk assessment between 31 October 2004 and 30 December 2016 (Figure 1, Table 1).

Figure 1: Study exclusions and incidence of CVD events during follow up.



*Excluded if ethnicity recorded as Middle Eastern, Latin American, African or recorded as 'other' or 'unknown' 'MELAA', 'other' or 'unknown' (in 70+ n=542).

During 185,150 person-years follow-up (mean follow-up time 4.6 years), 5,948 (15%) experienced an incident CVD event of which 1,065 (18%) were fatal. The Appendix describes the number and type of CVD event; mostly due to MI (1,690 events; 28.4%), ischaemic stroke (1,154 events; 19.4%) and heart failure (1,107 events; 18.5%). An additional 3,932 people (10%) died from non-CVD causes. The incidence of CVD and fatal non-CVD events increased markedly with increasing five-year age bands.

The majority of the cohort were women (57%), European (76%) and non-smokers (74%). Just over a third were resident in the two most deprived quintiles. In terms of comorbidity, 6% had a history of atrial fibrillation, 18% had diabetes and 18% had a Charlson comorbidity index of one or more. Overall, 51% of the cohort were on BP-lowering medications, 32% on lipid-lowering and 29% on antithrombotic medications. With increasing age there was an increase in the proportion of women, those of European ethnicity, non-smokers, those dispensed BP-lowering medications and people with atrial fibrillation, diabetes and a comorbidity score of one or more, as well as an increase in mean SBP. Only the mean TC/HDL and proportion dispensed lipid-lowering medications decreased with age.

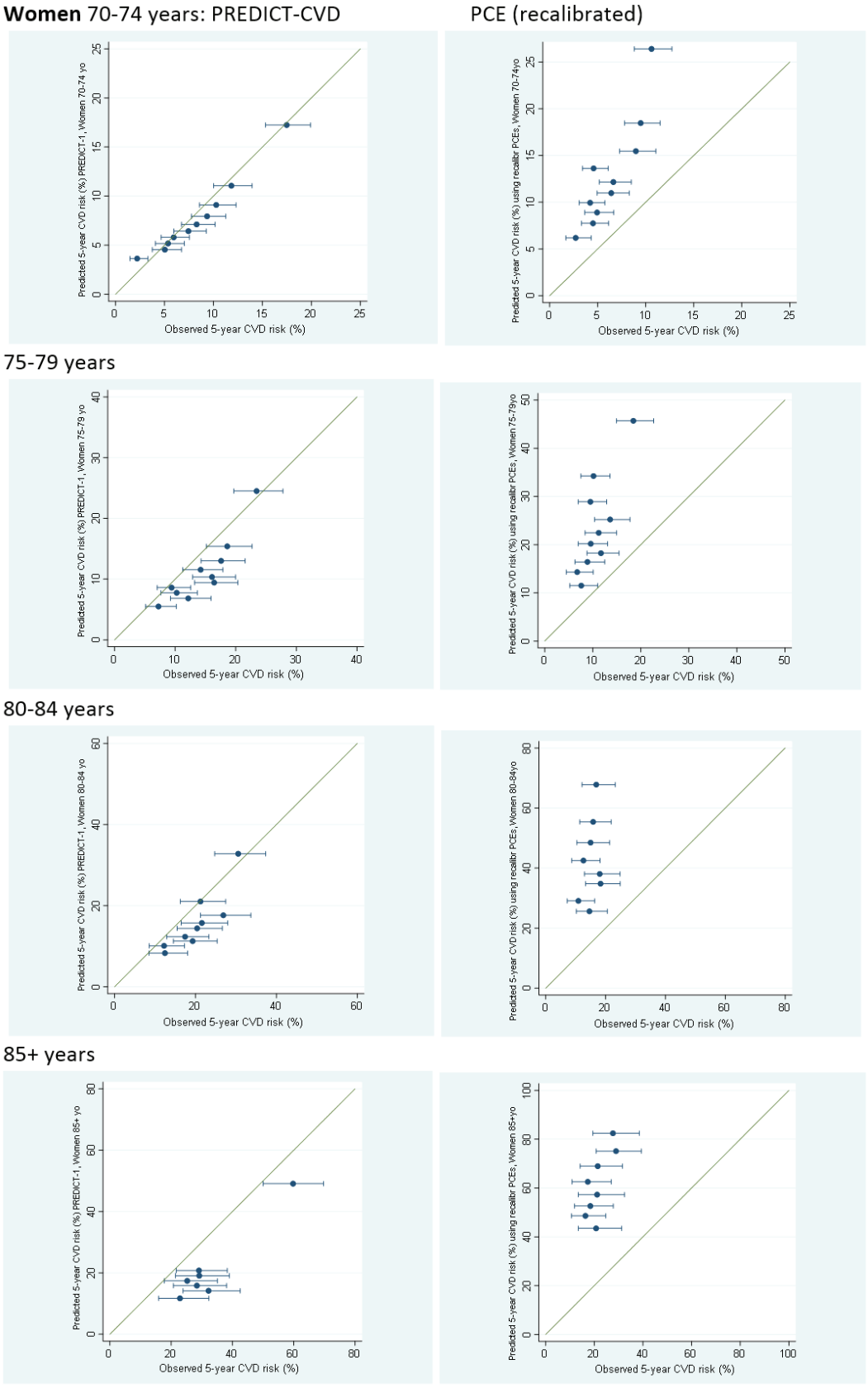
Calibration graphs by decile of predicted risk versus observed five-year CVD event risk for the New Zealand PREDICT-CVD equations and recalibrated PCEs are shown for women (Figure 2) and men (Figure 3) by five-year age groups. In the over 80-year age groups, some deciles could not be plotted according to observed event rate due to insufficient numbers with follow-up at five years.

Table 1: Description of the PREDICT cohort aged 70 years and over.

	Total	70–74 years	75–79 years	80–84 years	85+ years
Median age 73, IQR [71-77], maximum 109 years n (% of cohort) Women	 40,161 22,766 (57%)	 24,795 (62%) 13,630 (55%)	 9,170 (23%) 5,228 (57%)	 4,157 (10%) 2,532 (61%)	 2,039 (5%) 1,376 (68%)
Incident CVD events	5,948 (15%)	2,639 (11%)	1,642 (18%)	1,015 (24%)	652 (32%)
Incidence CVD (per 1,000 per year), median (IQR)	32 (31–33)	23 (22–24)	37 (35–39)	54 (51–58)	85 (78–91)
Non-CVD deaths)	3,932 (10%)	1,517 (6%)	1,036 (11%)	770 (19%)	609 (30%)
Total person-years observed	185,150	114,157	44,599	18,692	7,702
Follow-up time in years; mean (SD), Follow-up time in years; median (IQR)	4.6 (2.3) 4 (3-6)	4.6 (2.2) 4 (3-6)	4.9 (2.3) 5 (3-7)	4.5 (2.3) 4 (3-6)	3.8 (2.2) 4 (2-5)
People with follow-up ≥5 years	15,954	9,506	4,124	1,741	583
Self-identified ethnicity					
European	30,685 (76%)	18,634 (75%)	6,918 (75%)	3,378 (81%)	1,755 (86%)
NZ Māori	1,923 (5%)	1,322 (5%)	434 (5%)	124 (3%)	43 (2%)
Pacific	2,384 (6%)	1,460 (6%)	598 (7%)	253 (6%)	73 (4%)
Indian	1,453 (4%)	993 (4%)	314 (3%)	110 (3%)	36 (2%)
Chinese/other Asian	3,716 (9%)	2,386 (10%)	906 (10%)	292 (7%)	132 (7%)
NZ Deprivation quintile					
1 (least deprived)	9,741 (24%)	6,225 (25%)	2,113 (23%)	947 (23%)	456 (22%)
2	8,638 (22%)	5,472 (22%)	1,974 (22%)	827 (20%)	365 (18%)
3	7,962 (20%)	4,965 (20%)	1,768 (19%)	803 (19%)	426 (21%)
4	7,403 (18%)	4,383 (18%)	1,761 (19%)	835 (20%)	424 (21%
5 (most deprived)	6,417 (16%)	3,750 (15%)	1,554 (17%)	745 (18%)	368 (18%)
Smoking					
Never smoker	29,706 (74%)	18,062 (73%)	6,862 (75%)	3,152 (76%)	1,630 (80%)
Ex-smoker	8,352 (21%)	5,206 (21%)	1,901 (21%)	876 (21%)	369 (18%)
Current smoker	2,103 (5%)	1,527 (6%)	407 (4%)	129 (3%)	40 (2%)
Family history of premature CVD	2,919 (7%)	1,940 (8%)	681 (7%)	209 (5%)	89 (4%)
History of atrial fibrillation	2,197 (6%)	1,048 (4%)	570 (6%)	364 (9%)	215 (11%)
Diabetes	7,382 (18%)	3,625 (15%)	2,165 (24%)	1,085 (26%)	507 (25%)
Charlson comorbidity index					
0	33,094 (82%)	21,168 (85%)	7,406 (81%)	3,128 (75%)	1,392 (68%)
1	1,903 (5%)	1,057 (4%)	458 (5%)	264 (6%)	124 (6%)
2	3,932 (10%)	1,965 (8%)	992 (11%)	584 (14%)	391 (19%)
3+	1,232 (3%)	605 (2%)	314 (3%)	181 (4%)	132 (7%)
Systolic blood pressure, mmHg; mean (SD)	137 (16)	136 (15)	137 (15)	138 (16)	139 (17)
TC/HDL*; mean (SD)	3.7 (1.0)	3.7 (1.0)	3.6 (1.0)	3.5 (1.0)	3.4 (1.0)
Medications at index assessment					
On blood pressure lowering medications	20,505 (51%)	11,372 (46%)	5,219 (57)	2,635 (63%)	1,279 (63%)
On lipid lowering medications	12,663 (32%)	7,479 (30%)	3,279 (36%)	1,394 (34%)	511 (25%)
On antithrombotic medications	11,540 (29%)	6,170 (25%)	3,060 (33%)	1,557 (38%)	753 (37%)

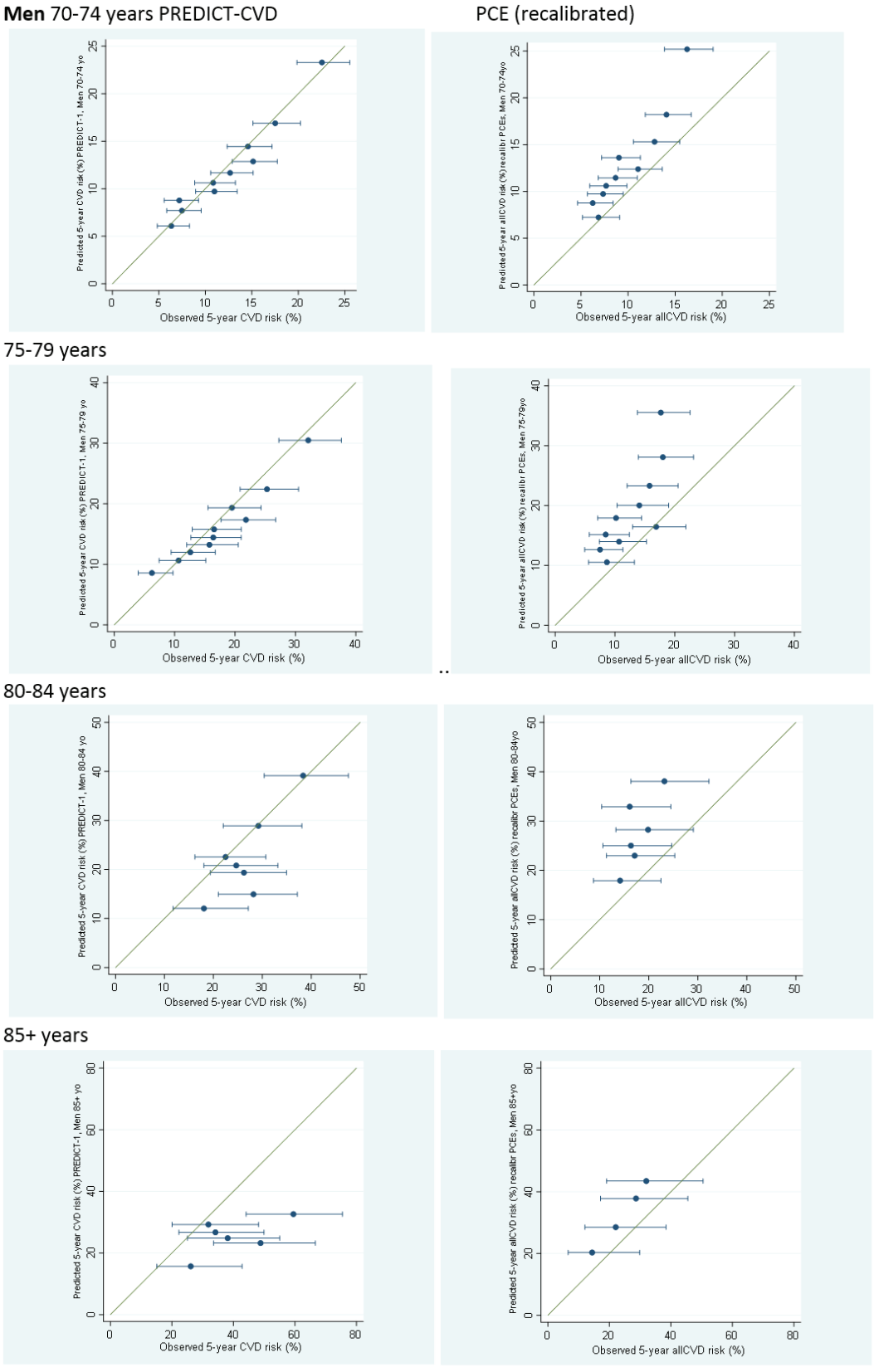
*IQR: interquartile range; SD: standard deviation; CVD: cardiovascular disease; NZ: New Zealand; TC/HDL: Total Cholesterol to HDL Cholesterol ratio.

Figure 2: Calibration plots by decile of predicted risk and observed CVD event risk at five years according to PREDICT-CVD, PCE and recalibrated PCE for women by age group.



A diagonal line with intercept of 0 and slope of 1 represents perfect calibration. Plotted risk deciles below the diagonal represent an underestimate of predicted risk, above the diagonal, an overestimate.

Figure 3: Calibration graphs by decile of predicted risk and observed CVD event risk at five years according PREDICT-CVD, PCE and recalibrated PCE for men by age group.



A diagonal line with intercept of 0 and slope of 1 represents perfect calibration. Plotted risk deciles below the diagonal represent an underestimate of predicted risk, above the diagonal, an overestimate.

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Table 2: Performance metrics of PREDICT-CVD models, by sex and age group.

	Women				Men			
	70–74 years	75–79 years	80–84 years	85+ years	70–74 years	75–79 years	80–84 years	85+ years
Harrell's C	0.638 (0.621, 0.655)	0.586 (0.565, 0.606)	0.577 (0.551, 0.602)	0.582 (0.553, 0.612)	0.617 (0.601, 0.633)	0.624 (0.603, 0.645)	0.557 (0.528, 0.587)	0.530 (0.489, 0.572)
D statistic	0.781 (0.689, 0.873)	0.483 (0.371, 0.595)	0.410 (0.277, 0.543)	0.512 (0.353, 0.671)	0.615 (0.529, 0.701)	0.638 (0.522, 0.754)	0.307 (0.150, 0.464)	0.226 (0.010, 0.442)
R^2	13% (9%, 16 %)	5% (3%, 8%)	4% (2%, 7%)	6% (3%, 10%)	8% (6%, 10%)	9% (6%, 13%)	2% (0%, 4%)	1% (0%, 4%)

For women, PREDICT-CVD was well calibrated for those aged 70–74 years but underestimated CVD risk for women aged 75–84 years with the exception of those in the highest deciles of risk. Among those aged 85 years and over, underestimation of risk was also observed as well as suggesting poor discrimination by decile of risk (ie, risk deciles clustered over a similar observed five-year event rate). In contrast, the recalibrated PCEs overestimated CVD risk across all age groups. For those over 80 years, while predicted risk deciles were well separated, they were also stacked above the same observed event rate, indicating poor discrimination as well as poor calibration.

For men, PREDICT-CVD was reasonably well calibrated for those aged 70–79 years but underestimated CVD risk for men aged 80–84 years with the exception of those in the three highest deciles of risk, and underestimated CVD risk for all aged 85 years and over as well as showing poor discrimination. The PCEs overestimated CVD risk across all age groups from 70–84 years. However, in the 85+ age group, in the deciles with sufficient participants at five years of follow-up, overestimation with the recalibrated PCEs was less marked than at younger age groups.

Tables 2 and 3 summarise the discrimination metrics by age group and sex for PREDICT-CVD and PCEs. The discrimination and overall performance were generally poor for both equations in people over age 75 years.

Discussion

This study investigated the performance of contemporary CVD risk prediction equations in a cohort of 40,161 ambulatory people aged 70 years and over who had a heart health check, while visiting their GP. Over a third of the cohort were aged over 74 years. While both the calibration and discrimination performance of the equations varied, in general they performed increasingly poorly in people over 75 years of age, particularly the PCEs.

This is the first study comparing the performance of contemporary CVD risk equations in a cohort of older people whose GPs had decided to risk assess them in a routine practice setting. Previous studies have been based on either total general practice population samples,[20] population-based health surveys[21] or combined cohort studies populations.[9,22] Our study

Table 3: Performance metrics of PCE models, by sex and age group.

	Women				Men			
	70–74 years	75–79 years	80–84 years	85+ years	70–74 years	75–79 years	80–84 years	85+ years
Harrell's C	0.611 (0.590, 0.631)	0.568 (0.541, 0.594)	0.536 (0.504, 0.567)	0.565 (0.525, 0.605)	0.593 (0.573, 0.612)	0.590 (0.563, 0.617)	0.551 (0.513, 0.588)	0.554 (0.503, 0.605)
D statistic	0.615 (0.505, 0.725)	0.367 (0.228, 0.506)	0.272 (0.103, 0.441)	0.386 (0.176, 0.596)	0.468 (0.358, 0.558)	0.444 (0.301, 0.587)	0.337 (0.141, 0.533)	0.371 (0.099, 0.643)
R^2	8% (6%, 12%)	3% (1%, 7%)	2% (0%, 5%)	3% (1%, 8%)	5% (2%, 7%)	4% (2%, 8%)	3% (1%, 6%)	3% (1%, 9%)

reported comorbidity and non-CVD deaths across our total cohort and in five-year age bands. While some comorbidities have been reported in previous evaluations of some equations,[20] none have reported how these factors, that are likely to influence the accuracy of risk assessment in the elderly, change with increasing age. Furthermore, previous evaluations of equation performance in older people have used wide age bands, which can mask significant differences by age, given the diminishing numbers of people in increasingly older age bands.[20,22]

There are other CVD risk prediction equations recommended for use in older patients. These include QRISK3 developed by UK researchers for people aged 25–84 years;[20] Systematic COronary Risk Evaluation in older people (SCORE O.P.) developed by European researchers for people aged 65–80 years;[22] and the Canadian CVD Population Risk Tool (CVDPoRT) for ages 20–105.[21] The QRISK3 model includes over 20 predictor variables,[20] many of which we were unable to incorporate given our more limited CVD profile data. Similarly, the Canadian CVDPoRT equation, derived from large population health surveys includes many lifestyle factors also not captured in our primary care-derived dataset.[21] We considered assessing the performance of SCORE O.P. equations, derived in people aged 65–80 years, but it only predicts CVD mortality and many patients are also concerned about the impact of non-fatal major CVD events. Moreover, diabetes is not included as a predictor, yet a quarter of the PREDICT cohort over 75 years had diabetes.

It has previously been reported that CVD risk prediction equations developed and validated in younger age cohorts may not perform well when applied to populations aged 75 and older due to competing risks.[23] Most equations do not incorporate the effect of other comorbid conditions or polypharmacy on CVD risk and competing risks of death from cancer or dementia. These competing risk events (non-CVD death events, which preclude an individual from experiencing a CVD event) become increasingly important with age. Indeed 10% of our study cohort died from non-CVD causes. For older age cohorts, where mortality rates are comparatively high, equations that treat non-CVD events as competing risks are likely to be needed to achieve more accurate risk prediction.[23]

The major strength of this study is also its major limitation. Participants were those older people, who, in the clinical judgement of primary care clinicians, were suitable for a routine preventive CVD risk assessment. While 90% of all New Zealanders aged 30–74 years have had a CVD risk assessment,[24] many of the older people in our cohort have been risk assessed largely at the discretion of their primary care provider. Therefore they are not representative of all older people in the study region, because risk assessment would not be clinically appropriate for many of those not included (eg, those with dementia or requiring palliative care). We estimated that 50% of people aged 75–79 years, 30% aged 80–84 years and 25% of those aged 85 years and over, who did not have prior CVD, were included in our study. A further limitation is the use of the Charlson comorbidity index, modified to the extent that only 9 of the 12 comorbidities could be present in the study cohort (heart failure, stroke, renal disease being excluded). While the index has been validated in a New Zealand population, it suffers from including a very limited range of hospitalised-only long-term conditions and therefore underestimates the true multimorbidity burden in primary care. Indeed the prevalence of multimorbidity in the 65–84 year age group has been found to be as much as 65% in Scottish general practices.[25] This is particularly relevant as most CVD risk prediction equations, and CVD risk management guidelines, tend to take a narrow disease-focused approach.[26]

This paper poses a series of clinical implications to current CVD risk prediction practice. Many older people are still engaged in the workforce and physically active. In the current Ministry of Health CVD guidance,[6] healthy people over 75 years with few comorbidities and an estimated life expectancy of more than five years, CVD risk assessment using the PREDICT equations are recommended as well as discussing the same management options as for people under 75 years of age. However, although CVD risk factors have similar effects in those under and over 75 years,[22,27] risk assessment and management is more complex for older age groups as health status, physical and

cognitive functioning varies greatly.[28] The risk of other long-term conditions increases with age[25] and this in turn is associated with polypharmacy and complicated medication regimens.[29,30] In this context, the risks and benefits of CVD risk-reducing interventions is accompanied by less certainty. Some treatment-related risks will increase, such as bleeding with aspirin, requiring clinicians to vary their advice.[30] Furthermore, general health and functioning such as frailty, cognitive impairment, quality of life and personal preferences need to be taken into account. Older people may be more concerned about the risk of stroke than MI, as stroke may result in mental and physical disability and loss of independence, so single CVD outcomes (eg, stroke), as well as composite CVD outcomes, may be useful to guide discussions. The emerging guidance on how best to manage multimorbidity might offer a way forward here, with its focus on realistic treatment goals shared between clinician and patient and the need to recognise preference sensitive decisions (eg, medication that may benefit one condition but may make another worse).[31–33]

From this study of presumed healthy older people being risk assessed in general practice, we have found that the performance of the CVD equations derived mainly in people under age 75 years need to be improved to support clinical decision-making for people aged 75 years and over. We recommend that CVD equations used in people over 75 years incorporate factors such as multimorbidity and competing risks with additional risk-benefit tools taking into account physical and cognitive functioning and patient preferences.

Appendix

Number and type of incident CVD events in the PREDICT-1° patients, 70+ years old men and women

Outcome type	Total	Non-fatal events, n	Fatal events, n	Proportion of all CVD events, %
Myocardial infarction	1,690	1244	446	28.4
Unstable angina	165	161	4	2.8
Other coronary heart disease	522	478	44	8.8
Congestive heart failure	1,107	1053	54	18.5
Ischaemic stroke	1,154	908	246	19.4
Haemorrhagic stroke	241	145	96	4.1
Transient ischemic attack	558	552	6	9.4
Other cerebrovascular disease	16	16	0	0.3
Peripheral vascular disease	386	326	60	6.5
Other CVD-related deaths	109	NA	109	1.8
All CVD events[a]	5,948	4,883	1,065	100

[a]If a patient had more than one type of CVD event, only the first was counted.

Medications available in New Zealand according to the CVD treatment categories of interest

	Class of blood pressure-lowering drugs*					
	ACE inhibitor	**ARB**	**Beta blocker**	**CCB**	**Other**	**Thiazide**
Medication name	Benazepril Captopril Cilazapril Enalapril Lisinopril Perindopril Quinapril Trandolapril	Candesartan Losartan	Acebutolol Alprenolol Atenolol Bisoprolol Carvedilol Celiprolol Labetalol Metoprolol Nadolol Oxprenolol Pindolol Propranolol Sotalol Timolol	Amlodipine Diltiazem Felodipine Isradipine Nifedipine Verapamil	Amiloride Clonidine Clopamide Hydralazine Methyldopa Triamterene	Bendrofluazide Chlorthalidone Chlorothiazide Cyclopenthiazide Hydrochlorothiazide Indapamide Methyclothiazide

*Alpha blockers, loop diuretics (bumetanide, frusemide), metolazone and spironolactone excluded as primary indication not usually to reduce blood pressure.

	Class of lipid-lowering drugs	
	Statin	**Other lipid lowering treatment**
Medication name	Atorvastatin Fluvastatin Pravastatin Simvastatin	Acipimox Bezafibrate Cholestyramine Clofibrate Colestipol Ezetimibe Ezetimibe with simvastatin Gemfibrozil Nicotinic acid

	Class of antithrombotic drugs	
	Antiplatelets	**Anticoagulants**
Medication name	Aspirin Clopidogrel Dipyridamole Prasugrel Ticagrelor Ticlopidine	Dabigatran Phenindione Rivaroxaban Warfarin

International Classification of Disease-10-Australian Modification (ICD-10-AM) codes for the PREDICT-1° CVD events outcome, from hospital discharge and mortality records

Outcome type	ICD-10-AM codes
Haemorrhagic stroke	I600 - I616, I618 - I619
Congestive heart failure	I110, I130, I132, I50, I500, I501, I509
Coronary heart disease	I200, I201, I208 – I209, I210 - I214, I219 - I222, I228 - I236, I238, I240, I248, I249, I253-I256, I460, I469
Cerebral vascular disease	I630 - I636, I638 - I639, I64 , G450 - G453, G458 - G459, G460 - G468, I660 - I664, I668 - I670, I672
Peripheral vascular disease	E1050 - E1052, E1150 - E1152, E1350 - E1352, E1451 - E1452, I650 - I653, I658 - I659, I7021-I7024, I7100 - I7103, I711, I713, I715, I718, I739 - I745, I748 - I749
Other ischaemic CVD-related deaths	E1053, E1059, E1153, E1159, E1353, E1359, E1453, E1459, I250, I2510-I2513, I258, I259, I461, I672, I690, I691, I693, I694, I698, I700, I701, I7020, I708, I709, I714, I716

International Classification of Disease-10-Australian Modification (ICD-10-AM) codes for the PCEs hard atherosclerotic CVD outcome,* from hospital discharge and mortality records.

Outcome type	ICD-10-AM codes
Myocardial infarction	I210, I211 - I214, I219 - I221, I228, I229
Other coronary heart disease	I201, I208, I209, I230, I231, I232, I233, I234, I235, I236, I238, I240, I248, I249, I252, I253, I254, I255, I256, I460, I469,
Ischaemic stroke	I630 - I636, I638, I639, I64
Haemorrhagic stroke	I600 - I616, I618, I619

*Both fatal and nonfatal events with myocardial infarction and stroke codes were included but only fatal events with 'Other coronary heart disease' codes.

ICD 10 codes included in the definition of prior CVD

CODE	DESCRIPTION FULL
G460	Middle cerebral artery syndrome (I66.0+)
G461	Anterior cerebral artery syndrome (I66.1+)
G462	Posterior cerebral artery syndrome (I66.2+)
G463	Brain stem stroke syndrome (I60-I67+)
G464	Cerebellar stroke syndrome (I60-I67+)
G465	Cerebellar stroke syndrome (I60-I67+)
G466	Pure sensory lacunar syndrome (I60-I67+)
G467	Other lacunar syndromes (I60-I67+)
G468	Other vascular syndromes of brain in cerebrovascular diseases (I60-I67+)
I651	Occlusion and stenosis of basilar artery
I660	Occlusion and stenosis of middle cerebral artery

I661	Occlusion and stenosis of anterior cerebral artery
I662	Occlusion and stenosis of posterior cerebral artery
I663	Occlusion and stenosis of cerebellar arteries
I664	Occlusion and stenosis of multiple and bilateral cerebral arteries
I668	Occlusion and stenosis of other cerebral artery
I669	Occlusion and stenosis of unspecified cerebral artery
I670	Dissection of cerebral arteries, nonruptured
I672	Cerebral atherosclerosis
I698	Sequelae of other and unspecified cerebrovascular diseases
G450	Vertebro-basilar artery syndrome
G451	Carotid artery syndrome (hemispheric)
G452	Multiple and bilateral precerebral artery syndromes
G453	Amaurosis fugax
G458	Other transient cerebral ischaemic attacks and related syndromes
G459	Transient cerebral ischaemic attack, unspecified
I630	Cerebral infarction due to thrombosis of precerebral arteries
I631	Cerebral infarction due to embolism of precerebral arteries
I632	Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries
I633	Cerebral infarction due to thrombosis of cerebral arteries
I634	Cerebral infarction due to embolism of cerebral arteries
I635	Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries
I636	Cerebral infarction due to cerebral venous thrombosis, nonpyogenic
I638	Other cerebral infarction
I639	Cerebral infarction, unspecified
I64	Stroke, not specified as haemorrhage or infarction
I693	Sequelae of cerebral infarction
I694	Sequelae of stroke, not specified as haemorrhage or infarction
I600	Subarachnoid haemorrhage from carotid siphon and bifurcation
I601	Subarachnoid haemorrhage from middle cerebral artery
I602	Subarachnoid haemorrhage from anterior communicating artery
I603	Subarachnoid haemorrhage from posterior communicating artery
I604	Subarachnoid haemorrhage from basilar artery
I605	Subarachnoid haemorrhage from vertebral artery
I606	Subarachnoid haemorrhage from other intracranial arteries
I607	Subarachnoid haemorrhage from intracranial artery, unspecified
I608	Other subarachnoid haemorrhage
I609	Subarachnoid haemorrhage, unspecified

I610	Intracerebral haemorrhage in hemisphere, subcortical
I611	Intracerebral haemorrhage in hemisphere, cortical
I612	Intracerebral haemorrhage in hemisphere, unspecified
I613	Intracerebral haemorrhage in brain stem
I614	Intracerebral haemorrhage in cerebellum
I615	Intracerebral haemorrhage, intraventricular
I616	Intracerebral haemorrhage, multiple localized
I618	Other intracerebral haemorrhage
I619	Intracerebral haemorrhage, unspecified
I690	Sequelae of subarachnoid haemorrhage
I691	Sequelae of intracerebral haemorrhage
3270000	Carotid bypass using vein
3270001	Carotid-carotid bypass using vein
3270002	Carotid-subclavian bypass using vein
3270003	Carotid-vertebral bypass using vein
3270004	Aorto-subclavian-carotid bypass using vein
3270005	Carotid bypass using synthetic material
3270006	Carotid-carotid bypass using synthetic material
3270007	Carotid-vertebral bypass using synthetic material
3270008	Carotid-subclavian bypass using synthetic material
3270009	Aorto-carotid bypass using synthetic material
3270010	Aorto-carotid-brachial bypass using synthetic material
3270011	Aorto-subclavian-carotid bypass using synthetic material
3270300	Resection of carotid artery with re-anastomosis
3270800	Aorto-femoral bypass using synthetic material
3270801	Aorto-femoro-femoral bypass using synthetic material
3270802	Aorto-iliac bypass using synthetic material
3270803	Aorto-ilio-femoral bypass using synthetic material
3271200	Ilio-femoral bypass using vein
3271201	Ilio-femoral bypass using synthetic material
3271500	Subclavian-femoral bypass using synthetic material
3271501	Subclavian-femoro-femoral bypass using synthetic material
3271502	Axillo-femoral bypass using synthetic material
3271503	Axillo-femoro-femoral bypass using synthetic material
3271800	Ilio-femoral crossover bypass
3271801	Femoro-femoral crossover bypass
3273000	Mesenteric bypass using vein, single vessel

3273001	Mesenteric bypass using synthetic material, single vessel
3273300	Mesenteric bypass using vein, multiple vessels
3273301	Mesenteric bypass using synthetic material, multiple vessels
3273600	Other procedures on inferior mesenteric artery
3273900	Femoral artery bypass using vein, above knee
3274200	Femoral artery bypass using vein, below knee
3274500	Femoral artery bypass using vein, to tibio-peroneal trunk, tibial or peroneal artery
3274800	Femoral artery bypass using vein, within 5cm of ankle
3275100	Femoral artery bypass using synthetic material, above knee
3275101	Femoral artery bypass using synthetic material, below knee
3275102	Femoral artery bypass using synthetic material, to tibio-peroneal trunk, tibial or peroneal artery
3275103	Femoral artery bypass using synthetic material, within 5 cm of ankle
3275400	Femoro-femoral bypass using composite graft
3275401	Femoro-popliteal bypass using composite graft
3275402	Femoral to tibial or peroneal artery bypass using composite graft
3275700	Femoral artery sequential bypass using vein
3275701	Femoral artery sequential bypass using synthetic material
3276300	Other arterial bypass using vein
3276301	Other arterial bypass graft using synthetic material
3276302	Subclavian-vertebral bypass using vein
3276303	Subclavian-axillary bypass using vein
3276305	Aorto-coeliac bypass using vein
3276306	Aorto-femoro-popliteal bypass using vein
3276307	Ilio-iliac bypass using vein
3276308	Popliteal-tibial bypass using vein
3276309	Aorto-subclavian bypass using synthetic material
3276310	Subclavian-subclavian bypass using synthetic material
3276311	Subclavian-vertebral bypass using synthetic material
3276312	Subclavian-axillary bypass using synthetic material
3276313	Axillo-axillary bypass using synthetic material
3276314	Axillo-brachial bypass using synthetic material
3276316	Aorto-coeliac bypass using synthetic material
3276317	Aorto-femoro-popliteal bypass using synthetic material
3276318	Ilio-iliac bypass using synthetic material
3276319	Popliteal-tibial bypass using synthetic material
3305000	Replacement of popliteal aneurysm using vein

3305500	Replacement of popliteal aneurysm using synthetic graft
3307500	Repair of aneurysm in neck
3308000	Repair of intra-abdominal aneurysm
3310000	Replacement of carotid artery aneurysm with graft
3311200	Replacement of suprarenal abdominal aorta aneurysm with graft
3311500	Replacement of infrarenal abdominal aortic aneurysm with tube graft
3311800	Replacement of infrarenal abdominal aortic aneurysm with bifurcation graft to iliac arteries
3312100	Replacement of infrarenal abdominal aortic aneursym with bifurcation graft to femoral arteries
3312400	Replacement of iliac artery aneurysm with graft, unilateral
3312700	Replacement of iliac artery aneurysm with graft, bilateral
3313000	Excision and repair of visceral artery aneurysm with direct anastomosis
3315100	Replacement of ruptured suprarenal abdominal aortic aneurysm with graft
3315400	Replacement of ruptured infrarenal abdominal aortic aneurysm with tube graft
3315700	Replacement of ruptured infrarenal aortic aneurysm with bifurcation graft to iliac arteries
3316000	Replacement of ruptured infrarenal abdominal aortic aneurysm with bifurcation graft to femoral arteries
3316300	Replacement of ruptured iliac artery aneurysm with graft
3317200	Replacement of other major artery aneurysm with graft
3317800	Repair of ruptured aneurysm in neck
3318100	Repair of ruptured intra-abdominal aneurysm
3350000	Carotid endarterectomy
3350600	Innominate endarterectomy
3350601	Subclavian endarterectomy
3350900	Aorta endarterectomy
3351200	Aorto-iliac endarterectomy
3351500	Aorto-femoral endarterectomy
3351501	Ilio-femoral endarterectomy, bilateral
3351800	Iliac endarterectomy
3352100	Ilio-femoral endarterectomy, unilateral
3352400	Renal endarterectomy, unilateral
3352700	Renal endarterectomy, bilateral
3353000	Coeliac endarterectomy
3353001	Superior mesenteric endarterectomy
3353300	Coeliac and superior mesenteric endarterectomy
3353600	Inferior mesenteric endarterectomy

3353900	Endarterectomy of extremities
3354200	Extended endarterectomy of deep femoral artery
3354800	Patch graft of artery using vein
3354801	Patch graft of artery using synthetic material
3354802	Patch graft of vein using vein
3354803	Patch graft of vein using synthetic material
3355100	Procurement of vein from limb for patch graft
3355400	Endarterectomy in conjunction with arterial bypass to prepare site for anastomosis
3530000	Percutaneous transluminal balloon angioplasty of 1 peripheral artery or vein of 1 limb
3530301	Percutaneous transluminal balloon angioplasty of aortic visceral branches
3530304	Percutaneous transluminal balloon angioplasty of 2 or more peripheral arteries or veins of 1 limb
3530306	Percutaneous transluminal balloon angioplasty
3530307	Open transluminal balloon angioplasty
3530600	Percutaneous insertion of 1 stent into single peripheral artery or vein of 1 limb
3530601	Percutaneous insertion of 2 or more stents into single peripheral artery or vein of 1 limb
3530602	Percutaneous insertion of 2 or more stents into multiple peripheral arteries or veins of 1 limb
3530700	Percutaneous transluminal angioplasty of single carotid artery, single stent
3530701	Percutaneous transluminal angioplasty of single carotid artery, multiple stents
3530900	Percutaneous insertion of 1 stent into single visceral artery or vein
3530901	Percutaneous insertion of 2 or more stents into single visceral artery or vein
3530902	Percutaneous insertion of 2 or more stents into multiple visceral arteries or veins
3530906	Percutaneous transluminal balloon angioplasty with stenting, single stent
3530907	Percutaneous transluminal balloon angioplasty with stenting, multiple stents
3530908	Open transluminal balloon angioplasty with stenting, single stent
3530909	Open transluminal balloon angioplasty with stenting, multiple stents
3531200	Percutaneous peripheral artery atherectomy
3531201	Open peripheral artery atherectomy
3531500	Percutaneous peripheral laser angioplasty
3531501	Open peripheral laser angioplasty
9021100	Subclavian-vertebral bypass using vein
9021101	Subclavian-axillary bypass using vein
9021102	Spleno-renal bypass using vein
9021103	Aorto-coeliac bypass using vein
9021104	Aorto-femoro-popliteal bypass using vein
9021105	Ilio-iliac bypass using vein

9021106	Popliteal-tibial bypass using vein
9021200	Aorto-subclavian bypass using synthetic material
9021201	Subclavian-subclavian bypass using synthetic material
9021202	Subclavian-vertebral bypass using synthetic material
9021203	Subclavian-axillary bypass using synthetic material
9021204	Axillo-axillary bypass using synthetic material
9021205	Axillo-brachial bypass using synthetic material
9021206	Spleno-renal bypass using synthetic material
9021207	Aorto-coeliac bypass using synthetic material
9021208	Aorto-femoro-popliteal bypass using synthetic material
9021209	Ilio-iliac bypass using synthetic material
9021210	Popliteal-tibeal bypass using synthetic material
9022900	Other endarterectomy
9023000	Embolectomy or thrombectomy of other artery
9023100	Replacement of occluded non-infected prosthetic bypass graft from trunk
Z958	Presence of other cardiac and vascular implants and grafts
Z959	Presence of cardiac and vascular implant and graft, unspecified
E1050	Insulin-dependent diabetes mellitus with peripheral circulatory complications, not stated as uncontrolled
E1051	Insulin-dependent diabetes mellitus with peripheral circulatory complications, stated as uncontrolled
E1052	Type 1 diabetes mellitus with peripheral angiopathy, with gangrene
E1150	Non-insulin-dependent diabetes mellitus with peripheral circulatory complications, not stated as uncontrolled
E1151	Non-insulin-dependent diabetes mellitus with peripheral circulatory complications, stated as uncontrolled
E1152	Type 2 diabetes mellitus with peripheral angiopathy, with gangrene
E1350	Other specified diabetes mellitus with peripheral circulatory complications, not stated as uncontrolled
E1351	Other specified diabetes mellitus with peripheral circulatory complications, stated as uncontrolled
E1352	Other specified diabetes mellitus with peripheral angiopathy, with gangrene
E1451	Unspecified diabetes mellitus with peripheral circulatory complications, stated as uncontrolled
E1452	Unspecified diabetes mellitus with peripheral angiopathy, with gangrene
I650	Occlusion and stenosis of vertebral artery
I652	Occlusion and stenosis of carotid artery
I653	Occlusion and stenosis of multiple and bilateral precerebral arteries

I658	Occlusion and stenosis of other precerebral artery
I659	Occlusion and stenosis of unspecified precerebral artery
I700	Atherosclerosis of aorta
I701	Atherosclerosis of renal artery
I7020	Atherosclerosis of arteries of extremities, unspecified
I7021	Atherosclerosis of arteries of extremities with intermittent claudication
I7022	Atherosclerosis of arteries of extremities with rest pain
I7023	Atherosclerosis of arteries of extremities with ulceration
I7024	Atherosclerosis of arteries of extremities with gangrene
I708	Atherosclerosis of other arteries
I709	Generalized and unspecified atherosclerosis
I7100	Dissection of aorta, unspecified site
I7101	Dissection of thoracic aorta
I7102	Dissection of abdominal aorta
I7103	Dissection of thoracoabdominal aorta
I711	Thoracic aortic aneurysm, ruptured
I713	Abdominal aortic aneurysm, ruptured
I714	Abdominal aortic aneurysm, without mention of rupture
I715	Thoracoabdominal aortic aneurysm, ruptured
I716	Thoracoabdominal aortic aneurysm, without mention of rupture
I718	Aortic aneurysm of unspecified site, ruptured
I739	Peripheral vascular disease, unspecified
I740	Embolism and thrombosis of abdominal aorta
I741	Embolism and thrombosis of other and unspecified parts of aorta
I742	Embolism and thrombosis of arteries of upper extremities
I743	Embolism and thrombosis of arteries of lower extremities
I744	Embolism and thrombosis of arteries of extremities, unspecified
I745	Embolism and thrombosis of iliac artery
I748	Embolism and thrombosis of other arteries
I749	Embolism and thrombosis of unspecified artery
3530401	Open transluminal balloon angioplasty of 1 coronary artery
3530501	Open transluminal balloon angioplasty of 2 or more coronary arteries
3531003	Open insertion of 1 transluminal stent into single coronary artery
3531004	Open insertion of 2 or more transluminal stents into single coronary artery
3531005	Open insertion of 2 or more transluminal stents into multiple coronary arteries
3845619	Other intrathoracic procedures on arteries of heart without cardiopulmonary bypass

3850500	Open coronary endarterectomy
3850700	Left ventricular aneurysmectomy
3850700	Left ventricular aneurysmectomy
3850800	Left ventricular aneurysmectomy with patch graft
3850900	Repair of ventricular septal rupture
3849700	Coronary artery bypass, using 1 saphenous vein graft
3849701	Coronary artery bypass, using 2 saphenous vein grafts
3849702	Coronary artery bypass, using 3 saphenous vein grafts
3849703	Coronary artery bypass, using 4 or more saphenous vein grafts
3849704	Coronary artery bypass, using 1 other venous graft
3849705	Coronary artery bypass, using 2 other venous grafts
3849706	Coronary artery bypass, using 3 other venous grafts
3849707	Coronary artery bypass, using 4 or more venous grafts
3850000	Coronary artery bypass, using 1 LIMA graft
3850001	Coronary artery bypass, using 1 RIMA graft
3850002	Coronary artery bypass, using 1 radial artery graft
3850003	Coronary artery bypass, using 1 epigastric artery graft
3850004	Coronary artery bypass, using 1 other arterial graft
3850300	Coronary artery bypass, using 2 LIMA grafts
3850301	Coronary artery bypass, using 2 RIMA grafts
3850302	Coronary artery bypass, using 2 radial artery grafts
3850303	Coronary artery bypass, using 2 epigastric artery grafts
3850304	Coronary artery bypass, using 2 or more other arterial grafts
3850500	Open coronary endarterectomy
3863700	Re-operation for reconstruction of occluded coronary artery
9020100	Coronary artery bypass, using 1 other material graft, not elsewhere classified
9020101	Coronary artery bypass, using 2 other material grafts, not elsewhere classified
9020102	Coronary artery bypass, using 3 other material grafts, not elsewhere classified
9020103	Coronary artery bypass, using 4 or more other material grafts, not elsewhere classified
Z951	Presence of aortocoronary bypass graft
3530400	Percutaneous transluminal balloon angioplasty of 1 coronary artery
3530500	Percutaneous transluminal balloon angioplasty of 2 or more coronary arteries
3531000	Percutaneous insertion of 1 transluminal stent into single coronary artery
3531001	Percutaneous insertion of 2 or more transluminal stents into single coronary artery
3531002	Percutaneous insertion of 2 or more transluminal stents into multiple coronary arteries
3830000	Percutaneous transluminal balloon angioplasty of 1 coronary artery

3830600	Percutaneous insertion of 1 transluminal stent into single coronary artery
3830601	Percutaneous insertion of >= 2 transluminal stents into single coronary artery
3830602	Percutaneous insertion of >= 2 transluminal stents into multiple coronary arteries
3830900	Percutaneous transluminal coronary rotational atherectomy [PTCRA], 1 artery
3831200	Percutaneous transluminal coronary rotational atherectomy [PTCRA], 1 artery with insertion 1 stent
3831201	Percutaneous transluminal coronary rotational atherectomy [PTCRA], 1 artery w insertion >= 2 stents
3831500	Percutaneous transluminal coronary rotational atherectomy [PTCRA], multiple arteries
3831800	Percutaneous transluminal coronary rotational atherectomy [PTCRA], multi arteries w insert 1 stent
9021800	Percutaneous transluminal coronary angioplasty with aspiration thrombectomy, 1 artery
9021801	Percutaneous transluminal coronary angioplasty with aspiration thrombectomy, multiple arteries
I110	Hypertensive heart disease with heart failure
I130	Hypertensive heart and renal disease with both (congestive) heart failure and renal failure
I132	Hypertensive heart and renal disease with both (congestive) heart failure and renal failure
I200	Unstable angina
I201	Angina pectoris with documented spasm
I208	Other forms of angina pectoris
I209	Angina pectoris, unspecified
I210	Acute transmural myocardial infarction of anterior wall
I211	Acute transmural myocardial infarction of inferior wall
I212	Acute transmural myocardial infarction of other sites
I213	Acute transmural myocardial infarction of unspecified site
I214	Acute subendocardial myocardial infarction
I219	Acute myocardial infarction, unspecified
I220	Subsequent myocardial infarction of anterior wall
I221	Subsequent myocardial infarction of inferior wall
I222	Subsequent non-ST elevation (NSTEMI) myocardial infarction
I228	Subsequent myocardial infarction of other sites
I229	Subsequent myocardial infarction of unspecified site
I230	Haemopericardium as current complication following acute myocardial infarction
I231	Atrial septal defect as current complication following acute myocardial infarction
I232	Ventricular septal defect as current complication following acute myocardial infarction
I233	Rupture of cardiac wall without haemopericardium as current complication following acute myocardial infarction

I234	Rupture of chordae tendineae as current complication following acute myocardial infarction
I235	Rupture of papillary muscle as current complication following acute myocardial infarction
I236	Thrombosis of atrium, auricular appendage, and ventricle as current complications following acute myocardial infarction
I238	Other current complications following acute myocardial infarction
I240	Coronary thrombosis not resulting in myocardial infarction
I248	Other forms of acute ischaemic heart disease
I249	Acute ischaemic heart disease, unspecified
I250	Atherosclerotic cardiovascular disease, so described
I2510	Atherosclerotic heart disease, of unspecified vessel
I2511	Atherosclerotic heart disease, of native coronary artery
I2512	Atherosclerotic heart disease, of autologous bypass graft
I2513	Atherosclerotic heart disease, of nonautologous biological bypass graft
I252	Old myocardial infarction
I253	Aneurysm of heart
I254	Coronary artery aneurysm
I255	Ischaemic cardiomyopathy
I256	Silent myocardial ischaemia
I258	Other forms of chronic ischaemic heart disease
I259	Chronic ischaemic heart disease, unspecified
I460	Cardiac arrest with successful resuscitation
I469	Cardiac arrest, unspecified
I50	Heart failure
I500	congestive heart failure
I501	Left ventricular failure
I509	Heart failure unspecified
Z955	Presence of coronary angioplasty implant and graft

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REFERENCES:

1. Prince MJ, Wu F, Guo Y, et al. The burden of disease in older people and implications for health policy and practice. Lancet 2015; 385(9967):549–62.
2. Hermanson B, Omenn GS, Kronmal RA, et al. Beneficial six-year outcome of smoking cessation in older men and women with coronary artery disease. Results from the CASS registry. New England Journal of Medicine 1988; 319(21):1365–9.
3. Blood Pressure Lowering Treatment Trialists C, Sundstrom J, Arima H, et al. Blood pressure-lowering treatment based on cardiovascular risk: a meta-analysis of individual patient data. Lancet 2014; 384(9943):591–8.
4. Cholesterol Treatment Trialists C. Efficacy and safety of statin therapy in older people: a meta-analysis of individual participant data from 28 randomised controlled trials. Lancet 2019; 393(10170):407–15.
5. Gueyffier F, Bulpitt C, Boissel JP, et al. Antihypertensive drugs in very old people: a subgroup meta-analysis of randomised controlled trials. INDANA Group. Lancet 1999; 353(9155):793–6.
6. Ministry of Health. Cardiovascular disease risk assessment and management for primary care. Wellington: Ministry of Health, 2018.
7. Wells S, Riddell T, Kerr A, et al. Cohort Profile: The PREDICT Cardiovascular Disease Cohort in New Zealand Primary Care (PREDICT-CVD 19). International Journal of Epidemiology 2015; doi: 10.1093/ije/dyv312 doi: doi: 10.1093/ije/dyv312
8. Pylypchuk R, Wells S, Kerr A, et al. Cardiovascular disease risk prediction equations in 400,000 primary care patients in New Zealand: a derivation and validation study. Lancet 2018; 391(10133):1897–907.
9. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology 2014; 63(25 Pt B):2935–59.
10. Ministry of Health. National Health Index Wellington2015 [Available from: http://www.health.govt.nz/our-work/health-identity/nation-

al-health-index accessed February 5 2015.

11. Chan WC, Wright C, Tobias M, et al. Explaining trends in coronary heart disease hospitalisations in New Zealand: trend for admissions and incidence can be in opposite directions. Heart 2008; 94(12):1589–93.
12. Ministry of Health. Ethnicity data protocols for the Health and Disability Sector. Wellington: Ministry of Health, 2004.
13. Salmond C, Crampton P, Atkinson J. NZDep2006 Index of Deprivation User's Manual. Wellington: ; 2007. Wellington: Department of Public Health, Wellington School of Medicine and Health Sciences, 2007.
14. Quan H, Li B, Couris CM, et al. Updating and validating the Charlson comorbidity index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. American Journal of Epidemiology 2011; 173(6):676–82.
15. Kaplan E, Meier P. Nonparametric estimation from incomplete observations. J Am Stat Assoc 1958; 53:457–81.
16. Crowson C, Atkinson E, Therneau T. Assessing Calibration of Prognostic Risk Scores. Stat Methods Med Res 2016; 25(4):1692–706. doi: . doi:10.1177/0962280213497434.
17. Harrell F, Califf R, Prior D, et al. Evaluating the yield of medical tests. Jounal of American Medical Association 1982; 247:2543–6.
18. Royston P, Sauerbrei W. A new measure of prognostic separation in survival data. Stat Med 2004; 23(5):723–48.
19. StataCorp. Stata Statistical Software. Release 15. College Station, TX: StatCorp LP, 2015.
20. Hippisley-Cox J, Coupland C, Brindle P. Development and validation of QRISK3 risk prediction algorithms to estimate future risk of cardiovascular disease: prospective cohort study. BMJ 2017; 357:j2099. doi: http://dx.doi.org/10.1136/bmj.j2099
21. Manuel DG, Tuna M, Bennett C, et al. Development and validation of a cardiovascular disease risk-prediction model using population health surveys: the Cardiovascular Disease Population Risk Tool (CVDPoRT). CMAJ Canadian Medical Association Journal 2018; 190(29):E871–E82.
22. Cooney MT, Selmer R, Lindman A, et al. Cardiovascular risk estimation in older persons: SCORE O.P. European Journal of Preventive Cardiology 2016; 23(10):1093–103.
23. Wolbers M, Koller MT, Witteman JC, et al. Prognostic models with competing risks: methods and application to coronary risk prediction. Epidemiology 2009; 20(4):555–61. doi: 10.1097/EDE.0b013e3181a39056 [published Online First: 2009/04/16]
24. Ministry of Health. How is My PHO performing? 2015/16 Quarter 4 (January to March) results summary. ed. Wellington: Ministry of Health, 2015.
25. Barnett K, Mercer SW, Norbury M, et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet 2012; 380(9836):37–43.
26. Forman DE, Maurer MS, Boyd C, et al. Multimorbidity in Older Adults With Cardiovascular Disease. Journal of the American College of Cardiology 2018; 71(19):2149–61.
27. Benetos A, Thomas F, Bean KE, et al. Role of modifiable risk factors in life expectancy in the elderly. Journal of Hypertension 2005; 23(10):1803–8.
28. Lowsky DJ, Olshansky SJ, Bhattacharya J, et al. Heterogeneity in healthy aging. J Gerontol A Biol Sci Med Sci 2014; 69(6):640–9. doi: 10.1093/gerona/glt162 [published Online First: 2013/11/20]
29. Calderon-Larranaga A, Poblador-Plou B, Gonzalez-Rubio F, et al. Multimorbidity, polypharmacy, referrals, and adverse drug events: are we doing things well? British Journal of General Practice 2012; 62(605):e821–6. doi: http://dx.doi.org/10.3399/bjgp12X659295
30. Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Archives of Internal Medicine 2002; 162(20):2269–76.
31. American Geriatrics Society. Guiding principles for the care of older adults with multimorbidity: an approach for clinicians: American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity. J Am Geriatr Soc 2012; 60(10):E1–E25. doi: http://dx.doi.org/10.1111/j.1532-5415.2012.04188.x
32. Muth C, van den Akker M, Blom JW, et al. The Ariadne principles: how to handle multimorbidity in primary care consultations. BMC Med 2014; 12:223. doi: http://dx.doi.org/10.1186/s12916-014-0223-1
33. Stokes T. Multimorbidity and clinical guidelines: problem or opportunity? New Zealand Medical Journal 2018; 131(1472):7–9.

Surveillance for dysplasia in patients with inflammatory bowel disease: an updated national survey of colonoscopic practice in New Zealand

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ABSTRACT

BACKGROUND: Patients with inflammatory bowel disease (IBD) undergo surveillance for an increased risk of colorectal cancer. Advances in endoscopy have rendered most previously invisible dysplasia visible, leading to changes in guidelines around surveillance and management of dysplasia. This study aims to assess New Zealand endoscopists' (i) understanding of current guidelines, (ii) uptake of advanced techniques and (iii) management of dysplasia.

METHODS: A digital survey of New Zealand endoscopists was undertaken. Invitations were sent to members of New Zealand gastroenterology and surgical societies. Questions were asked regarding demographics, surveillance interval, risk stratification, endoscopic technique and dysplasia management.

RESULTS: Fifty of the 322 invitees completed the survey (15.5%). Over 80% used techniques meeting the guideline recommendations. The majority (77%) of endoscopists take random biopsies in addition to targeted. Endoscopically resectable polypoid low-grade dysplasia was typically managed with surveillance (93%) but this dropped to less than half for high-grade dysplasia and less than a third for non-polypoid high-grade dysplasia (inconsistent with guidelines).

CONCLUSIONS: Current New Zealand endoscopists' practice appears to be aligned with international guidelines in terms of screening interval, risk stratification and technique. However, New Zealand endoscopists are less likely to offer a patient surveillance for endoscopically resectable dysplasia.

There is an increasing rate of inflammatory bowel disease (IBD) in New Zealand.[1] Patients with IBD are known to have an increased risk of colorectal cancer.[2] This risk is greater with an increased duration, extent or severity of disease.[2–4] The New Zealand Guidelines Group has set out recommendations regarding the timing of screening and surveillance of patients with IBD.[5]

In 2004, a survey of New Zealand endoscopists suggested a relatively poor understanding of the guidelines of the time and a degree of under-estimation of the risk associated with a finding of low-grade dysplasia.[6] Traditional endoscopic techniques available during this period were relatively insensitive for the macroscopic detection of dysplasia and hence relied heavily on extensive random biopsies.[7] Current advances in endoscopic technology and techniques (such as high definition (HD) and chromendoscopy) are significantly more sensitive and have rendered most dysplasia visible.[8] This has allowed more cases to be managed endoscopically, preserving native colon for longer.

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With the Surveillance for Colorectal Endoscopic Neoplasia Detection and Management in Inflammatory Bowel Disease Patients: International Consensus Guidelines (SCENIC) published in 2015, there have been a number of changes made to the nomenclature and management approach. Specifically, there is an increased focus on surveillance as opposed to colectomy for endoscopically resectable lesions.[9] This study aimed to (i) assess the understanding of current IBD surveillance guidelines by New Zealand endoscopists; (ii) establish the prevalence of advanced techniques for dysplasia detection; and (iii) gauge the current attitudes of endoscopists to towards the endoscopic management of dysplasia in the context of IBD in New Zealand.

Methods

A prospective survey of the current practice of New Zealand endoscopists was performed. Ethics approval was granted by the University of Otago Human Ethics Committee (reference code 19/029).

Population

The target population included all endoscopists currently performing IBD surveillance endoscopy in New Zealand. There is no complete register for this so permission was sought to disseminate the survey through the New Zealand Society of Gastroenterology (NZSG), the New Zealand Association of General Surgeons (NZAGS) and the New Zealand branch of the Colorectal Society of Australia and New Zealand (CSSANZ NZ Inc).

Membership of NZSG is voluntary, the NZSG workforce survey published in 2018 estimated that there were 93 practising gastroenterologists in New Zealand. The membership of NZSG currently includes approximately 106 senior medical officers practising in New Zealand as gastroenterologists or physicians. Membership of NZAGS is similarly voluntary; it is estimated that there are 270 practising general surgeons in New Zealand, of which 195 are members of the NZAGS although the proportion of these performing endoscopy regularly is unknown. Membership of CSSANZ is voluntary among colorectal surgeons; 41 are members of the CSSANZ. Some surgeons are members of CSSANZ, NZAGS and NZSG, participants were asked to complete the survey once only.

Survey

The survey consisted of five demographic questions to ensure the correct group was surveyed and ascertain the clinical settings of participants, followed by seven questions pertaining to the participants' clinical practice (see Appendix).

Analysis

Statistics analyses were performed using SPSS version 25. Frequencies, percentages, medians and means were calculated where appropriate. For inferential statistics, chi-squares were performed comparing Speciality (three categories) by variable (two or more categories). In cases within which one of the variables had 0 cases in one of the specialties, Chi-square was artificially made possible by converting the 0s into 1s. Figures were made using Excel.

Results

Response rate and demographics

In total, 305 invitations to participate were sent to members of NZSG, NZAGS and CSSANZ (NZ). A total of 61 (20%) participants started the survey and 50 (16.3% of invitees) completed all of it.

Of the 61 that started the survey, 50 reported being involved in the care of UC patients. The demographics of the participants are represented in Table 1. The majority of respondents (30 of 56 who answered; 54%) do not participate in a regular IBD Multidisciplinary Team meeting. Forty-five percent confirmed a two pathologist review process for dysplasia in their institution (25 of 56), while 46% (16 of 56) didn't know and 9% reported that this was not the case.

Table 1: Demographic groups of respondents.

Demographic	**Number (percentage) n=50**
Colorectal surgeon	31 (62%)
Gastroenterologist	13 (26%)
General surgeon	11 (22%)
Other	1 (2%)

Table 2: General principles of timing and surveillance practice.

Question	Answer	n	%	Total
Time from diagnosis to first colonoscopy in UC[1] pancolitis	8 years	22	40	
	10 years	21	38	
	5 years	8	14.5	
	15 years	2	3.6	
	Other	2	3.6	55
Initial colonoscopy interval in pancolitis	Variable	28	51	
	2 years	16	29	
	1 year	5	9	
	3 years	3	5.4	
	none	3	5.4	55
Factors that would warrant increased surveillance	FH CRC[2]	44	80	
	PSC[3]	43	78.2	
	Poor disease control	40	72.7	
	Prolonged duration of disease	37	67	
	Onset <15 age	18	32.7	
	Crohn's colitis	10	18	55

[1]Ulcerative colitis; [2]family history colorectal cancer; [3]primary sclerosing cholangitis.

Outcomes

Initial surveillance and risk factors

The results of the questions pertaining to initial screening, surveillance interval and risk stratification are presented in Table 2. The majority of respondents answered in accordance with current guidelines that they would initiate surveillance within 8–10 years and employ variable surveillance intervals depending on risk stratification of the individual patient.

Endoscopic technique and the use of random biopsies

Table 3 outlines the prevalence of technique and the use of random biopsies reported by the group. Gastroenterologists were more likely to use chromendoscopy than other groups, however they were still more likely to use HD, white light over all. Forty of the 52 respondents reported taking random biopsies (76.9%) and there was no significant difference between subspecialty in this regard.

Management of dysplasia

The management of an endoscopically completely resected polypoid lesion with low-grade dysplasia (LGD) was predominantly in favour of surveillance (46 of 49; 93.9%), with three recommending colectomy. Polypoid high grade dysplasia (HGD) was managed slightly more commonly with colectomy (n=25 of 48; 52.1%), while colectomy was clearly more likely to be recommended for non-polypoid HGD (n=34 of 49; 69.4%), with no significant difference by subspecialty. When random biopsies identified HGD the majority (n=27/49; 55%) would recommend colectomy, while 12 (24.5%) would repeat an HD colonoscopy with chromendoscopy, nine (18.4%) would refer to an IBD specialist endoscopist and one (2.0%) would repeat SD, white light endoscopy (Table 4). Across these management decisions there was no significant difference between specialist groups.

Table 3: Technical aspects of colonoscopy.

Question	Variable	n	%	Total
Technique used	HD[1] WL[2]	27	52	
	HD chromendoscopy	10	18	
	SD[3] WL	7	13.5	
	SD chromendoscopy	4	7.7	
	Narrow band	2	3.6	
	Other	2	3.6	52
Random biopsies taken?	Yes	40	76.9	
	Mean number of sites			
	8.08; SD[4] 3.44			
	Mean number of biopsies/site			
	3.38; SD 1.25			
	No	12	23.1	52

[1]High definition; [2]white light; [3]standard definition; [4]standard deviation.

Discussion

Surveillance for neoplasia in IBD is a rapidly evolving field driven by advances in understanding and technology. This anonymised survey of New Zealand endoscopists (based on a similar questionnaire performed 15 years ago and recent international consensus guidelines) found a reasonably high compliance with current surveillance guidelines (see Table 5 for a summary of recent guidelines). However, the management of dysplasia is less consistent with guidelines with a tendency to recommended colectomy more often than endoscopic approaches for endoscopically resectable lesions.

Table 4: Management of dysplasia.

Question	Variable	n	%	Total
Management of completely resected polypoid LGD[1]	Surveillance	46	93.9	
	Colectomy	3	6.1	49
Surveillance post-complete resection of polypoid LGD	1 year	20	43.5	
	6 months	13	28.3	
	2 years	5	10.9	
	3 years	5	10.9	
	5 years	1	2.2	
	other	2	4.4	46
Management of completely resected polypoid HGD[2]	Colectomy	25	52.1	
	Surveillance	23	47.9	48
Management of endoscopically resected non-polypoid HGD	Colectomy	34	69.4	
	Surveillance	15	30.6	49
Management of HGD confirmed on random biopsy	Colectomy	27	55.1	
	Repeat HD[3] chromendoscopy	12	29.5	
	Refer IBD[4] specialist endoscopist	9	18.4	
	Repeat SD[5] WL[6] endoscopy	1	2	49

[1]Low-grade dysplasia; [2]high-grade dysplasia; [3]high definition; [4]inflammatory bowel disease; [5]standard definition; [6]white light.

Seventy-eight percent of respondents would commence screening colonoscopy within 8–10 years of diagnosis. The majority of guidelines recommend initial colonoscopy within eight years, however there is discrepancy between guidelines as to whether this is from the "onset of symptoms" (European Crohn's and Colitis Organisation (ECCO)[10] and National Institute for Health Care Excellence (NICE)[11]) or "diagnosis" (American College of Gastroenterology (ACG)[12]). There is reasonable concordance in terms of surveillance interval depending on risk stratification and the individual high-risk factors for this (specifically pancolonic disease, the presence of PSC, disease severity and duration).

There is some debate over the best technique for surveillance with most guidelines recommending HD white light over SD white light and advising the use of chromendoscopy if SD is used.[9,12] Chromendoscopy is recommended by all guidelines, although the recommendation is less strong if HD white light is used.[9–12] The European guideline allows for variation in local expertise and suggests either "chromendoscopy with targeted biopsy" or "random biopsies every 10cm with additional targeted biopsy for visible abnormality".[10] NBI is not recommended by the SCENIC[9] guideline although it is supported by the ACG guideline.[12] By this standard 85% of respondents' answers were supported by acceptable guidelines (72% either HD white light or HD plus chromendoscopy; 8% SD with chromendoscopy and 5% with NBI).

Interestingly, despite the utilisation of advanced techniques by over 80% of respondents, 77% still routinely take random biopsies in addition to targeted biopsies. There is considerable debate regarding the value of additional random biopsies. Random biopsies have significantly lower yield than targeted biopsies and add considerably to the procedure length and histologic processing time.[13] However, in a prospective series of 100 chromendoscopy colonoscopies performed with targeted and random biopsies 12 of 94 patients (10.6%) with dysplasia were detected by random biopsy alone, particularly associated with personal history of colorectal cancer and PSC. The authors suggested random biopsies should be performed in anyone with a personal history of neoplasia, PSC or a "tubular appearing colon" at endoscopy.[14]

Arguably the most significant change in the guidelines has to do with the approach to management of dysplasia, once identified. At the time of the previously undertaken survey, a significant proportion of cases of dysplasia were considered 'invisible' and hence the capacity to safely assess and survey this group was limited. The previous survey suggested that the perception of risk from dysplasia was underestimated and that more people should be considered for colectomy.[6] Since this period, most dysplasia has been rendered 'visible' through the development of more reliable technology and techniques and the pendulum has swung towards surveillance over colectomy for endoscopically resectable dysplasia.[9,10,12] The ACG guidelines even allow for segmental or subtotal colectomies in selected cases.[12]In this survey, over 90% of respondents espouse surveillance for endoscopically resectable polypoid LGD, however this decreases to less than half for polypoid HGD and less than a third in non-polypoid HGD. Where random biopsies demonstrate HGD, most guidelines recommend referral to a specialist endoscopist, however in our sample only 45% would either repeat the colonoscopy or refer to a specialist, while 55% would recommend colectomy. This probably represents an over treatment in our current practice and further education is warranted to bring our practice in line with current guidelines.

This study is limited by a low response rate, particularly among gastroenterologists, although it is hard to truly estimate the national denominator. While the answers do seem to reflect current New Zealand guidelines and do not vary significantly by subspecialty, it is possible this has introduced a non-response bias and does not represent the actual current practice. Response rates to online surveys of medical specialists are currently notoriously low due to lack of time and the excess of surveys. Some groups suggest optimising response rates by offering incentives, however this was not considered appropriate in this setting.[15]

Table 5: Comparison of major recent guidelines.

Guideline	Year	Schedule	Technique	Dysplasia management
American College of Gastroenterology[12]	2019	• Initial screening colonoscopy for patients with disease extending proximal to the rectum from eight years after diagnosis • Surveillance performed at 1–3 years depending on risk stratification • PSC mandates yearly surveillance	• High definition white light suggest chromendoscopy or narrow band imaging • Standard definition white light strongly recommend chromendoscopy or narrow band imaging	• Endoscopically completely resectable lesions may be followed up with surveillance • Consider surgical resection if multiple pseudopolyps make endoscopic management impractical • Selective recommendation for segmental or subtotal resections in appropriate candidates
ECCO[10]	2017	• Initial colonoscopy at eight years from onset of symptoms • If disease extends beyond rectum ongoing surveillance • Follow-up: Low risk five years Intermediate risk 2–3 years High risk (or PSC) one year	Depending on local expertise: • Chromendoscopy with targeted biopsies Or • Random biopsies (quadrantic every 10cm) in addition to biopsies of visible lesions High definition white light should be used if available	• Endoscopically visible: Endoscopic management sufficient for excisable polypoid dysplasia in the absence of non-polypoid or invisible dysplasia Selective endoscopic management of non-polypoid dysplasia (complete resection, no invisible dysplasia or other non-polypoid dysplasia) • 'Endoscopically invisible': Refer to IBD specialist endoscopist If confirmed to be endoscopically undetectable with histologically HGD then consider colectomy
SCENIC[9]	2015	N/A	• High definition white light recommended over standard definition • Chromendoscopy recommended over standard definition or high definition white light • Narrow band imaging not recommended over other modalities	• Surveillance endoscopy recommended over colectomy for endoscopically completely resected polypoid and non-polypoid lesions • Referral to specialist endoscopist for assessment/N/Amanagement of 'invisible dysplasia' prior to consideration of surgery
NZGG[5]	2011	• Initial colonoscopy 8–10 years following diagnosis • Follow-up: Low risk five years Intermediate risk three years High risk one year	'Chromendoscopy not available in New Zealand at time of guideline so not included'	N/A
NICE[11]	2011	• Initial colonoscopy at 10 years from symptoms onset to establish risk • Follow-up: Low risk five years Intermediate risk three years High risk one year	Colonoscopy with chromendoscopy and targeted biopsy (for initial and follow-up)	N/A

Conclusion

In contrast to the previous survey in 2004, there appears to be a reasonable grasp of current guidelines and techniques in line with internationally accepted recommendations. The main area of lag appears to be the persistent preference to manage endoscopically resectable lesions with colectomy rather than surveillance. Further education will be required to standardise care such that the appropriate patients are offered surveillance or surgery.

Appendix

Survey

Screening Colonoscopy in IBD (Crohn's and Ulcerative Colitis (UC)) Questionnaire

Thank you for clicking on this survey. This should take eight minutes. We are asking all endoscopists in New Zealand about surveillance in IBD. We are asking you to answer based on YOUR own practice and opinions and not what you think other endoscopists are answering.

By consenting below, you consent to your anonymous answers being collated with the other responses to be analysed for future publications, including a Master's degree, conference proceedings, and a journal publication.

CONSENT BOX

Demographics:

1. Do you look after patients with ulcerative colitis? Yes / No
2. Do you perform colonoscopy? Yes / No
3. To which of the following groups do you belong?
   - A. Gastroenterologist (hospital catchment <100,000 people)
   - B. Gastroenterologist (hospital catchment >100,000 people)
   - C. General surgeon (hospital catchment <100,000 people)
   - D. General surgeon (hospital catchment >100,000 people)
   - E. Colorectal surgeon
   - F. Colorectal trainee
   - G. Gastroenterology trainee
   - H. Other (please specify)
4. Do you participate in an IBD MDT?
5. Do two pathologists review all diagnoses of dysplasia at your institution? Y / N

Survey:

1. How long after diagnosis do you recommend surveillance colonoscopy be commenced for UC patients with pancolitis?
   - A. 5y
   - B. 8y
   - C. 10y
   - D. 15y
   - E. 20y
   - F. Not at all
   - G. Other (please specify)
2. How frequently do you recommend surveillance colonoscopy once started for pancolitis?
   - A. 6 monthly
   - B. Yearly
   - C. 2 yearly
   - D. 3 yearly
   - E. Once only
   - F. Not at all
   - G. Variably depending on activity/control of disease or previous dysplasia

3. In patients with disease extent less than pan-colitis, which of these would influence you to survey more frequently? (you may select more than one)
   A. Prolonged duration of colitis
   B. Presence of primary sclerosing cholangitis
   C. Poor disease control
   D. Family history of bowel cancer
   E. Crohn's Colitis as opposed to UC
   F. Onset of disease before age 15y
4. Regarding your approach to surveillance colonoscopy:

What is your preference for surveillance endoscopy in IBD:

   A. Standard definition, white light
   B. High definition, white light
   C. Standard definition, chromendoscopy
   D. High definition, chromendoscopy
   E. Narrow band imaging instead of white light
   F. Other?

5. Do you routinely take random biopsies (as opposed to only if there is macroscopic abnormality?) Y / N

If yes:

   A. At how many different sites do you take biopsies?
   B. How many biopsies do you take at each site?

6. In the context of a completely endoscopically resected polypoid lesion showing LGD:
   A. Do you recommend i. colectomy or ii. surveillance?
   B. If surveillance then when?
   C. If the lesion shows HGD would you recommend i. colectomy or ii. surveillance?
   D. If the lesion was non-polypoid would you recommend i. colectomy or ii. surveillance?
7. If random biopsies returned as HGD after standard definition, white light endoscopy, would you recommend
   A. Further pathology review?
   B. Colectomy?
   C. Repeat standard definition, white light endoscopy?
   D. Repeat high definition, chromendoscopy?
   E. Referral to IBD specialist endoscopist?

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Nil.

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URL:
www.nzma.org.nz/journal-articles/surveillance-for-dysplasia-in-patients-with-inflammatory-bowel-disease-an-updated-national-survey-of-colonoscopic-practice-in-new-zealand

REFERENCES:

1. Su HY, Gupta V, Day AS, Gearry RB. Rising Incidence of Inflammatory Bowel Disease in Canterbury New Zealand. Inflammatory Bowel Disease. 2016; 22:2238–2234.
2. Eaden JA, Abrams KR, Mayberry JF. The risk of colorectal cancer in ulcerative colitis: a meta-analysis. Gut. 2001; 48:526–535.
3. Jess T, Rungoe C, Peyrin-Biroulet L. Risk of colorectal cancer in patients with ulcerative colitis: a meta-analysis of population-based cohort studies. Clin Gastroenterol Hepatol 10, 639-645, doi:10.1016/j.cgh.2012.01.010 (2012).
4. Lutgens MW, et al. Declining risk of colorectal cancer in inflammatory bowel disease: an updated meta-analysis of population-based cohort studies. Inflamm Bowel Dis 19, 789-799, doi:10.1097/MIB.0b013e31828029c0 (2013).
5. NZ Guidelines Group. (ed Department of Health) (Wellington, 2011).
6. Gearry RB, et al. Surveillance for Dysplasia in Patients With Inflammatory Bowel Disease: A National Survey of Colonoscopic Practice in New Zealand. 2004; 47:314–322, doi:10.1007/s10350-003-0049-y.
7. Bernstein CN, Shanahan F, Weinstein WM. Are we telling patients the truth about surveillance colonoscopy in ulcerative colitis? Lancet (London, England) 1994; 343:71–74, doi:10.1016/s0140-6736(94)90813-3.
8. Marion JF, et al. Chromoendoscopy Is More Effective Than Standard Colonoscopy in Detecting Dysplasia During Long-term Surveillance of Patients With Colitis. Clin Gastroenterol Hepatol 2016; 14:713–719, doi:10.1016/j.cgh.2015.11.011.
9. Laine L, et al. SCENIC international consensus statement on surveillance and management of dysplasia in inflammatory bowel disease. Gastrointest Endosc. 2015; 81:489–501 e426, doi:10.1016/j.gie.2014.12.009.
10. Magro F, et al. Third European Evidence-based Consensus on Diagnosis and Management of Ulcerative Colitis. Part 1: Definitions, Diagnosis, Extra-intestinal Manifestations, Pregnancy, Cancer Surveillance, Surgery, and Ileo-anal Pouch Disorders. J Crohns Colitis 2017; 11:649–670, doi:10.1093/ecco-jcc/jjx008.
11. Excellence, N. I. f. H. a. C. Colorectal cancer prevention: colonoscopic surveillance in adults with ulcerative colitis, Crohn's disease or adenomas (CG118), http://www.nice.org.uk/guidance/cg118 (23 March 2011).

12. Rubin DT, Ananthakrishnan AN, Siegel CA, Sauer BG, Long MD. ACG Clinical Guideline: Ulcerative Colitis in Adults. The American journal of gastroenterology. 2019; 114:384–413, doi:10.14309/ajg.0000000000000152.
13. Watanabe T, et al. Comparison of Targeted vs Random Biopsies for Surveillance of Ulcerative Colitis-Associated Colorectal Cancer. Gastroenterology. 2016; 151:1122–1130,doi:10.1053/j.gastro.2016.08.002.
14. Moussata D, et al. Are random biopsies still useful for the detection of neoplasia in patients with IBD undergoing surveillance colonoscopy with chromoendoscopy? Gut. 2018; 67:616–624, doi:10.1136/gutjnl-2016-311892.
15. Cunningham CT, et al. Exploring physician specialist response rates to web-based surveys. BMC medical research methodology. 2015; 15:32, doi:10.1186/s12874-015-0016-z.

Te Hā o Whānau: A culturally responsive framework of maternity care

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ABSTRACT

AIM: A nuanced healthcare framework, Te Hā o Whānau, aims to make the maternal-infant healthcare system more accessible and culturally responsive for Māori following unexpected events that led to the harm or loss of their baby.

METHOD: Te Hā o Whānau was developed from three components. Firstly, it was grounded and informed by Kaupapa Māori qualitative research involving whānau who had experienced the harm or loss of their baby. These learnings were then combined with mātauranga Māori (Māori knowledge) and built on three articles of Te Tiriti o Waitangi: Kāwanatanga, Rangatiratanga and Ōritetanga.

RESULTS: Te Hā o Whānau has been developed to specifically guide the maternal-infant healthcare system in providing culturally responsive practice points and guidelines. These practice points and guidelines align with three tikanga Māori (customs): Tikanga manaakitanga, Tikanga rangatiratanga and Tikanga whakawhanaunga.

CONCLUSION: To address the stark health inequities present, we must forge innovative models and strategies, rather than reproducing (less successful) paths that have the less resistance. Te Hā o Whānau is provided with the aim of providing better outcomes for all, not just Māori.

The maternal-infant healthcare system is failing Māori, evident in the maternal and infant health inequities between Māori and non-Māori.[1] It is an unwelcome truth that for Māori, (Indigenous people of Aotearoa New Zealand), "too many die young, suffer avoidable illnesses and injuries and live in unnecessarily difficult circumstances".[2] Māori wāhine (women) and their babies face higher rates of morbidity and mortality than non-Māori.[3] In addition to death, Māori babies are more likely to be born preterm (born before 37 weeks gestation),[4–5] which is associated with poor health, often requiring intensive medical care at a neonatal intensive care unit (NICU) or special care baby unit (SCBU). The higher rates of morbidity and mortality can be attributed to health inequities faced by Māori wāhine and their babies. For example, it has been found that Māori women often receive suboptimal clinical care during preterm labour.[3] These health inequities are a breach of Te Tiriti o Waitangi, the founding document of Aotearoa New Zealand, and a representation of how the maternal-infant healthcare system is failing Māori. This paper purposefully refers to Te Tiriti rather than the Treaty of Waitangi, as both are different documents that carry different meanings, with the latter privileging the alleged cession of Māori sovereignty to the Crown.[6–7] The Crown has held fast to the notion that the Treaty of Waitangi is a treaty of cession to legitimise its rule and governance. Many Māori believe that they are not bound by the Treaty of Waitangi, as there are inaccurate interpretations, and are instead committed to uphold what responsibilities their ancestors signed to in Te Tiriti o Waitangi.[7]

In conjunction with Te Tiriti o Waitangi, recent qualitative research by the authors involving 10 whānau following the harm or loss of their baby informs this paper. This research found that when these whānau entered the maternal-infant healthcare system under unexpected circumstances, the system failed at delivering culturally responsive care.[1] A systemic failure considered in need of immediate remediation.

Aim

Responding to this systemic failure, the authors aim to develop a healthcare framework to guide the maternal-infant healthcare sector in providing culturally responsive care for Māori whānau who have experienced the harm or loss of their baby.

Methods

Te Hā o Whānau, a framework of healthcare, has been developed from the convergence of three components. Firstly, it was grounded and informed by a Kaupapa Māori qualitative research involving whānau who had experienced the harm or loss of their baby. Kaupapa Māori research is decolonising because it rejects dominant notions of knowledge held by those in colonial power that dehumanises Māori, and is instead about representing the lived realities of whānau, within the context of a structural analysis of the systems that prevent whānau achieving wellbeing.[8] This contrasts with deficit-based research where Māori are seen as a problem in need of 'fixing'.[9] Secondly, the learnings from the lived realities of whānau were combined with mātauranga Māori (Māori knowledge). Thirdly, to give Te Hā o Whānau further legitimacy, it was built upon three articles of Te Tiriti o Waitangi: Kāwanatanga, Rangatiratanga and Ōritetanga.

Article 1, kāwanatanga, outlines the right for the Crown to govern, therefore having the right to make laws and practices that are beneficial and fair for all.[13] When signing to this agreement, Māori expected good governance and the provision of policies and services that contribute to the health and wellbeing of all in Aotearoa New Zealand. It has been recognised that Māori did not cede sovereignty to the Crown.[3,6] This means that have In return of consenting the Queen kāwanatanga in Article 1, Article 3 promises ōritetanga, the Queen's protection of all Māori and ensure their equal rights as English.[7,13] Article 3 addresses issues of equity and equality; it is a responsibility of the Crown to actively protect and reduce inequities between Māori and Pākehā (non-Māori).[13] However, ōritetanga has not been upheld as there are stark inequities present between Māori and Pākehā, particularly within the maternal-infant health space.

Appropriate tikanga Māori (customs) practice points and examples are offered as guidelines for stakeholders within the maternal-infant healthcare that align with what is promised in these three articles. The practice points and examples are strengths-based to ensure culturally responsive care is delivered to whānau following the harm or loss of their baby. The naming of Te Hā o Whānau was deliberate, whereby Te hā means the breath, to which was taken to mean the voice, and o whānau carries the meanings of both family and maternity. Thus, Te Hā o Whānau, means whānau voices leading maternity care in Aotearoa New Zealand.

Data collection

Qualitative whānau interviews were conducted with 10 wāhine (women) and between one and eight members of their whānau. Whānau were asked to share their stories in a manner that best suited them, with this inquiry resulting in a rich collection of whānau lived realities following the harm or loss of their baby. Each interview was transcribed and analysed through interpretative phenomenological analysis (IPA). IPA is particularly suited to this type of analysis because it involves the interpretation of participants' narratives in which participants have been allowed to speak freely, tell and reflect and express any ideas or concerns.[10–11] IPA allowed the researchers to look deeply into those narratives and analyse the meanings whānau ascribed to their experiences. Data analysis began with the reading and re-reading of the transcribed interviews, making notes and logging significant aspects throughout to examine the meanings whānau ascribed to their experiences. Commonalities and differences across whānau were then organised. The themes that emerged from this approach were shared back with whānau to help ensure validity and the responsiveness of the analysis to their experiences. All whānau endorsed what was found in the analysis. The themes then informed the practice points and examples within Te Hā o Whānau framework.

Mātauranga Māori data was sourced through a consultation journey that involved having kōrero (discussions) with kaumātua (elders), Māori health experts, Māori researchers and reviewing available

literature.[12] Data for Te Tiriti o Waitangi was sourced from available literature.[6,13]

Results

This section will share the resultant framework that emerged from the convergence of the three data sources. The framework has been designed this way to provide equity for Māori health outcomes and Māori participation in the design and delivery of maternal-infant healthcare in Aotearoa New Zealand. Corresponding tikanga have been suggested as practice points and examples within each component of the framework: Tikanga manaakitanga, Tikanga rangatiratanga, Tikanga whakawhanaunga.

Tikanga manaakitanga

Manaakitanga is a tikanga that may align with Article 1, kāwanatanga. In the healthcare context, acting with manaakitanga will ensure environments where cultural practices and values are respected to have a contributory role in the health and wellbeing of whānau. Manaakitanga involves acting in a manner that uplifts the mana (prestige) of others (and in doing so, uplifting your own mana). It involves the act of sharing and caring and exercising governance concurrently.[14] The shared experiences of the 10 whānau commonly cited an absence of manaakitanga, whereby healthcare practitioners showed a lack of concern for their cultural practices and beliefs. For example, *"it would have been nice if I could have done karakia and karanga when my baby was birthed".*[1] Consequently, the mana and wairua (spiritual wellbeing) of the wāhine and their whānau were diminished because they were denied the opportunity, and right, to be and openly thrive as Māori. Another expression of poor manaakitanga was the absence of offered support or kindness—*"we didn't even get offered the motel support until the very end"; "by the time I left there I wanted to burn the place down…yeah it was not good how I was treated".*[1]

Positive reports were expressed when the wāhine felt the healthcare practitioners respected their cultural values and practices. Examples of this occurring was when they felt genuinely respected, when whānau were offered back their whenua (placenta) to practice whenua ki te whenua tikanga (placenta to earth); and were offered food and empathy. Having access to their whānau support and/or support from social service practitioners was also positively reflected on. As one participant shares, *"[husband] was allowed to stay with this baby and it just makes the experience for us so much more tolerable…".*[1] Therefore, the provision of good healthcare was affiliated with a mana enriching environment.

Table 1: Tikanga manaakitanga–practice points and examples.

Practice points	Practice examples
Demonstrate value for 'patients'	• Provide healthcare from a position of humility and demonstrate empathy.
Provide an environment that respects, encourages and facilitates Māori cultural values and practices	• Observe appropriate tikanga (for example, karakia (prayer), waiata (song) and karanga (welcoming call). • Understand the kaupapa behind Māori values and practices so these can be encouraged and pursued. • Provide access to kaumātua if requested.
Govern the environment whereby support—both from whānau and social support services—are standardised.	• Review the two-visitor rule during adverse events to lift restrictions about whānau visiting. • Enable the transfer of whānau as support. • Provide more community outreach services to deliver healthcare services to whānau.

Table 2: Tikanga tino rangatiratanga—practice points and examples.

Practice points	Practice examples
Recognise and alleviate the epistemic injustice within the maternal-infant healthcare system	• Respect and be open to other bodies of knowledge and ways of doing. • Becoming health literate by engaging in meaningful communication that is comprehendible and allows participation by all.
Value the whānau voice and participation	• Provide whānau the opportunity to share their knowledge, concerns and ideas. • Encourage choice when possible to facilitate the co-construction of care with whānau.
Increase the Māori healthcare workforce	• Review education and training to disrupt barriers that restrict Māori participation. • Indigenise the education curriculum so healthcare practitioners are more aware of hauora Māori. • Encourage Māori inclusion in governance roles. • Make it policy to have more meaningful consultation with Māori during healthcare policy development.

Tikanga rangatiratanga

The experiences of the 10 whānau participants highlighted the absence of the right for whānau to participate in the decision making of the healthcare of their baby. As a result of entering the maternal-infant healthcare system, mothers lost their rangatiratanga to care for their baby that they deemed appropriate; fathers lost their rangatiratanga of being loving and supportive partners; and wāhine were encouraged to follow hospital understandings of maternities and infant cares. In this context, those enforcing the healthcare policies and procedures hold the power. This was noted by the participants, and many reflected on how they often felt powerless in comparison to the healthcare practitioners. For example, *"it was pretty trying times, everything is so clinical and every eight hours you have a different nurse telling you what to do…we didn't feel like parents until we got home".*[1] This reflects the frustration these parents felt by being told what to do, when to do, without having the opportunity to have any participation in decisions.

Article 2 is not being recognised and upheld as Māori continue to be without their tino rangatiratanga and are made to interact with and within systems that are derivative of Eurocentric worldviews. To overcome this, Māori should be free to express their right to rangatiratanga over their health and wellbeing. Revitalising the Māori voice and increasing the Māori healthcare workforce may lead to greater Māori participation in the healthcare context.

Tikanga whakawhanaungatanga

Collaboration between Māori and non-Māori people and practices can contribute towards equity as communities, whānau, sectors and agencies can have a better chance of working together to reach equitable health outcomes. The qualitative research found that the current maternal-infant healthcare system presents few opportunities for whānau to have any collaboration with stakeholders in the maternal-infant healthcare system.[1] Collaboration can be aligned with the tikanga Māori whakawhanaungatanga (development of meaningful relationships).

The 10 whānau were provided minimal opportunities to establish whanaungatanga (meaningful relationships) with those caring for them and their baby. When whakawhanaungatanga is avoided, Māori tend to feel unconnected to the place and people within that place. Instead of being made to feel welcome, whānau reported feeling isolated and alienated. For example, *"they would just come into our room and not introduce themselves then leave again".*[1] Even if introductions were made, their

Table 3: Tikanga whakawhanaunga—practice points and examples.

Practice points	Practice examples
Alleviate power imbalances	• Be whānau-centred. Shape services based on the needs of the whānau. • Improve inter-professional relations and communications to work as one perinatal team, rather than separate midwifery, obstetrics and neonatal teams.
Engage in meaningful relationship building with whānau	• Take the time to build rapport. • Introduce yourself and your role.
Change the environment from being task-focused to being whānau-focused	• Greet and/or converse in te reo Māori if that is the preferred language of whānau. • Care for visiting whānau and make them feel welcome. • Encourage and facilitate whānau having a role in the recovery of health and wellbeing of their loved one(s). Add cultural needs to the standardised care guidelines.

efforts were rushed and the practitioners did not take the time to allow the whānau to introduce themselves. This caused confusion for whānau because they often did not know who was leading the care for their baby, and often received inconsistent communication and treatment plans from different health practitioners.[1] This increased their anxiety about the wellbeing of their baby. The maternal-infant healthcare system can become a culturally responsive collaborative partner by actively engaging in whakawhanaungatanga (the act of building relationships) to establish whanaungatanga with both people and space.[1] One participant stated that *"it would have been nice to have more space for my whānau who had travelled down to visit me and baby"*.[1] This would have provided a welcoming space for that participant. Ensuring a welcoming space that is accommodating for whānau will help remove feelings of alienation and isolation in the maternal-infant healthcare system because places have a healing role too.[15] The core of whakawhanaungatanga is about interdependence, not independence, to develop whanaungatanga. Within this interdependent relationship are defined roles for all participants.

Discussion

Although there are numerous healthcare models in Aotearoa New Zealand, Te Hā o Whānau is a nuanced framework that specifically focuses on providing practice points and examples that could enable the maternal-infant healthcare system delivering culturally responsive care for whānau under unanticipated and unexpected circumstances. The practice points and examples have been designed directly from the whānau experiences within the qualitative research and are appropriate for all stakeholders within the maternal-infant healthcare system. These practice points can be transformative practice. The framework aligns with te ao Māori (Māori worldview) and Te Tiriti o Waitangi, a dual alignment that should be made customary within the healthcare sector.

Today, the maternal-infant healthcare system continues to be designed and delivered through mainstream, monocultural and biomedical processes that tend to be inflexible for accommodating te ao Māori.[1,16] In 1988, Puao-te-ata-tu clearly stated that national structures have been developed from values, systems and views of the majority culture only. Participation of the minority cultures is conditional on them subjugating their own values and systems to the power system.[17] Today this has not changed, as the recent WAI2575 report deemed the primary healthcare system has failed, and is failing, to achieve Māori health equity as the mainstream design and delivery of services are flawed. Policies and legislations that underpin the system do not allow for Māori having the freedom to exercise rangatiratanga.[18] Through imposing

policies that govern the healthcare system with tikanga Māori, it is envisaged that better outcomes will eventuate for all, not just Māori. We are more likely to achieve better health outcomes by building new pathways that include mātauranga Māori while also enabling the creation of new, appropriate knowledge and practices[19] to align Māori and Pākehā worldviews.

Implementing Te Hā o Whānau within this particular context has the potential to contribute towards informing the maternal-infant healthcare system becoming a culturally responsive partner for Māori. It can be implemented and trialled within district health boards and evaluate its success in building culturally responsive and better wellbeing outcomes. To resolve poor health and restore balance (health equity) within Aotearoa New Zealand, policymakers must have the courage to make innovative change and resist settling for the status quo, or worse, reverberating back to paths that have already attempted and failed to bring about change.[20] If Te Hā o Whānau is evaluated as a success, then options for national rollout could be explored. It is said that it takes a kāinga (village) to raise a child. Abiding by that philosophy, this framework requires the commitment of all stakeholders (maternity healthcare practitioners, neonatal healthcare practitioners, district health boards and the Ministry of Health) to ensure the application, growth and success of this potentially beneficial healthcare framework.

Conclusion

To address the stark health inequities present, we must forge innovative models and strategies, rather than reproducing (less successful) paths that have the less resistance. There is a need to indigenise, if not decolonise[21] the maternal-infant healthcare system to make it a compatible, culturally responsive partner for whānau. Te Hā o Whānau framework is an attempt to meet this need. It is a fundamental right, as guaranteed to Māori under Te Tiriti o Waitangi, to have access to culturally responsive healthcare. It is also the Crown's responsibility, under Te Tiriti, to provide quality healthcare and ensure that all organisations involved in the health sector is committed to doing so. It is a further responsibility of the Crown to ensure equitable health outcomes for Māori are achieved, and that the Treaty and Te Tiriti are visible, understood and complied with by all stakeholders in the healthcare system.[18] As Paul Whitinui claimed in 2011, "closing the gap between Māori and non-Māori will not be achieved if as a nation we continue to create health models, frameworks, programmes, initiatives and interventions that are mere reflections of mainstream health processes".[20]

Competing interests:
Nil.

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REFERENCES:

1. Stevenson K. Mā te wāhine, mā te whenua, ka ngaro te tangata. Wāhine and whānau experiences informing the maternal-infant health care system. University of Otago, 2018.
2. Blaiklock A, Kiro C. (2015). Hauora, health and wellbeing: The right of every child and young person. In M. Ratima & L. Signal (Eds.), Promoting Health in Aotearoa NZ (pp. 188-216). Dunedin: Otago University Press.
3. PMMRC. Twelfth annual report of the perinatal and maternal mortality review committee: Reporting mortality 2016. Wellington: Health Quality & Safety Commission. (http://www.hqsc.govt.nz/our-programmes/mrc/pmmrc), 2018.
4. Craig ED, Mantell CD, Ekeroma AJ, et al. Ethnicity and birth outcome: New Zealand trends 1980–2001. Part 1. Introduction, methods, results and overview. Australian and New Zealand Journal of Obstetrics and Gynaecology 2004; 44(6):530–36.
5. Ministry of Health. (2017). Report on Maternity 2015. Retrieved from: http://www.health.govt.nz/publication/report-maternity-2015
6. Berghan G, Came H, Doole C, et al. Te Tiriti-Based Practice in Health Promotion: Auckland, New Zealand: STIR: Stop Institutional Racism, 2017.
7. Healy S, Huygens I, Murphy T. Ngāpuhi speaks. Whangarei, New Zealand: Network Waitangi Whangarei, Te Kawariki 2012.
8. Pihama L, Cram F, Walker S. Creating methodological space: A literature review of Kaupapa Maori research. Canadian Journal of Native Education 2002; 26(1):30.
9. Ormond A, Cram F, Carter L. Researching our relations: Reflections on ethics and marginalisation. AlterNative: An International Journal of Indigenous Peoples 2006; 2(1):174–93.
10. Smith Jonathan A, Flowers Paul, Larkin Michael. Interpretive Phenomenological Analysis: Theory, method and research. London: Sage 2009.
11. Brocki JM, Wearden AJ. A critical evaluation of the use of interpretative phenomenological analysis (IPA) in health psychology. Psychology and health 2006; 21(1):87–108.
12. Stevenson K. A consultation journey: developing a Kaupapa Māori research methodology to explore Māori whānau experiences of harm and loss around birth. AlterNative: An International Journal of Indigenous Peoples 2017.
13. Health Promotion Forum of New Zealand. TUHA-NZ. A Treaty Understanding of Hauora in Aotearoa New Zealand. Wellington: Health Promotion Forum, 2002.
14. Jackson A. A discursive analysis of rangatiratanga in a Māori fisheries context. Mai Journal 2013; 1(2):3–17.
15. Elder H. Te Waka Kuaka and Te Waka Oranga. Working with Whānau to Improve Outcomes. Australian and New Zealand Journal of Family Therapy 2017; 38(1):27–42.
16. Wilson D, Barton P. Indigenous hospital experiences: a New Zealand case study. Journal of clinical nursing 2012; 21(15–16):2316–26.
17. Ministerial Advisory Committee. Puao te ata tu (Day break). Wellington, New Zealand: Department of Social Welfare, 1988.
18. Waitangi Tribunal. WAI2575 Hauora Health Services and Outcomes Kaupapa Inquiry. Wellington, New Zealand: Waitangi Tribunal, 2019.
19. Royal C. 'Let the World Speak': Towards Indigenous Epistemology. Te Kaimānga: Towards a New Vision for Mātauanga Māori 2009.
20. Whitinui P. The Treaty and "Treating" Māori Health: Politics, policy and partnership. AlterNative: An International Journal of Indigenous Peoples 2011; 7(2):138–51.
21. Smith LT. Decolonizing methodologies: Research and indigenous peoples: Zed Books Ltd & Otago University Press 1999.

Asthma and Respiratory Foundation NZ Adolescent and Adult Asthma Guidelines 2020: a quick reference guide

Richard Beasley, Lutz Beckert, James Fingleton, Robert J Hancox, Matire Harwood, Miriam Hurst, Stuart Jones, Susan Jones, Ciléin Kearns, David McNamara, Betty Poot, Jim Reid

ABSTRACT

The purpose of the 2020 Asthma and Respiratory Foundation NZ Adolescent and Adult Asthma Guidelines is to provide simple, practical and evidence-based recommendations for the diagnosis, assessment and management of asthma in adolescents and adults (aged 12 and over) in a quick reference format. The intended users are health professionals responsible for delivering asthma care in the community and hospital settings, and those responsible for the training of such health professionals. The main changes in the 2020 update are: 1) combining the recommendations for both adolescents and adults in a single document, 2) the recommendation to avoid SABA-only treatment in the long-term management of asthma, 3) the use of budesonide/formoterol reliever, with or without maintenance budesonide/formoterol, is preferred to SABA reliever, with or without maintenance ICS or ICS/LABA, across the spectrum of asthma severity, 4) introduction of the terminology 'anti-inflammatory reliever (AIR)' therapy to describe the use of budesonide/formoterol as a reliever medication, with or without maintenance budesonide/ formoterol therapy. This approach encompasses and extends the 'Single combination ICS/LABA inhaler Maintenance And Reliever Therapy' (SMART) approach recommended in the previous guideline, 5) the inclusion of two stepwise management algorithms, 6) a clinical allergy section, 7) the role of LAMA therapy in severe asthma, 8) the role of omalizumab in severe allergic asthma and mepolizumab in severe eosinophilic asthma, 9) an appendix detailing educational materials.

Abbreviations:

AIR	Anti-inflammatory reliever
COPD	Chronic obstructive pulmonary disease
FeNO	Fraction of expired Nitric Oxide
FEV_1	Forced expiratory volume in one second
FVC	Forced vital capacity
GINA	Global Initiative for Asthma
ICS	Inhaled corticosteroid
IgE	Immunoglobulin E
LABA	Long-acting $beta_2$-agonist
LAMA	Long-acting muscarinic antagonist
pMDI	Pressurised Metered Dose Inhaler
PaO_2, $PaCO_2$	Arterial oxygen and carbon dioxide tension
PEF	Peak expiratory flow
SABA	Short-acting $beta_2$-agonist
SMART	Single combination ICS/LABA inhaler Maintenance And Reliever Therapy
SpO_2	Oxygen saturation measured by pulse oximetry

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Context[1–7]

Asthma is a major public health problem in New Zealand with up to 20% of children and adults having asthma. The prevalence rates, particularly in Māori and Pacific adults, are among the highest in the world.

Providing health professionals with current best practice guidance sits within the Asthma and Respiratory Foundation New Zealand's work programme as a priority action towards reducing New Zealand's significant respiratory health burden. Three important documents were released by the Foundation in 2015; *Te Hā Ora: The National Respiratory Strategy*, *The Impact of Respiratory Disease in New Zealand: 2014 update* and *He Māramatanga huangō: Asthma health literacy for Māori children in New Zealand*. These place in context the high prevalence and impact of asthma in New Zealand, the inequities suffered by Māori, Pacific peoples and low income families, and the need for a holistic approach when providing asthma care.

Guidelines review[8–10]

The Asthma and Respiratory Foundation New Zealand published the Adult Asthma Guidelines in 2016 and the Childhood and Adolescent Asthma Guidelines in 2017. Since their publication, there have been a number of major advances in the treatment of asthma in adolescents and adults. There has also been greater recognition that the investigation and management of asthma in adolescents and adults (aged 12 and over) has a similar evidence base, which warrants the combining of guideline recommendations across these age groups. For this reason, the 2020 update includes recommendations for both adolescents and adults, and incorporates recent advances in knowledge based on high-quality scientific evidence. The major document which has been reviewed to formulate the 2020 update is the Global Initiative for Asthma (GINA) 2019 Update strategy. As previously, a systematic review was not performed; relevant references were reviewed where necessary to formulate this guideline version and referenced as required to support key recommendations. Readers are referred to the GINA 2019 Update strategy for the more comprehensive detail that it provides, accessed at https://ginasthma.org.

Grading

No levels of evidence grades are provided because the guidelines are formatted as a Quick Reference Guide. Readers are referred to the GINA 2019 Update strategy and handbooks for the level of evidence for the recommendations on which the guidelines are based.

Guideline development group

This group primarily includes members of the Asthma and Respiratory Foundation New Zealand Scientific Advisory Group and comprises representatives from a range of professions and disciplines relevant to the scope of the guidelines. Development of the Adolescent & Adult Asthma Guidelines was funded by the Asthma and Respiratory Foundation New Zealand. No funding was sought or obtained from pharmaceutical companies.

Peer review

The draft guidelines were peer-reviewed by a wide range of respiratory health experts and key professional organisations, including representatives from Asthma New Zealand, Can Breathe, New Zealand Nurses Organisation Te Rūnanga o Aotearoa, Nurse Practitioner New Zealand, Comprehensive Care, Hutt Valley DHB, Capital and Coast DHB, Auckland DHB, Ngā Kaitiaki o te Puna Rongoā, PHARMAC, Thoracic Society of Australia and New Zealand, Internal Medicine Society of Australia and New Zealand, University of Auckland, Wellington Free Ambulance Service and the Global Initiative for Asthma Scientific Committee.

Presentation

The guidelines are primarily presented through bullet points, key practice points, tables and figures. Key references are provided where necessary to support recommendations that may differ from previous guidelines or current clinical practice. An educational slide set is available on the website. The Asthma and Respiratory Foundation New Zealand encourages the integration of the graphs and figures into local clinical pathways.

Dissemination plan

The guidelines will be translated into tools for practical use by health professionals, and used to update Health Pathways and existing consumer resources. The guidelines will be published in the *New Zealand Medical*

Journal and on the Asthma and Respiratory Foundation New Zealand website, and disseminated widely via a range of publications, training opportunities and other communication channels, to health professionals, nursing and medical schools, primary health organisations and district health boards.

Implementation

The implementation of the guidelines by organisations will require communication, education and training strategies.

Expiry date

2024.

Definition[10]

- The GINA consensus definition of asthma is:
  - Asthma is a heterogeneous disease, usually characterised by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.

Diagnosis[10–12]

- The diagnosis of asthma starts with the recognition of a characteristic pattern of symptoms and signs, in the absence of an alternative explanation.
- The key to making the diagnosis of asthma is to take a clinical history, undertake a focused physical examination, document variable expiratory airflow limitation and assess response to inhaled bronchodilator and/or ICS treatment (Table 1, Figure 1). There is no reliable single 'gold standard' diagnostic test.

Table 1: Clinical features that increase or decrease the probability of asthma.

A. Asthma more likely

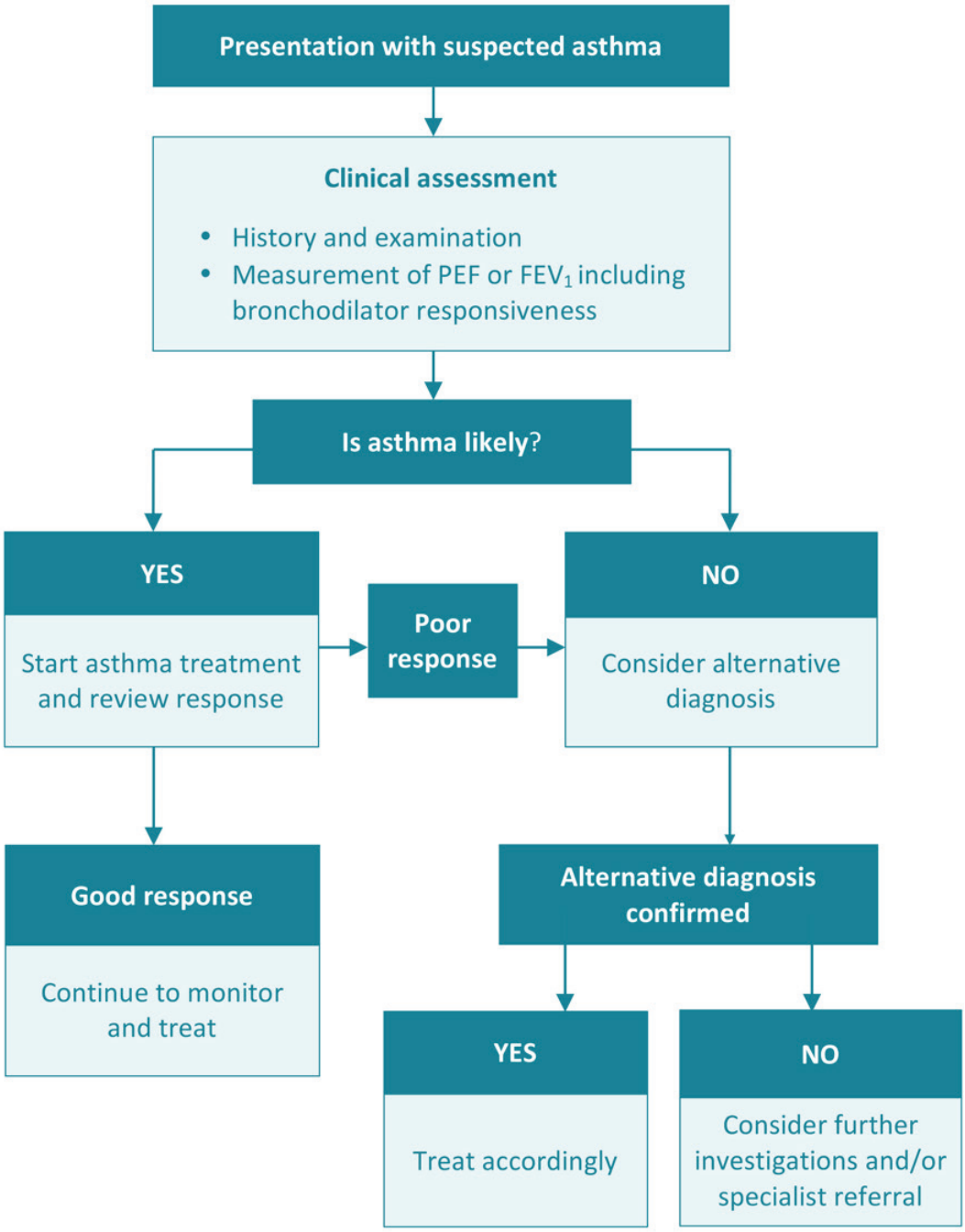
- Two or more of these symptoms:
  - Wheeze (most sensitive and specific symptom of asthma)
  - Breathlessness
  - Chest tightness
  - Cough
- Symptom pattern:
  - Intermittent
  - Typically worse at night or in the early morning
  - Provoked by exercise, cold air, allergen exposure, irritants, viral infections, beta blockers, aspirin or other non-steroidal anti-inflammatory drugs
  - Recurrent or seasonal
  - Began in childhood
- History of atopic disorder or family history of asthma
- Widespread wheeze heard on chest auscultation
- Symptoms rapidly relieved by inhaled SABA or budesonide/formoterol
- Airflow obstruction on spirometry (FEV1/FVC < Lower limit of normal)
- Increase in FEV1 following bronchodilator ≥12%; the greater the increase the greater the probability
- Variability in PEF over time (highest-lowest PEF/mean) ≥15%; the greater the variability the greater the probability

B. Asthma less likely

- Chronic productive cough in absence of wheeze or breathlessness
- No wheeze when symptomatic
- Normal spirometry or PEF when symptomatic
- Symptoms beginning later in life, particularly in people who smoke
- Increase in FEV1 following bronchodilator <12%; the lesser the increase the lower the probability
- Variability in PEF over time <15%; the lesser the variability the lower the probability
- No response to trial of asthma treatment
- Clinical features to suggest an alternative diagnosis

Modified from BTS/SIGN asthma guidelines.[11]

Figure 1: An approach to the diagnosis of asthma.



Modified from BTS/SIGN asthma guidelines.[11]

Practice points

- An increase in FEV_1 ≥12% and ≥200ml from baseline after bronchodilator therapy, has traditionally been considered as a diagnostic criterion for asthma. However, most people with asthma will not exhibit this degree of reversibility at one assessment, and normal spirometry does not exclude asthma. There is a substantial overlap in bronchodilator reversibility between individuals with asthma, COPD and those with no respiratory disease, and as a result no clear-cut divisions can be suggested. The greater the magnitude of bronchodilator reversibility the greater the likelihood that there is an asthma component to the disease.

- Alternative methods to identify variable airflow obstruction include repeat measures of spirometry with bronchodilator reversibility, peak flow variability with repeat measures at different times of the day, and other specialist tests such as measures of bronchial challenge testing. Once the diagnosis has been confirmed it is not necessary to routinely undertake bronchodilator reversibility testing.
- In most patients, observing a symptomatic response to treatment may help confirm the diagnosis, however a limited response to bronchodilator or ICS does not rule out asthma. It may be difficult to distinguish between a diagnosis of asthma and COPD, in adults with a smoking history, as they may have clinical features of both disorders. If asthma is believed to be part of the presentation, the management must include an ICS.
- The possibility of an occupational cause should be considered in all cases of adult onset asthma. If occupational asthma is suspected, it needs to be formally investigated and this may require specialist referral.

Assessing asthma severity, control and future risk[10–14]

Evaluation of asthma severity, the level of control and the risk of future events are all important components of the assessment of individuals with asthma.

Severity of asthma is defined by the treatment needed to maintain good control.

- For symptomatic patients, asthma severity can be determined only after a therapeutic trial of ICS for at least eight weeks. Start the therapeutic trial and book the follow-up appointment for eight weeks later.
- Patients who initially present with frequent symptoms often have mild asthma, which can be well controlled with ICS-based therapy.
- Asthma symptom control is defined by the frequency of symptoms, the degree to which symptoms affect sleep and activity, and the need for reliever medication.

Practice point

Many patients under-report their asthma symptoms. Different methods for assessing asthma symptom control are available including:

i) Asthma Control Test (ACT)

This test has been widely validated and is recommended with the following cut points:

20–25: well controlled

16–19: partly controlled

5–15: poorly controlled

The latest version of the test can be accessed via http://www.asthmacontrol.co.nz/.

ii) Australian Asthma Handbook

This provides useful alternative questions that might be used to assess control (Table 2).

Assessment of the risk of adverse outcomes including severe exacerbations and mortality (Table 3).

Table 2: Definition of levels of recent asthma control in adults and adolescents (regardless of current treatment regimen).

Good control	Partial control	Poor control
All of: **Daytime symptoms ≤2 days per week** **Need for SABA reliever ≤2 days per week†** **No limitation of activities** **No symptoms during night or on waking**	One or two of: Daytime symptoms >2 days per week Need for SABA reliever >2 days per week† Any limitation of activities Any symptoms during night or on waking	Three or more of: Daytime symptoms >2 days per week Need for SABA reliever >2 days per week† Any limitation of activities Any symptoms during night or on waking

† SABA, not including doses taken prophylactically before exercise. (Record this separately and take into account when assessing management.)
Note: Recent asthma symptom control is based on symptoms over the previous four weeks.
Modified from the Australian Asthma Handbook.[12]

Table 3: Clinical features associated with increased risk of severe exacerbations and mortality.

A.	**Asthma**
•	Poor symptom control
•	One or more exacerbation requiring oral corticosteroids in the last year
•	Hospitalisation or emergency department visit in the last year
•	High SABA use (≥3 canisters per year)
•	Home nebuliser
•	History of sudden asthma attacks
•	Impaired lung function (FEV1 <60% predicted)
•	Raised blood eosinophil count
•	Intensive Care Unit admission or intubation (ever)
•	Requirement for long term oral corticosteroids
B.	**Comorbidity**
•	Psychotropic medications
•	Major psychosocial problems
•	Smoking
•	Food allergy/anaphylaxis
•	Alcohol and drug abuse
•	Aspirin or other non-steroidal anti-inflammatory drug sensitivity
C.	**Other factors**
•	Underuse or poor adherence to ICS treatment
•	Discontinuity of medical care
•	Socioeconomic disadvantage and poor housing
•	Māori and Pacific ethnicity
•	Occupational asthma

Practice points

1. High-risk patients can be identified by monitoring healthcare use (such as hospital admissions, emergency and/or unplanned doctor visits) and medication requirements (such as courses of corticosteroids, frequency of SABA prescriptions, and more prescriptions for SABA than ICS).
2. The risk associated with Māori and Pacific ethnicity relates to the wider determinants of severe asthma including damp, cold, mouldy or crowded housing, living in neighbourhoods of high deprivation, discontinuity of medical care, institutional racism, poor health literacy, inadequate income, inadequate treatment and occupational asthma.
3. Risk should be assessed at the time of issuing a repeat prescription. Where higher risk is identified a formal asthma review may be required.

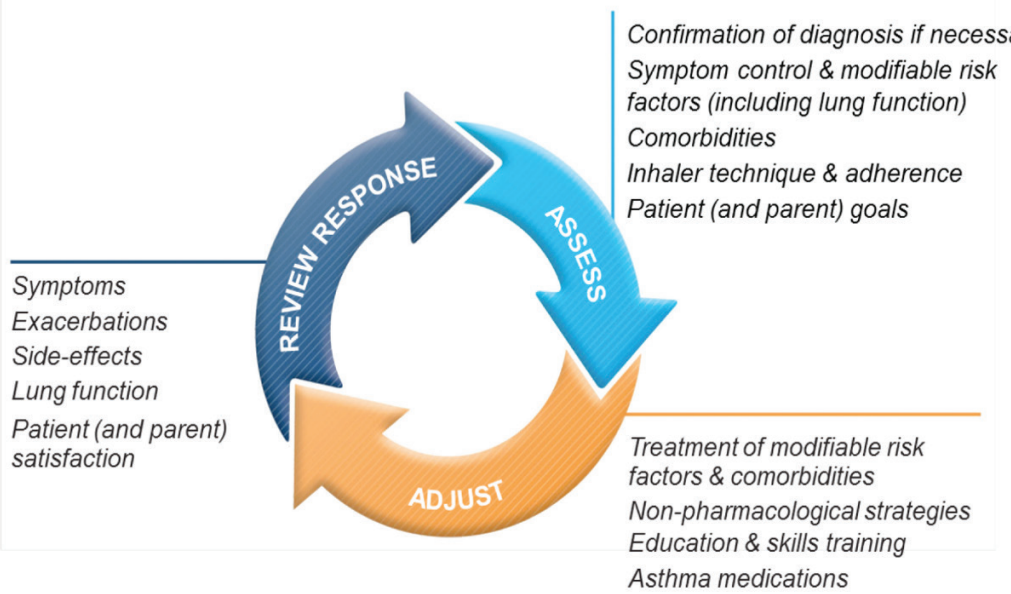
Identifying management goals in collaboration with the patient[10]

Managing asthma requires a partnership between the patient, their whānau and their healthcare team. This involves agreeing on management goals and a cycle based on repeated assessment, adjustment of treatment and review of responses as outlined in Figure 2 [Box 3–2].

Inhaler technique and adherence[10,15,16]

The most common reasons for poor asthma control are inadequate inhaler technique and poor compliance/adherence. It is recommended that the patient's inhaler technique is observed at every consultation, with instruction as required. The patient's preference and ability are important considerations in the choice of inhaler device. The lower carbon footprint of dry powder devices (less than 10% of pMDIs) should be considered alongside other factors.

Figure 2:



Adapted from GINA Update.[10]

It is recommended that for the regular administration of ICS or ICS/LABA, if a pMDI is used, it is self-administered with a spacer device. There are two methods for inhaling via a spacer: one deep slow inhalation and a 10 second breath-hold; or 5–6 tidal breaths, with one actuation of medication into the spacer at a time.

Adherence can be checked using multiple techniques (questioning, diaries, apps, pharmacy dispensing records). Patients' understanding of the regimen should be confirmed, including their health beliefs, with their regimen tailored accordingly where possible. Fears and misconceptions are common barriers to adherence.

Good inhaler technique and adherence should be confirmed before any increase in treatment is initiated. Practice nurses and pharmacists may be well placed to undertake these checks.

Practice points

- Check adherence and inhaler technique (and instruct patients using a physical demonstration of correct technique) at every visit.
- Consider alternative inhaler devices if persistent difficulty with technique.

Reliever therapy[10,17–23]

- SABA reliever as sole therapy (without ICS or ICS/LABA) is no longer recommended in the long-term management of asthma in adolescents or adults.
- Long-term treatment with ICS/fast-onset beta$_2$-agonist reliever therapy is superior to SABA reliever in reducing exacerbation risk in adolescents and adults, across the range of asthma severity.
- In New Zealand the only ICS/fast-onset beta$_2$-agonist combination product that is available is budesonide/formoterol and to date this is only approved as reliever therapy using the Turbuhaler device. As a result budesonide/formoterol Turbuhaler is the preferred reliever treatment for intermittent, mild, moderate and severe asthma. One actuation of budesonide/formoterol 200/6µg or 100/6µg via Turbuhaler is taken as required to relieve symptoms, rather than the two puffs at a time traditionally used with SABA pMDI reliever inhalers. The budesonide/formoterol 400/12µg formulation should not be used as reliever therapy.

- Repeat administration of budesonide/formoterol or salbutamol in the ratio of 6µg formoterol to 200µg salbutamol results in a similar short-term bronchodilator response in the treatment of acute asthma.
- Budesonide/formoterol 200/6µg one inhalation as-needed, as sole reliever therapy, reduces the risk of a severe exacerbation by at least 60% compared with SABA sole reliever therapy in adolescents and adults with mild asthma. This regimen is recommended as the preferred initial treatment in patients with intermittent or mild asthma.
- Budesonide/formoterol as reliever therapy reduces the risk of a severe exacerbation by about one-third compared with SABA reliever therapy in adolescents and adults taking maintenance ICS/LABA therapy. As a result budesonide/formoterol maintenance and reliever therapy is preferred to maintenance ICS/LABA and SABA reliever therapy for the treatment of patients with moderate to severe asthma.
- This evidence has led to the term 'Anti-Inflammatory Reliever' (AIR) therapy to describe the use of budesonide/formoterol as a reliever medication, with or without maintenance budesonide/formoterol therapy. This approach encompasses and extends the 'Single inhaler Maintenance and Reliever Therapy' (SMART) approach recommended in previous guidelines (see below).

ICS treatment[10,17–22,24–30]

ICS are the preferred anti-inflammatory 'preventive' therapy. ICS may be administered as:

A) Budesonide/formoterol 'Anti-Inflammatory Reliever' (AIR) therapy with or without maintenance budesonide/formoterol
B) Maintenance ICS together with SABA reliever therapy
C) Maintenance ICS/LABA with SABA reliever therapy

Anti-Inflammatory Reliever (AIR) therapy

- AIR therapy (Figure 3) uses the combination budesonide/formoterol inhaler taken as-needed to relieve symptoms. This can be done:

i) without maintenance ICS: just using the combined budesonide/formoterol inhaler to relieve symptoms in mild asthma.
ii) with maintenance budesonide/formoterol: using the combined budesonide/formoterol inhaler taken regularly, with an additional dose taken as-needed to relieve symptoms in moderate and severe asthma. This approach is also known as 'Single combination ICS/LABA inhaler Maintenance and Reliever Therapy' (SMART).

- AIR therapy requires a fast-onset beta-agonist combined with an ICS in a single inhaler for as-needed use to relieve symptoms. At present the only such combination inhaler available in New Zealand is budesonide/formoterol, and it is only approved for use as a reliever therapy with the Turbuhaler device. While there is evidence of efficacy/safety with budesonide/formoterol pMDI used as a reliever therapy, the pMDI formulation is not licensed for reliever use and therefore this would represent an off-label prescription.
- Other ICS/LABA combinations available in New Zealand that do not contain formoterol, such as fluticasone propionate/salmeterol or fluticasone furoate/vilanterol, should not be used in this way.
- Patients should not be prescribed budesonide/formoterol as a reliever therapy in addition to maintenance fluticasone propionate/salmeterol or fluticasone furoate/vilanterol, as there is no evidence base for the use of two different ICS/LABA products together.
- When using budesonide/formoterol combination inhaler for both regular maintenance use (once or twice daily), and for relief of symptoms (one actuation as required), patients should not be prescribed a SABA reliever inhaler.

Maintenance fixed dose ICS plus SABA reliever

- Regularly scheduled ICS may be taken as maintenance therapy together with SABA reliever therapy.
- When taken as regular maintenance therapy, the daily doses of ICS which achieve 80–90% of maximum obtainable efficacy are shown in Table 4. These can be considered 'standard' doses for ICS, rather than 'low' doses. Some patients with severe asthma will require higher doses of ICS.
- It is recommended that when ICS therapy is initiated as a regular maintenance treatment, either as a separate inhaler or in combination with a LABA as an ICS/LABA inhaler, these standard doses are used. There is no greater benefit with initiation of ICS therapy at higher doses.

Maintenance fixed dose ICS/LABA plus SABA reliever therapy

- A combination ICS/LABA inhaler may also be taken as regular maintenance therapy together with SABA reliever therapy. The maintenance ICS/LABA with SABA reliever therapy regimen is less effective than budesonide/formoterol maintenance and reliever therapy regimen at reducing severe exacerbations in patients with a history of severe exacerbations.
- Fluticasone furoate/vilanterol 100/25µg one inhalation once daily represents an option for patients who may prefer once daily medication use. This regimen does not reduce the risk of severe exacerbations compared with optimised usual care.
- LABA monotherapy is unsafe in patients with asthma and separate LABA inhalers are a risk if patients are poorly adherent with ICS therapy. LABAs should not be prescribed in a separate inhaler from ICS in patients with asthma.

Stepwise approach to asthma treatment[22,31]

Pharmacological treatment

In the stepwise approach to asthma management, patients step up and down as required to achieve and maintain control of their asthma and reduce the risk of exacerbations.

i) AIR therapy-based algorithm: This is the preferred algorithm, and is based on the use of budesonide/formoterol as reliever therapy, with or without regular maintenance budesonide/ formoterol therapy. The use of budesonide/formoterol as both maintenance and reliever therapy at steps 2 and 3 is also known as 'Single combination ICS/LABA inhaler Maintenance and Reliever Therapy (SMART)'. The budesonide/formoterol 200/6µg Turbuhaler formulation is used as the basis for the algorithm as this is the only formulation which has both an evidence base and regulatory approval for AIR therapy with or without regular maintenance budesonide/formoterol therapy. At step 2 the choice of one inhalation twice daily or two inhalations once daily will depend on patient preference.

ii) SABA reliever therapy-based algorithm: This alternative algorithm is based on the use of a SABA as reliever therapy, in addition to ICS or ICS/LABA maintenance therapy.

Table 4: The recommended standard daily dose of ICS in adult asthma.

Beclomethasone dipropionate	400–500µg/day
Beclomethasone dipropionate extrafine	200µg/day
Budesonide	400µg/day
Fluticasone propionate	200–250µg/day
Fluticasone furoate	100µg/day

Figure 3: Stepwise anti-inflammatory reliever (AIR) based algorithm.

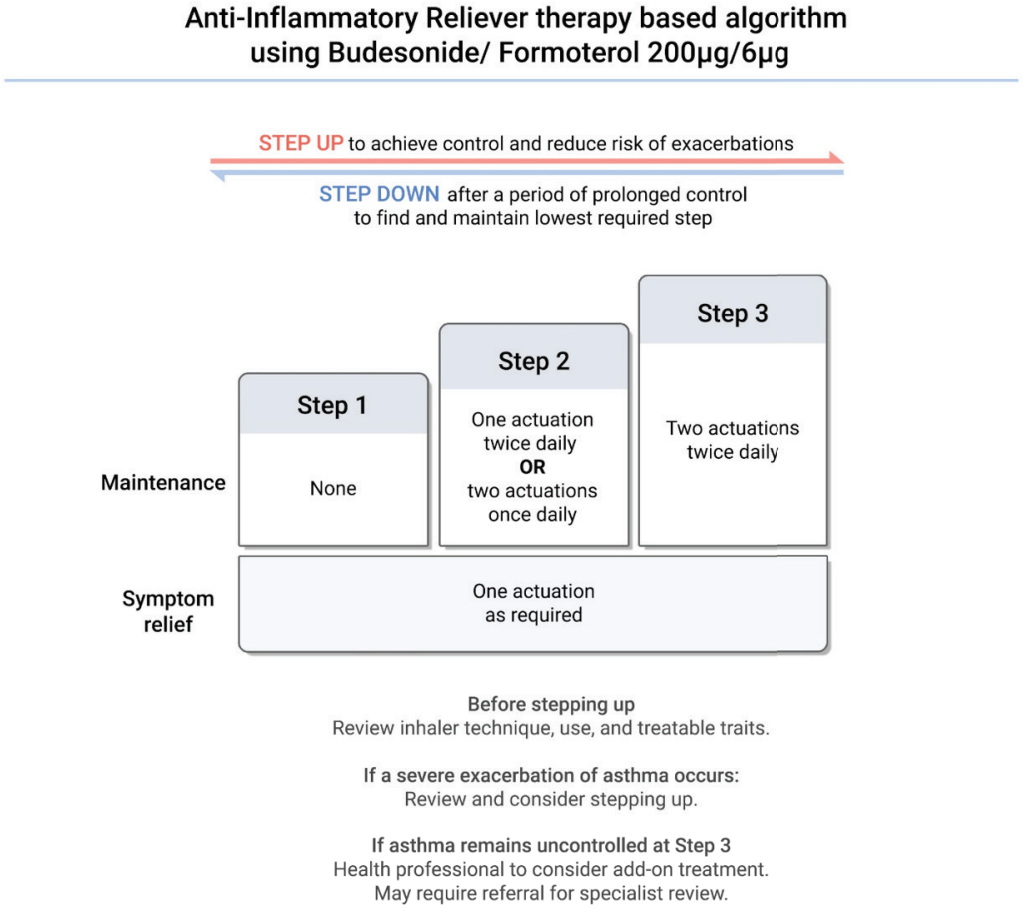
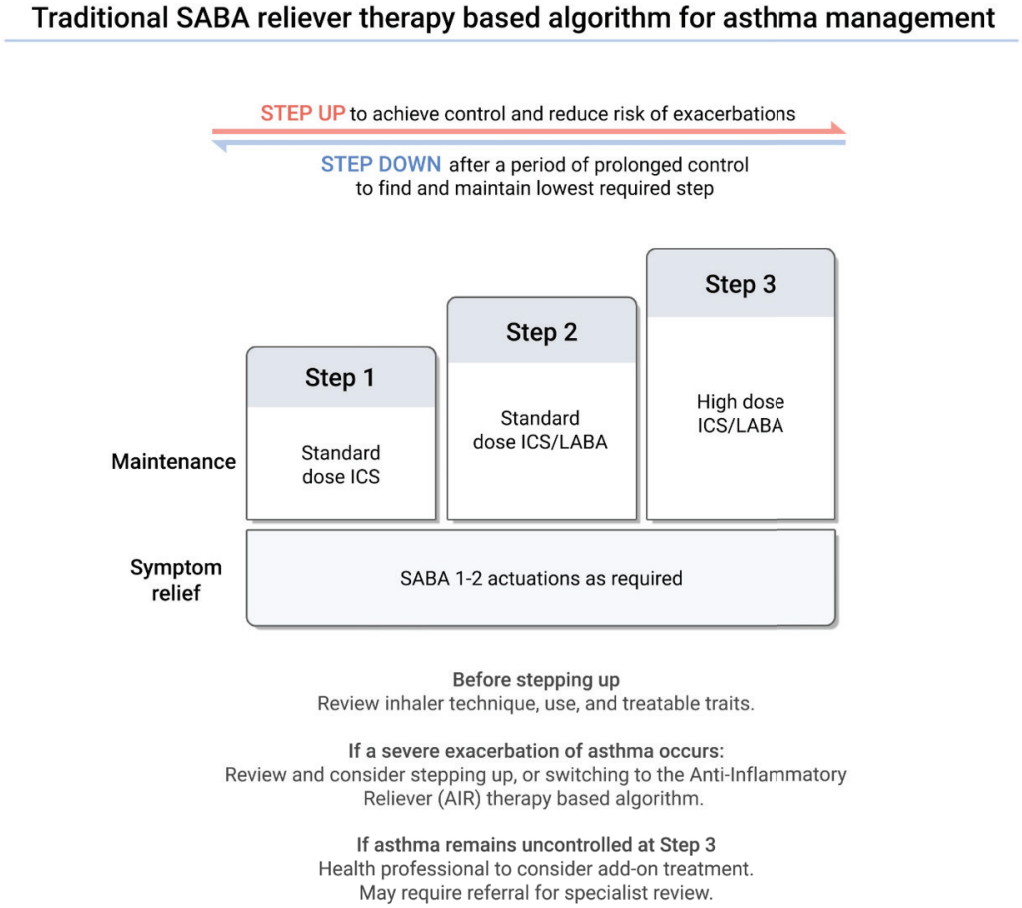


Figure 4: Stepwise anti-inflammatory reliever based algorithm.



Practice points

- Although current evidence indicates that the AIR-based strategy is more effective at preventing exacerbations, the traditional treatment approach may be preferred for individual patients if their asthma is already well controlled on this regimen, or if they have poor technique with the Turbuhaler device.
- Consider stepping up if uncontrolled symptoms, exacerbations or at increased risk, but check diagnosis, adherence, inhaler technique and modifiable risk factors first.
- Consider stepping down if symptoms are controlled for three months and the patient is at low risk for exacerbations.
- At each step check inhaler technique, adherence to treatment, understanding of self-management plan and barriers to self-care.
- Stopping ICS completely is not advised. The minimum level of treatment recommended is as-needed budesonide/formoterol. Treatment with a SABA reliever alone, without maintenance ICS or ICS/LABA therapy is not recommended.
- Consider referral for specialist review and consideration of addition of other treatments if persistent exacerbations or poor control despite step 3 treatment.
- Asthma is common in older people and multi-dimensional assessment may be required to address complicating factors such as comorbidities and frailty.

Add-on treatments

LAMAs[32–34]

Long-acting muscarinic antagonists (LAMAs) have efficacy in severe asthma not well-controlled on ICS/LABA. When added to ICS/LABA treatment they modestly reduce the risk of severe exacerbations, and improve lung function and symptom control. The strongest evidence is with tiotropium 5µg/day delivered via the Respimat device. The addition of tiotropium to maintenance ICS/LABA is a MEDSAFE approved indication, but is not funded in New Zealand for asthma. The alternative approach of prescribing an ICS/LABA/LAMA 'triple therapy' is neither MEDSAFE approved nor funded in New Zealand. LAMA therapy is funded for patients with COPD with or without co-existent asthma, diagnosed using spirometry, as long as the prescription is endorsed accordingly. As a result it is currently recommended that a LAMA may be considered in asthma patients with features of COPD, who are not controlled at step 3.

Biological treatments[35–37]

Monoclonal antibody treatments targeting specific inflammatory pathways now have an established role in severe uncontrolled asthma. They may be effective for patients with severe asthma and elevated serum IgE or markers of Th-2 inflammation (high blood eosinophil counts). Omalizumab (targeting IgE) and both mepolizumab and benralizumab (targeting Interleukin-5) are currently licensed in New Zealand for administration by sub-cutaneous injection. At the time of writing, omalizumab is publically funded in people aged six and above and mepolizumab is funded in people aged 12 and above, meeting specific criteria. The choice of agent is determined by the inflammatory pathway to be targeted and likely to be influenced by the funding guidelines and cost of treatment. There is insufficient evidence regarding comparative efficacy between the different drugs. They should be considered as add-on treatments in patients with severe disease and are likely to remain specialist-only treatments for the foreseeable future.

Other medications[10,38]

Alternative therapies such as sodium cromoglycate or nedocromil may be considered in some patients with mild asthma. Montelukast should also be considered as add-on therapy in patients not controlled on standard treatment and in all patients with aspirin-exacerbated respiratory disease. Prescribers should be aware of the risk of neuropsychiatric events associated with montelukast.

Additional high dose ICS, oral corticosteroids, oral theophylline and azithromycin may be considered as other add-on treatments, with specialist review. Both risks and benefits of these treatments should be considered.

The provision of a home nebuliser for administration of bronchodilator medication is discouraged, due to the high dosing and the potential for delay in seeking medical review with its repeated use in a severe exacerbation.

Non-pharmacological measures[39,40]

- Key non-pharmacological measures to improve asthma outcomes include smoking cessation (including cannabis, e-cigarettes and vaping), weight loss, asthma education, regular exercise and breathing exercises.
- Avoid triggers that have been identified to provoke attacks in particular attacks associated with features of anaphylaxis. Specifically question about sensitivity to aspirin and non-steroidal anti-inflammatory drugs, and consider aspirin-exacerbated respiratory disease in such patients, especially if there is a history of nasal polyps.
- Currently available house dust mite avoidance measures are not effective.
- Modifications to diet are unlikely to improve asthma control. Food avoidance should not be recommended unless an allergy or sensitivity has been confirmed.
- Exercise should be encouraged. If exercise provokes asthma this is a marker of poor control and should lead to a review of treatment, rather than exercise avoidance. In addition, reliever may be taken pre-exercise.
- Limitation of exposure or removal from the workplace is crucial in the management of occupational asthma. Early removal from exposure may lead to a complete remission.
- Asthma control may be improved by a warm, dry domestic environment. Where a patient is living in poor quality or damp housing, referral to locally available support services such as the healthy homes initiative is appropriate.
- Unflued gas heaters may worsen asthma symptoms; electric heat pumps are recommended.
- As people in low income households have a higher burden of disease and can face barriers to accessing healthcare provision and medications, it is appropriate to check whether patients are accessing their government support entitlements and refer to support services as appropriate.

Specific allergy issues[41–48]

A diagnosis of allergy requires a history of reaction to a given allergen, and is confirmed by detection of specific IgE antibodies, either on serum or by skin prick testing. Skin prick testing has a high negative predictive value for allergy to the antigen used and a low risk of systemic allergic reactions, but serum specific IgE may be more appropriate in certain settings, eg, patient unable to stop antihistamine medications, unstable asthma, pregnancy or dermatographism. Aeroallergens such as house dust mite, pollens or pet dander are the most common allergic triggers for asthma.

Allergen immunotherapy can offer clinical improvements in asthma. Confirmation of specific IgE is required prior to starting. Both sublingual and subcutaneous immunotherapy are available but unfunded in New Zealand for aeroallergens; treatment can be expensive and time-consuming. Aspirin desensitisation for patients with aspirin-exacerbated respiratory disease should be done under immunologist/allergist guidance.

Asthma is the most significant risk factor for fatal food-related anaphylaxis. Failure to recognise and treat anaphylaxis contributes to the risk of fatality.

Practice points

- Consider testing for allergen-specific IgE to aeroallergens in patients with allergic asthma.
- Allergen immunotherapy may be considered in patients with allergic asthma and allergic rhinitis who have evidence of allergy to house dust mite and/or pollens.
- All patients with food-related anaphylaxis should be referred to an immunologist/allergist.

Treatable traits[49–52]

In patients with difficult to treat asthma a key feature of management is the recognition and treatment of overlapping disorders, comorbidities, environmental and behavioural factors for which specific treatment is available, recently referred to as 'treatable traits'. The assessment and management of some of the treatable traits may require specialist referral and consideration of additional interventions. Systematic assessment of treatable traits in the severe asthma clinic is associated with improved outcomes. One schema to consider is as follows:

Table 5: Treatable traits in asthma.

Overlapping disorders
• COPD
• Bronchiectasis
• Allergic bronchopulmonary aspergillosis
• Dysfunctional breathing including vocal cord dysfunction
Comorbidities
• Obesity
• Gastro-oesophageal reflux disease
• Rhinitis
• Chronic rhinosinusitis ± nasal polyps
• Obstructive sleep apnoea
• Depression/anxiety
Environmental
• Smoking
• Damp, mouldy, cold or crowded housing
• Occupational exposures
• Provoking factors including aeroallergens
• Drugs such as aspirin, other non-steroidal anti-inflammatory drugs and beta blockers
• Insufficient income to access healthcare
Behavioural
• Adherence
• Inhaler technique
• Health literacy

Practice point

The treatable traits approach is particularly important for a patient who has poorly controlled asthma and/or poor respiratory health.

Self-management[53–56]

Self-management based on a written, personalised, action plan improves health outcomes and should be offered to and discussed with all people with asthma. Copies should be kept in their medical records. A variety of formats are available for patients and their families, and the most appropriate source of information for the patient should be assessed, whether written, pictorial, electronic, app etc.

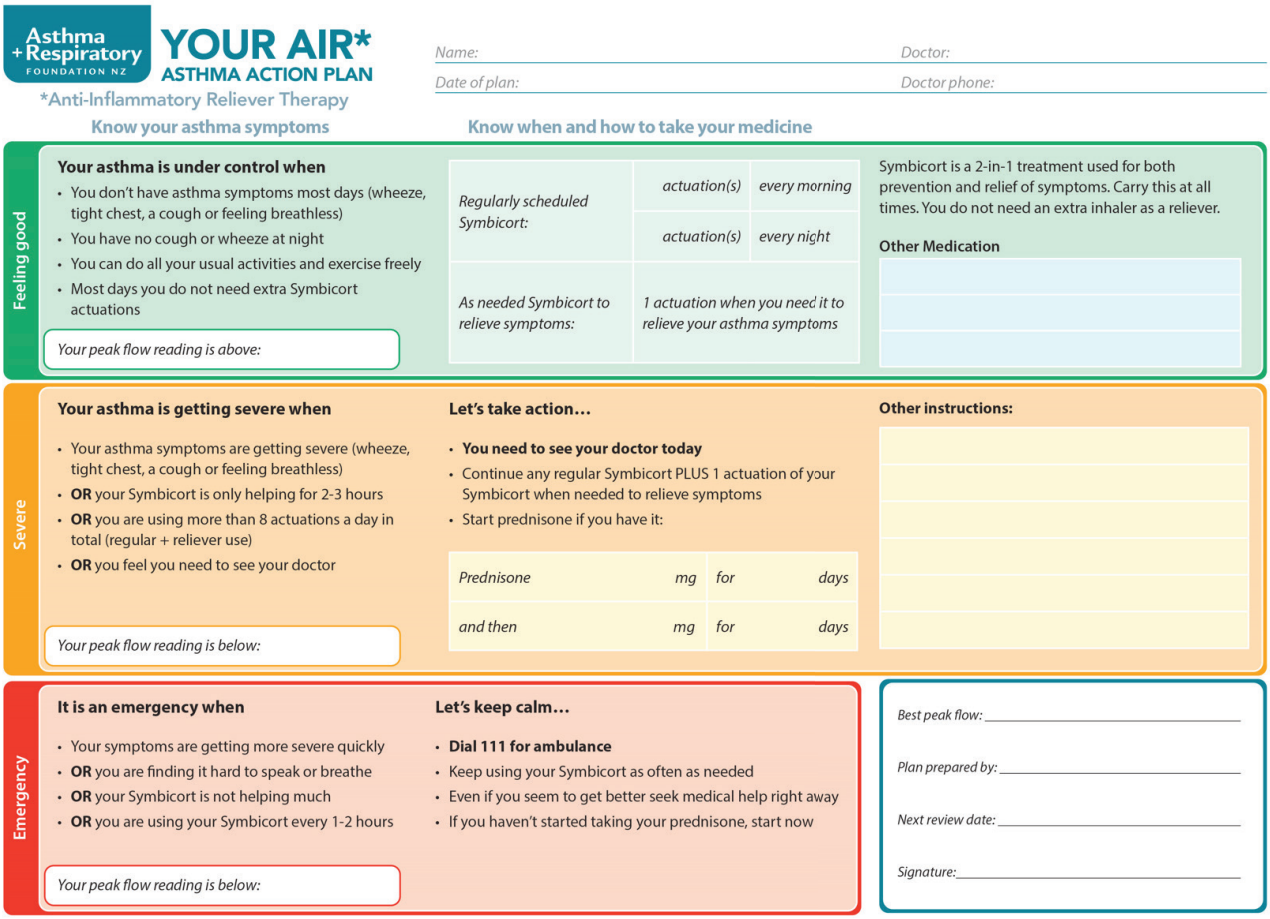
Practice points

- Asthma action plans should be based on symptoms with or without peak flow measurements and comprise either three or four stages depending on patient and health professional preference.
- Asthma and Respiratory Foundation NZ asthma action plans can be downloaded from their website http://asthmafoundation.org.nz/:
  - Budesonide/formoterol reliever ± maintenance (AIR plan)
  - ICS plus SABA (four-stage plan)
  - ICS or ICS/LABA plus SABA (three-stage plan)
- The peak flow level at which patients are guided to recognise worsening asthma is around 80% (of best), severe asthma at 60–70% of best and an asthma emergency at around 50% of best.
- The four-stage plan has been shown to be effective in the management of asthma. In this plan there is an extra step giving patients the option of increasing the dose of ICS, up to four-fold, through increasing the frequency of use, and/or the dose at each use, in response to worsening asthma symptoms or deteriorating peak flow. Patients should be advised to return to their normal ICS dose once asthma symptoms and peak flows have improved.
- The recommended action plans can be modified as required depending on patient and practitioner preference.
- The standard regimen for a course of prednisone in the situation of severe asthma is 40mg daily for five days. An alternative regimen is 40mg daily until definite improvement, and then 20mg daily for the same number of days. These regimens may need to be adjusted according to clinical factors

such as weight, comorbidities and interactions with other medications.

- Adherence to treatment should be routinely assessed and encouragement provided as part of the self-management education. For example, encourage patients to link their inhaler use with some other activity such as cleaning their teeth (and then rinsing their mouth).
- Inhaler technique should be routinely assessed at consultations and training provided as part of self-management education. If using a pMDI, it is preferable to administer via a spacer.
- A four-step adult asthma consultation, which includes guidance for writing an asthma action plan, is provided in the Appendix.

AIR asthma action plan with budesonide/formoterol reliever ± maintenance therapy



Asthma + Respiratory FOUNDATION NZ

YOUR AIR* ASTHMA ACTION PLAN

*Anti-Inflammatory Reliever Therapy

Name: Doctor:

Date of plan: Doctor phone:

Know your asthma symptoms | **Know when and how to take your medicine**

Feeling good

Your asthma is under control when

- You don't have asthma symptoms most days (wheeze, tight chest, a cough or feeling breathless)
- You have no cough or wheeze at night
- You can do all your usual activities and exercise freely
- Most days you do not need extra Symbicort actuations

Your peak flow reading is above:

Regularly scheduled Symbicort:	*actuation(s)*	*every morning*
	actuation(s)	*every night*
As needed Symbicort to relieve symptoms:	*1 actuation when you need it to relieve your asthma symptoms*	

Symbicort is a 2-in-1 treatment used for both prevention and relief of symptoms. Carry this at all times. You do not need an extra inhaler as a reliever.

Other Medication

Severe

Your asthma is getting severe when

- Your asthma symptoms are getting severe (wheeze, tight chest, a cough or feeling breathless)
- **OR** your Symbicort is only helping for 2-3 hours
- **OR** you are using more than 8 actuations a day in total (regular + reliever use)
- **OR** you feel you need to see your doctor

Your peak flow reading is below:

Let's take action...

- **You need to see your doctor today**
- Continue any regular Symbicort PLUS 1 actuation of your Symbicort when needed to relieve symptoms
- Start prednisone if you have it:

Prednisone	*mg*	*for*	*days*
and then	*mg*	*for*	*days*

Other instructions:

Emergency

It is an emergency when

- Your symptoms are getting more severe quickly
- **OR** you are finding it hard to speak or breathe
- **OR** your Symbicort is not helping much
- **OR** you are using your Symbicort every 1-2 hours

Your peak flow reading is below:

Let's keep calm...

- **Dial 111 for ambulance**
- Keep using your Symbicort as often as needed
- Even if you seem to get better seek medical help right away
- If you haven't started taking your prednisone, start now

Best peak flow: _____

Plan prepared by: _____

Next review date: _____

Signature: _____

Maintenance ICS & SABA reliever four-stage asthma action plan

Asthma + Respiratory FOUNDATION NZ

YOUR ASTHMA ACTION PLAN

Name: Doctor:

Date of plan: Doctor phone:

Know your asthma symptoms | **Know when and how to take your medicine**

Feeling good

Your asthma is under control when
- you don't have asthma symptoms most days (wheeze, tight chest, a cough or feeling breathless)
- you have no cough or wheeze at night
- you can do all your usual activities and exercise freely
- most days you don't need a reliever

Your peak flow reading is above

Preventer	*actuation(s)*	*every morning*
[name]	*actuation(s)*	*every night*
Reliever	*actuation(s)*	*when you need it to relieve your asthma symptoms*
[name]		

Carry your reliever at all times

Other Medication

Getting worse

Caution- your asthma is getting worse when
- you have symptoms most days (wheeze, tight chest, a cough or feeling breathless)
- you are waking at night with symptoms
- you are getting a cold

Your peak flow reading is below

Let's get prepared...
- Step up your preventer medicine:

  Take ____ actuations four times each day
- Use your reliever as often as needed – through a spacer, if one can be used with your reliever inhaler

Other instructions:

Severe

Caution- your asthma is getting severe when
- Your symptoms are getting severe (wheeze, tight chest, a cough or feeling breathless)
- **OR** your reliever is only helping for 2-3 hours
- **OR** you are using more than 12 actuations a day
- **OR** you feel you need to see your doctor

Your peak flow reading is below

Let's take action...
- **You need to see your doctor today**
- Continue your medicine for "getting worse"
- Start prednisone if you have it:

Prednisone	*mg*	*for*	*days*
and then	*mg*	*for*	*days*

Other instructions:

Emergency

Emergency
- Your symptoms are getting more severe quickly
- **OR** you are finding it hard to speak or breathe
- **OR** your reliever is not helping much
- **OR** you are using your reliever every 1-2 hours

Your peak flow reading is below

Let's keep calm...
- **Dial 111 for ambulance**
- Keep using your reliever as often as needed – through a spacer, if one can be used with your reliever inhaler
- Even if you seem to get better seek medical help right away
- If you haven't started taking your prednisone, start now

Best peak flow: _____

Plan prepared by: _____

Next review date: _____

Signature: _____

Maintenance ICS/LABA & SABA reliever three-stage asthma action plan or maintenance ICS & SABA reliever three-stage asthma action plan

Asthma + Respiratory FOUNDATION NZ

YOUR ASTHMA ACTION PLAN

Name: Doctor:

Date of plan: Doctor phone:

Know your asthma symptoms | **Know when and how to take your medicine**

Feeling good

Your asthma is under control when
- you don't have asthma symptoms most days (wheeze, tight chest, a cough or feeling breathless)
- you have no cough or wheeze at night
- you can do all your usual activities and exercise freely
- most days you don't need a reliever

Your peak flow reading is above

Preventer	*actuation(s)*	*every morning*
[name]	*actuation(s)*	*every night*
Reliever	*actuation(s)*	*when you need it to relieve your asthma symptoms*
[name]		

Carry your reliever at all times

Other Medication

Severe

Caution- your asthma is getting severe when
- Your asthma symptoms are getting severe (wheeze, tight chest, a cough or feeling breathless)
- **OR** your reliever is only helping for 2-3 hours
- **OR** you are using more than 12 actuations in a day
- **OR** you feel you need to see your doctor

Your peak flow reading is below

Let's take action...
- **You need to see your doctor today**
- Continue your regular preventer **AND** use your reliever as often as needed to relieve symptoms
- Start prednisone if you have it:

Prednisone	*mg*	*for*	*days*
and then	*mg*	*for*	*days*

Other instructions:

Emergency

Emergency
- Your symptoms are getting more severe quickly
- **OR** you are finding it hard to speak or breathe
- **OR** your reliever is not helping much
- **OR** you are using your reliever every 1-2 hours

Your peak flow reading is below

Let's keep calm...
- **Dial 111 for ambulance**
- Keep using your reliever as often as needed – through a spacer, if one can be used with your reliever inhaler
- Even if you seem to get better seek medical help right away
- If you haven't started taking your prednisone, start now

Best peak flow: _____

Plan prepared by: _____

Next review date: _____

Signature: _____

Adolescents[57–59]

The recommendations in this guideline apply to people aged 12 and above. Adolescence is a period of increased risk taking and decreased adherence, which may be due to forgetfulness, lack of routines, denial, beliefs about asthma or medication, difficulty using inhalers, fear of side effects and embarrassment in front of peers. They may be taking on risky activities such as smoking, e-cigarettes, vaping or drug taking. Parents/caregivers/whānau may play a key role in reminding and otherwise encouraging adolescents to take their medication.

Adolescents require an approach that enables them to take increasing responsibility while feeling empowered and confident to do so. Many adolescents report difficulties in communicating with their healthcare professional. Ensure that adolescents have a developmentally appropriate understanding of their asthma and treatment. If they have had asthma for a long time, it will be necessary to transition from the childhood to adult-centric approach to care.

Practice points

- Prioritise the relationship, offer continuity of care, and emphasise confidentiality. It is important to establish trust and explore barriers to access.
- Attempt to instil a sense of control, that adherence will improve the adolescent's control over their asthma and their lives. Consider if a practice nurse could play a coaching role.
- See adolescents individually first, and then with parents/caregivers as appropriate. Ensure they know that as they transition to adulthood they need to take more responsibility for their own healthcare and can make appointments for themselves.
- Explain risks of sharing inhalers with others (infection, inhaler runs out more quickly).
- Ask about smoking, vaping, and drug taking and advise accordingly.
- Assume that the young person is likely to have other health and social issues and questions. Complete a brief HEADSS (Home & Environment, Education & Employment, Activities, Drugs, Sexuality, Suicide/Depression) or holistic psychosocial assessment if practicable.
- Consider simple treatment regimens. Ensure that the young person is aware of what to do if symptoms escalate, and has someone to contact if they have concerns.
- Arrange follow-up appointments and ensure the adolescent knows how and when to instigate appointments.

Asthma in Māori[60–66]

Māori rights in regard to health, recognised in Te Tiriti of Waitangi and other national and international declarations, promote Māori participation in health-related decision making, as well as equity of health outcomes for all New Zealanders. Currently Māori with asthma are more likely to be hospitalised or die due to asthma than New Zealand European. Despite this, Māori with asthma are less likely to be prescribed ICS, have an action plan or receive adequate education. Major barriers to good asthma management which may affect Māori include access to and cost of care, services and approaches that do not meet their needs, discontinuity and poor quality care, lack of culturally appropriate services and health professionals, failure to provide information that is understandable to the individual, trust and confidence in the health system. Be mindful of institutional/structural racism (barriers) when treating Māori patients. Māori whānau have greater exposure to environmental triggers for asthma, such as smoking and poor housing. It is recommended that for Māori with asthma:

- Asthma providers should undertake clinical audit or other similar quality-improvement activities to monitor and improve asthma care and outcomes for Māori. The asthma action plan system of care, and the anti-inflammatory reliever (AIR) regimen have been shown to improve outcomes in Māori.
- A systematic approach to health-literacy and asthma education for Māori whānau is required. The evidence of the health literacy demands, the barriers and facilitators, and

steps to delivering excellent asthma management with Māori that are described in He maramatanga huango: Asthma health literacy for Maori children in New Zealand apply just as much to adults as they do to children.

- Asthma providers should support staff to develop culturally safe skills for engaging Māori with asthma and their whānau in line with professional requirements. https://www.mcnz.org.nz/our-standards/current-standards/cultural-safety/
- Māori leadership is required in the development of asthma management programmes that improve access to asthma care and facilitate 'wrap around' services to address the wider determinants (such as housing or financial factors) for Māori with asthma.

Asthma in Pacific peoples

Similar considerations as for Māori are likely to apply to asthma in Pacific peoples who also have a disproportionate burden of asthma, including high rates of hospital admission, and should be considered a high-risk group requiring targeted care. Inclusive in this targeted approach is addressing risk factors such as poor housing, over-crowding, health literacy, obesity, smoking and poor access to healthcare services. Be mindful of institutional/structural racism (barriers) when treating Pacific patients.

Asthma in pregnancy[10]

- Pregnancy can affect the course of asthma and women should be advised of the importance of maintaining good asthma control during pregnancy to avoid risk to both mother and baby.
- The risks to the baby of poor asthma control and associated exacerbations in pregnancy outweigh any theoretical risks associated with asthma medications.
- ICS, ICS/LABA and SABAs should be used as normal during pregnancy.
- Stopping usual asthma medications during pregnancy is associated with adverse outcomes for both the mother and her baby.
- Oral corticosteroids should be used as normal when indicated for severe asthma exacerbations during pregnancy.
- Acute severe asthma in pregnancy is a medical emergency and should be treated in hospital.
- Consider early referral for specialist review in pregnant patients with poor asthma control or a history of exacerbations.

Practice point

Treatment as usual for asthma in pregnancy, and early referral if there is poor asthma control or a recent exacerbation.

Management of acute severe asthma (Primary care, afterhours or ED)[10,67–73]

- Acute asthma management is based on:
  - objective measurement of severity (Table 6)
  - assessment of the need for referral to hospital and/or hospital admission (Table 7)
  - administering treatment appropriate for the degree of severity, and
  - repeatedly assessing the response to treatment.
- Direct measurement of airflow obstruction is the most objective marker of asthma severity. This can be based on either the measurement of PEF or preferably FEV1, if available at the time of assessment, with both measures expressed as percent of the previous best or predicted reference values.
- The levels of FEV1 or PEF to signify severe and life-threatening asthma in these situations, differ from, and are lower than, those used by patients in action plans in a non-healthcare setting.
- Key priorities include identification of a life-threatening attack requiring urgent admission to an intensive care unit or high dependency unit, and a severe asthma attack requiring hospital admission (Table 7).

Table 6: Levels of severity of acute asthma exacerbation.

Mild/moderate asthma exacerbation:	• Increasing symptoms • FEV1 or PEF >50% best or predicted • No features of acute severe asthma
Acute severe asthma:	Any one of: • FEV1 or PEF 30-50% best or predicted • Respiratory rate ≥25/min • Heart rate ≥110/min • Inability to complete sentences in one breath
Life-threatening asthma:	Any one of the following in a patient with severe asthma: • FEV1 or PEF <30% best or predicted • SpO2 <92% or PaO2 <60mmHg • PaCO2 ≥45mmHg • Inability to talk# • Silent chest# • Cyanosis# • Feeble respiratory effort, exhaustion# • Hypotension or bradycardia#

#These are very late manifestations and reflect a patient at risk of imminent respiratory arrest.

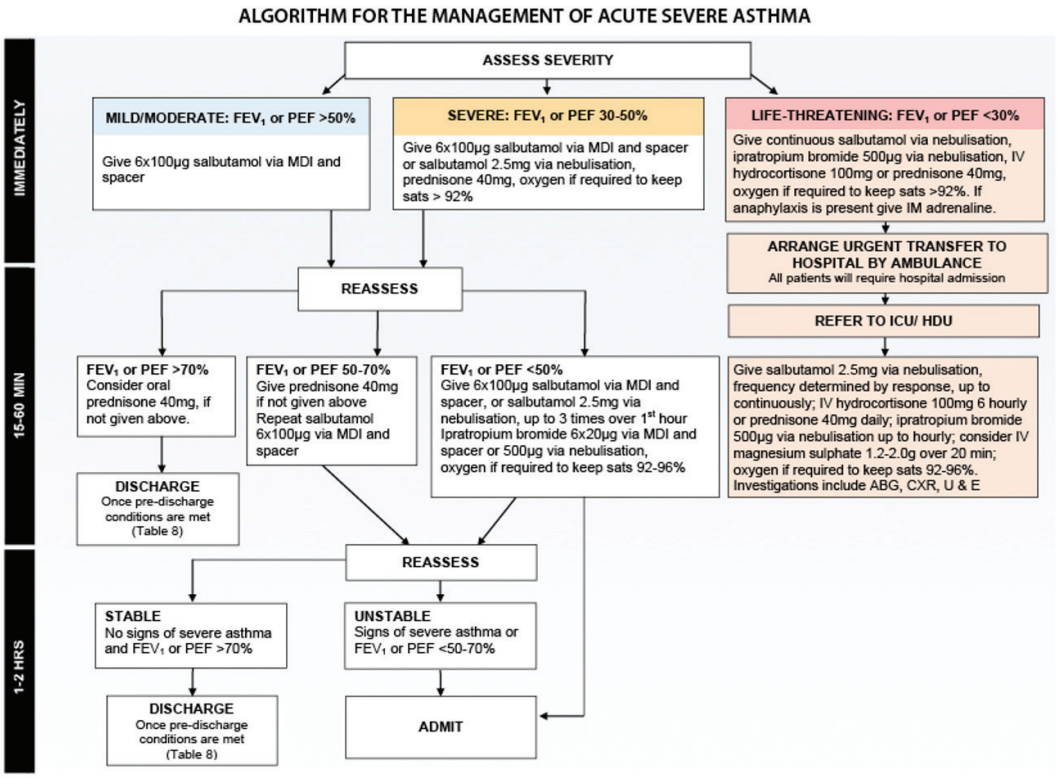
Practice points

A pragmatic rule is that a lack of response to initial bronchodilator treatment and/or a requirement for repeat doses indicates the likely requirement for referral to hospital and/or admission.

- For most patients initial treatment with a SABA via a spacer and oral corticosteroids is likely to be sufficient. Reserve nebulised bronchodilators for those with severe asthma who do not respond to initial inhaled therapy.
- Nebulisers may increase the risk for aerosolisation of viruses such as SARS-CoV-2 (COVID-19) and influenza. Nebulisers should be avoided, if possible, in any patient who could be infected. If they are used, appropriate aerosolisation infection precautions should be implemented.
- There is insufficient evidence to guide the use of combination budesonide/formoterol by health professionals in the setting of acute severe asthma and for this reason a SABA is the preferred agent in this setting.
- Consider and treat anaphylaxis with intramuscular adrenaline (epinephrine) in acute severe asthma. Be vigilant in patients with known food allergy and/or anaphylaxis plans, and recognise that skin signs may be absent.

Table 7: Criteria for referral to hospital and/or hospital admission.

- Patients with any feature of life-threatening asthma
- Patients with any feature of severe attack persisting after initial treatment
- Patients in whom other considerations suggest that admission may be appropriate:
  - Still have significant symptoms after bronchodilator treatment
  - Living alone/socially isolated
  - Psychosocial problems
  - Physical disability or learning difficulties
  - Previous near fatal attack
  - Exacerbation despite adequate dose of oral corticosteroids pre-presentation
  - Presentation at night and especially if no means of communication or transport
  - Pregnancy



For practical purposes, the FEV_1 and PEF are considered interchangeable when expressed as % predicted for the purpose of assessment of acute asthma severity.

- There is insufficient evidence to support the use of intramuscular adrenaline in severe asthma without anaphylaxis, and so intramuscular adrenaline is not recommended unless there are signs or clinical suspicion of anaphylaxis.
- Intravenous magnesium sulphate may be administered in life-threatening asthma. There is no role for intravenous beta-2 agonists, unless inhaled treatment cannot be given. Similarly, there is no role for intravenous aminophylline.
- There is insufficient evidence to support the use of non-invasive ventilation in life-threatening asthma, outside an intensive care unit or high dependency unit setting, and as a result it is not recommended in other settings.
- For patients who are treated in primary care or discharged from the afterhours or ED, long-term management should be reviewed and an early follow-up appointment with their primary healthcare team should be arranged (Table 8).
- All patients not taking ICS should have an ICS dispensed and appropriate technique taught before going home.

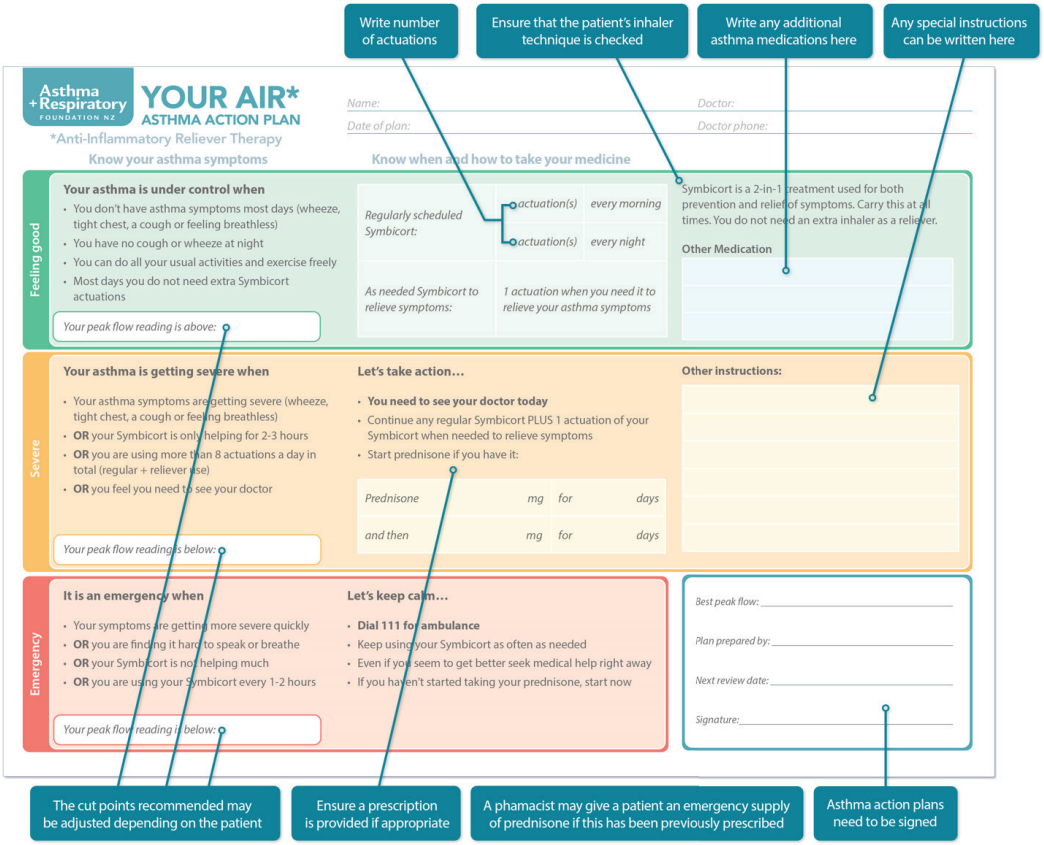
Table 8: Pre-discharge considerations.

1.	Most patients presenting with acute exacerbations of asthma should have a course of oral prednisone, 40mg daily for at least five days.
2.	An acute exacerbation is an opportunity to consider switching patients to AIR therapy with ICS/formoterol as the maintenance and reliever treatment, as the optimal treatment to reduce the risk of future severe exacerbations.
3.	It is recommended that patients have prednisone and ICS dispensed prior to discharge to ensure there are no barriers to taking medication.
4.	Consider referral to a specialist respiratory service.
5.	Before the patient goes home, ensure that the patient:
•	Can use their inhalers correctly, and has a supply of their medication (including ICS).
•	Has a written self-management plan which includes the treatment prescribed, and when to seek further urgent medical review.
•	Knows when to contact emergency medical help if worsens.
•	Arranges an early follow-up appointment with their primary healthcare team for review.

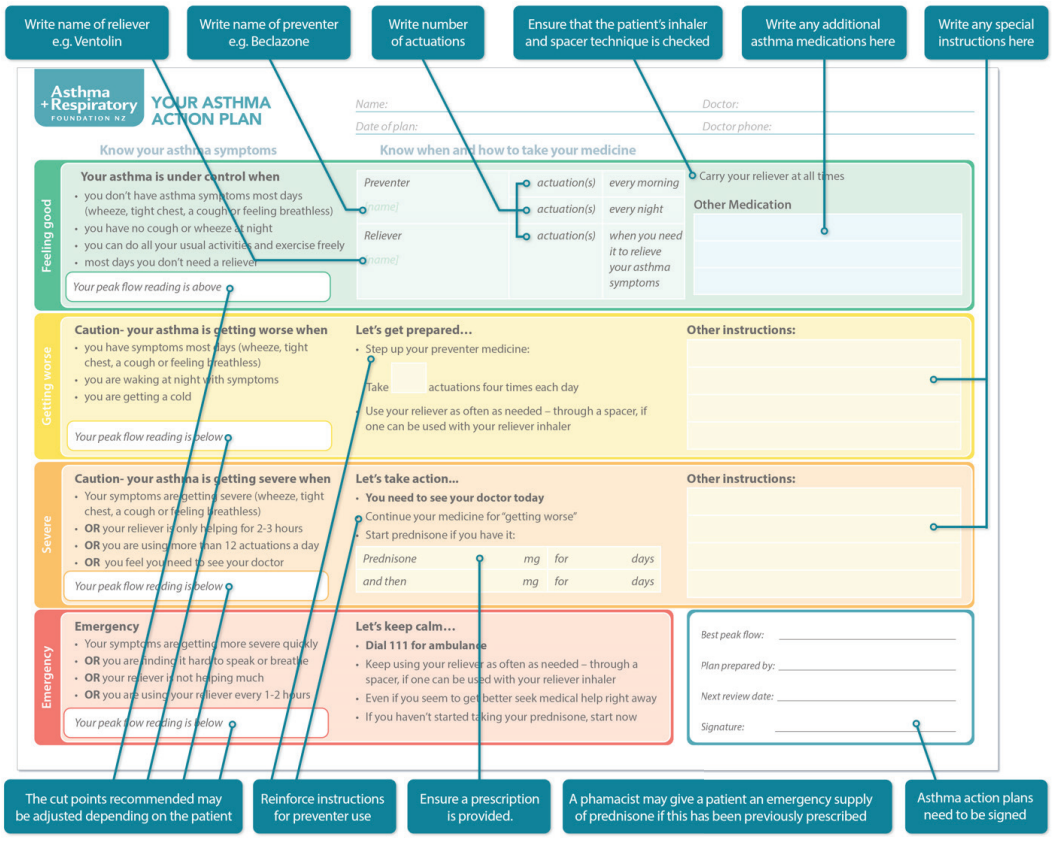
Appendix: the four-step asthma consultation

1. Assess asthma control	2. Consider other relevant clinical issues	3. Decide if increase or decrease in maintenance therapy required	4. Complete the asthma action plan
Complete the Asthma Control Test (ACT) score 20–25: well controlled 16–19: partly controlled 5–15: poorly controlled Review lung function tests Peak flow monitoring and/or Spirometry Review history of severe asthma attacks in last 12 months (requiring urgent medical review, oral corticosteroids or bronchodilator nebuliser use)	Ask & investigate (eg prescribing records) about medication use, including adherence with maintenance treatment Check inhaler technique Enquire about clinical features associated with an increased risk Consider treatable traits Decide whether peak flow monitoring is indicated	Is a step up in the level of treatment required if asthma is not adequately controlled, poor lung function or recent severe exacerbation? Is a change to the AIR regimen required in patients who have had a recent severe exacerbation? Is a step down in the level of treatment possible if there has been a sustained period of good control?	Decide which plan to use: • AIR budesonide/formoterol reliever ± maintenance therapy • 3-stage maintenance ICS or ICS/LABA + SABA reliever • 4-stage maintenance ICS + SABA reliever [This includes the instruction to increase dose and frequency of ICS in worsening asthma] For those with peak flow instructions, enter personal best recent peak flow and peak flow at each level in the plan. The recommended cut points of <80% for getting worse, <60 to 70% for severe asthma and <50% for an emergency are a reference guide only and can be adjusted according to clinical judgement depending on the patient. Enter the prednisone regimen. The standard regimen in severe asthma is 40mg daily for five days. An alternative regimen is 40mg daily until there is definite improvement and then 20mg daily for the same number of days. Enter additional instructions in the box provided. This may include avoidance of provoking factors such as aspirin. Save a copy of the plan on the patient record.

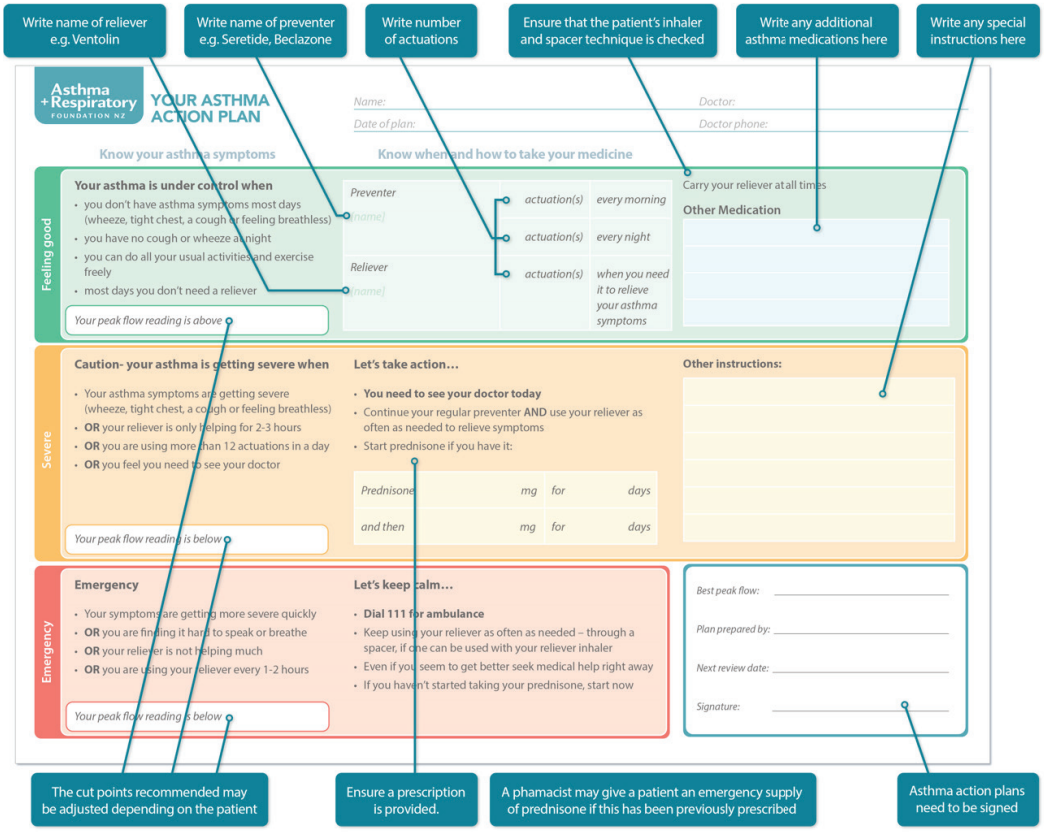
Completing the budesonide/formoterol reliever ± maintenance therapy (AIR) asthma action plan



Completing the maintenance ICS & SABA reliever four-stage asthma action plan



Completing the maintenance ICS/LABA & SABA reliever or maintenance ICS & SABA reliever three-stage asthma action plan



Useful documents/resources/IT support/educational tools/audit tools section

Health professionals

Asthma control

The Asthma Control Test can be used during a consultation/appointment to standardise the review of asthma symptoms: http://www.asthmacontrol.co.nz/.

Asthma self-management plans (action plans)

Every person with asthma should have an individualised written asthma plan, which is updated yearly. The plan should be appropriate for level of treatment, asthma severity, health literacy, culture and ability to self-manage. There is a range of plans available:

https://www.nzasthmaguidelines.co.nz/resources

Inhaler technique

Correct inhaler technique is central for good asthma control. Incorrect use of an inhaler may lead to worsening asthma control due to inadequate drug delivery to the airways. Information and videos on correct inhaler technique can be found here:

https://www.nationalasthma.org.au/living-with-asthma/how-to-videos; https://www.health-navigator.org.nz/medicines/i/inhaler-devices/?tab=10755#Overview

Dispensing records

Clinicians are encouraged to check pharmacy dispensing records for a patient when assessing concordance with asthma medication. These records may be available through primary care, pharmacy or district health board patient records systems.

Audit Tools

Health professionals providing asthma care are encouraged to participate in audit

https://bpac.org.nz/Audits/docs/bpac_audit_asthma_management2017.pdf

https://www.thoracic.org.au/researchawards/new-zealand-national-asthma-audit

Resource for school teachers

The Teachers' Asthma Toolkit is a free online tool that covers information about asthma, how asthma affects education, how asthma is treated, common triggers and what to do in an asthma emergency. The toolbox is interactive, featuring video clips, animations, classroom resources and child-friendly activities.

https://learnaboutlungs.asthmaandrespiratory.org.nz/

Resources for those who have asthma and their families

Asthma apps

The My Asthma App provides educational information on asthma, signs and symptoms, triggers, treatment, medication, ACT, helpful contacts and resources. It includes the ability to include an individualised asthma action plan. This resource was developed by the Asthma and Respiratory Foundation New Zealand and can be downloaded from: Android: bit.ly/AsthmaAppAndroid or

Apple: bit.ly/AsthmaAppApple

Websites providing guidelines, educational information and e-learning course

Online information on asthma is readily available. There are several New Zealand and Australian websites which provide high-quality information and downloadable resources on asthma and other conditions which may impact on asthma management. These include:

Asthma and Respiratory Foundation New Zealand https://www.asthmafoundation.org.nz/

https://www.asthmafoundation.org.nz/health-professionals/copd-asthma-fundamentals

Asthma New Zealand https://www.asthma.org.nz/

Allergy New Zealand http://www.allergy.org.nz/

Severe asthma toolkit https://toolkit.severeasthma.org.au/

National Asthma Council Australia https://www.nationalasthma.org.au/

The New Zealand Formulary has information on drugs in sport http://www.nzf.org.nz

Australian Society of Clinical Immunology and Allergy website has a range of information, action plans, treatment plans, patient handouts and e-learning course for health professionals https://www.allergy.org.au/

National Institute for Clinical Excellence has a useful patient inhaler decision aid https://www.nice.org.uk/guidance/ng80/resources/inhalers-for-asthma-patient-decision-aid-pdf-6727144573

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REFERENCES:

1. Asthma and Respiratory Foundation of New Zealand 2015. Te Hā Ora (The Breath of Life): National Respiratory Strategy. Wellington: The Asthma Foundation.
2. Jones B, Ingham T. He Māramatanga huangō: Asthma health literacy for Māori children in New Zealand: Report to the Ministry of Health. Wellington: Ministry of Health 2015.
3. Telfar Barnard L, et al. The impact of respiratory disease in New Zealand: 2018 update. Wellington: Asthma Foundation 2019.
4. Holt S, Beasley R. The Burden of Asthma in New Zealand. Asthma & Respiratory Foundation NZ and Medical Research Institute of New Zealand. Auckland: Adis International Ltd 2002; 48p.
5. ISAAC Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema: ISAAC. Lancet 1998; 351:1225–32.
6. Lai CKW, et al. Global variation in the prevalence and severity of asthma symptoms: Phase Three of the International Study of Asthma and Allergies in Childhood (ISAAC). Thorax 2009; 64:476–83.
7. Masoli M, et al. Global Burden of Asthma. Global Initiative for Asthma (GINA) 2004. www.ginasthma.com
8. Beasley R, et al. Asthma and Respiratory Foundation NZ adult asthma guidelines: A quick reference guide. NZMJ 2016; 129:83–102.

9. Asher I, et al. Asthma and Respiratory Foundation NZ child and adolescent asthma guidelines: A quick reference guide. NZMJ 2016; 130:10–33.
10. Global Strategy for Asthma Management and Prevention. Global Initiative for Asthma (GINA). 2019 Update.
11. British Thoracic Society, Scottish Intercollegiate Guidelines Network. QRG 141: British Guideline on the Management of Asthma Quick Reference Guide. October 2014.
12. National Asthma Council Australia. Australian Asthma Handbook Quick Reference Guide. Version 2.0, available at: http://www.asthmahandbook.org.au/
13. Nathan R, et al. Development of the Asthma Control Test: a survey for assessing asthma control. J Allergy Clin Immunol 2004; 113:59–65.
14. Schatz M, et al. Asthma control Test: reliability, validity, and responsiveness in patients not previously followed by asthma specialists. J Allergy Clin Immunol 2006; 117:549–56.
15. Janson C, et al. Carbon footprint impact of the choice of inhalers for asthma and COPD. Thorax 2020; 75:82–4.
16. Wilkinson AJK, et al. Costs of switching to low global warming potential inhalers. An economic and carbon footprint analysis of NHS prescription data in England. BMJ Open 2019; 9:e028763. doi: 10.1136/bmjopen-2018-028763.
17. Bateman ED, et al. As-needed budesonide-formoterol versus maintenance budesonide in mild asthma. N Engl J Med 2018; 378:1877–87.
18. Hardy J, et al. Budesonide-formoterol reliever therapy versus maintenance budesonide plus terbutaline reliever therapy in adults with mild to moderate asthma (PRACTICAL): a 52-week, open-label, multicentre, superiority, randomised controlled trial. Lancet 2019; 394:919–28.
19. O'Byrne PM, et al. Inhaled combined budesonide–formoterol as needed in mild asthma. N Engl J Med 2018; 378:1865–76.
20. Beasley R, et al. Controlled trial of budesonide-formoterol as-needed for mild asthma. N Engl J Med 2019; 380:2020–30.
21. Sobieraj DM, et al. Association of inhaled corticosteroids and long-acting β-agonists as controller and quick relief therapy with exacerbations and symptom control in persistent asthma a systematic review and meta-analysis. JAMA 2018; 319:1485–96.
22. Beasley R, et al. ICS-formoterol reliever therapy stepwise treatment algorithm for adult asthma. Eur Respir J 2020; 55:1901407. doi: 10.1183/13993003.01407-2019.
23. Balanag VM, et al. Efficacy and safety of budesonide/formoterol compared with salbutamol in the treatment of acute asthma. Pulm Pharmacol Ther 2006; 19:139–47.
24. Powell H, Gibson P. High dose versus low dose inhaled corticosteroids as initial starting dose for asthma in adults and children. The Cochrane Collaboration. The Cochrane Library 2008, Issue 4.
25. Holt S, et al. Dose-response relation of inhaled fluticasone propionate in adolescents and adults with asthma: meta-analysis. BMJ 2001; 323:253–6.
26. Masoli M, et al. Dose-response relationship of inhaled budesonide in adult asthma: a meta-analysis. Eur Respir J 2004; 23:552–8.
27. Pauwels RA, et al. Early intervention with budesonide in mild persistent asthma: a randomised, double-blind trial. Lancet 2003; 361:1071–6.
28. Beasley R, et al. Call for withdrawal of LABA single-therapy inhaler in asthma. Lancet 2010; 376:750–1.
29. Woodcock A, et al. Effectiveness of fluticasone furoate plus vilanterol on asthma control in clinical practice: an open-label, parallel group, randomised controlled trial. Lancet 2017; 390:2247–55.
30. Patel M, et al. Efficacy and safety of maintenance and reliever combination budesonide–formoterol inhaler in patients with asthma at risk of severe exacerbations: a randomised controlled trial. Lancet Respir Med 2013; 1:32–42.
31. Gibson PG, et al. Asthma in older adults. Lancet 2010; 376:803–13.
32. Anderson DE, et al. Long-acting muscarinic antagonists (LAMA) added to inhaled corticosteroids (ICS) versus the same dose of ICS alone for adults with asthma. Cochrane Database Syst Rev 2015; 8:CD011397.
33. Sobieraj DM, et al. Association of inhaled corticosteroids and long-acting muscarinic antagonists with asthma control in patients with uncontrolled, persistent asthma: a systematic review and meta-analysis. JAMA 2018; 319:1473–84.

34. Virchow JC, et al. Single inhaler extrafine triple therapy in uncontrolled asthma (TRIMARAN and TRIGGER): two double-blind, parallel-group, randomised, controlled phase 3 trials. Lancet 2019; 394:1737–49.

35. Normansell R, et al. Omalizumab for asthma in adults and children. Cochrane Database Syst Rev 2014; 1:CD003559.

36. Pavord ID, et al. Mepolizumab for severe eosinophilic asthma (DREAM): a multicentre, double-blind, placebo-controlled trial. Lancet 2012; 380:651–9.

37. Peters MC, Wenzel SE. Intersection of biology and therapeutics: type 2 targeted therapeutics for adult asthma. Lancet 2020; 395:371–83.

38. Kowalski ML, et al. Diagnosis and management of NSAID-Exacerbated Respiratory Disease (N-ERD)—a EAACI position paper. Allergy 2019; 74:28–39.

39. Gotzsche PC, Johansen HK. House dust mite control measures for asthma. The Cochrane Collaboration 2008.

40. Howden-Chapman P, et al. Effect of insulating existing houses on health inequality: cluster randomised study in the community. BMJ 2007; 334:460.

41. Australasian Society of Clinical Immunology and Allergy. Skin prick testing for the diagnosis of allergic disease: a manual for practitioners. ASCIA 2016. http://allergy.org.au/images/stories/pospapers/ASCIA_SPT_Manual_March_2016.pdf . Accessed 17/12/19.

42. Australasian Society of Clinical Immunology and Allergy. Laboratory tests in the diagnosis of allergic disease. ASCIA. http://allergy.org.au/hp/papers/tests-in-the-diagnosis-of-allergic-diseases Accessed 17/12/19.

43. Novakova P, et al. Allergen immunotherapy in asthma: current evidence. J Asthma 2019; doi: 10.1080/02770903.2019.1684517.

44. Agache I, et al. EAACI Guidelines on Allergen Immunotherapy: House dust mite-driven allergic asthma. Allergy 2019; 74:855–73.

45. Dhami S, et al. Allergen immunotherapy for allergic asthma: A systematic review and meta-analysis. Allergy 2017; 72:1825–48.

46. Smith PK, et al. Risk multipliers for severe food anaphylaxis. World Allergy Organ J 2015; 8:30.

47. Kool B, et al. Adult food-induced anaphylaxis hospital presentations in New Zealand. Postgrad Med J 2016; 92:640–4.

48. Turner PJ, et al. Fatal Anaphylaxis: Mortality Rate and Risk Factors. J Allergy Clin Immunol Pract 2017; 5:1169–78.

49. Agusti A, et al. Treatable traits: towards precision medicine of chronic airways diseases. Eur Respir J 2016; 47:410–9.

50. Agusti A, et al. Precision medicine in airway diseases: moving to clinical practice. Eur Respir J 2017; 50:1701655.

51. Pavord I, et al. After asthma: redefining airways diseases. Lancet 2018; 391:350–400.

52. Clark VL, et al. Multidimensional assessment of severe asthma: A systematic review and meta-analysis. Respirology 2017; 22:1262–75.

53. Holt S, et al. The use of the self-management plan system of care in adult asthma. Prim Care Resp J 2004; 13:19–27.

54. Gibson PG, Powell H. Written action plans for asthma: an evidence-based review of the key components. Thorax 2004; 59:94–9.

55. Reddel HK, et al. A summary of the new GINA strategy: a roadmap to asthma control. Eur Respir J 2015; 46:622–39.

56. Reddel HK, et al. The GINA asthma strategy report: what's new for primary care? NPJ Primary Care Respiratory Med 2015; 25;150–6.

57. Sadof M, Kaslovsky R. Adolescent asthma: a developmental approach. Curr Opin Pediatr 2011; 23:373–8.

58. Buston KM, Wood SF. Non-compliance amongst adolescents with asthma: listening to what they tell us about self-management, Family Practice 2000; 17:134–8.

59. Holley S, et al. Barriers and facilitators to asthma self-management in adolescents: A systematic review of qualitative and quantitative studies. Pediatr Pulmonol 2017:52:430-42.

60. Hobbs M, et al. Reducing health inequity for Maori people in New Zealand. Lancet 2019; 394:1613–4.

61. Gillies TD, et al. Ethnic disparities in asthma treatment and outcomes in children aged under 15 years in New Zealand: analysis of national databases. Prim Care Respir J 2013; 22:312–8.

62. Metcalfe S, et al. Variation in the use of medicines by ethnicity during 2006/07 in New Zealand: a preliminary analysis. NZMJ 2013; 126:14–41.

63. Harris RB, et al. The relationship between

socially-assigned ethnicity, health and experience of racial discrimination for Maori: analysis of the 2006/07 New Zealand Health Survey. BMC Public Health 2013; 13:844.

64. Robson B, Harris R. Hauora: Màori Standards of Health IV. A study of the years 2000–2005. 2007.

65. Tatau Kahukura: Māori Health Chart Book 2015, 3rd edition. Accessed 17/12/19. http://www.health.govt.nz/publication/tatau-kahukura-maori-health-chart-book-2015-3rd-edition.

66. Pilcher J, et al. Combination budesonide/formoterol inhaler as maintenance and reliever therapy in Māori with asthma. Respirology 2014; 19:842–51.

67. Aldington S, Beasley R. Asthma exacerbations. 5: Assessment and management of severe asthma in adult in hospital. Thorax 2007; 62:447–58.

68. Rowe BH, et al. Corticosteroids for preventing relapse following acute exacerbations of asthma. Cochrane Database Syst Rev 2007; (3):CD000195.

69. Bowler SD, et al. Corticosteroids in acute severe asthma: effectiveness of low doses. Thorax 1992; 47:584–7.

70. Camargo CA Jr, et al. Continuous versus intermittent beta-agonists in the treatment of acute asthma. Cochrane Database Syst Rev 2003; (4):CD001115.

71. Cates CJ, et al. Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma. Cochrane Database Syst Rev 2013; (9):CD000052.

72. Emerman CL, et al. Comparison of 2.5 vs 7.5 mg of inhaled Albuterol in the treatment of acute asthma. Chest 1999; 115:92–6.

73. Rodrigo GJ, Castro-Rodriguez JA. Anticholinergics in the treatment of children and adults with acute asthma: a systematic review with meta-analysis. Thorax 2005; 60:740–6.

Human lungs are created to breathe clean air: the questionable quantification of vaping safety "95% less harmful"

Kelly S Burrowes, Lutz Beckert, Stuart Jones

ABSTRACT

The New Zealand government is aiming for Smokefree Aotorea, equivalent to a reduction in smoking prevalence to 5% or less by 2025. E-cigarettes may be one tool to meet this target, but how safe are they? Little is known about their long-term health implications in humans. In 2015, Public Health England commissioned a report summarising the available literature on e-cigarettes and coined the now well-known quantification that "e-cigarettes are 95% less harmful to your health than normal cigarettes". In this article, we argue that this is an unfounded quantification because the data required to make this quantification are not yet available. The value of '95% safer' was based on a study estimating the relative harms of nicotine-containing products that utilised scoring from a selected panel of experts. One of the key limitations of this quantification is that while the scores provided by the panellists were informed by knowledge, they are fundamentally value judgements and are not an exact science. E-cigarettes are probably safer than conventional cigarettes, however, there is mounting evidence that they are not without harm and the long-term health impacts are not yet known.

E-cigarettes and harm reduction—more evidence is needed

It is projected that smoking will kill one billion people worldwide this century.[1] Up to two-thirds of those who smoke will die prematurely due to smoking.[2]

In New Zealand smoking rates in adults have fallen significantly over the last two decades; dropping from 25% in 1996/97 to a current rate of 12.5%, with Māori still having significantly higher smoking rates (34%).[3] Some of the greatest reductions in smoking have been seen in our school children where smoking rates in our 15–17 year olds have fallen from 14–3% over the same period of time. That is a great success story and important to achieve long-term good health.

The New Zealand government is targeting a drastic reduction in smoking prevalence to 5% or less by 2025, and e-cigarettes are one possible tool to meet this target. Little is known about the health implications of e-cigarettes in humans, in particular we have no long-term data. E-cigarettes, also known as vaping devices, are electronic nicotine delivery systems (ENDS) that use heat (>100°C)[4] to aerosolise a liquid ('e-liquid') which is then inhaled. E-liquids typically consists of propylene glycol (PG), glycerol, nicotine and flavourings.[5] Since e-cigarettes first came to market in 2006, uptake has grown rapidly, to the point that sales of these products are predicted to surpass conventional cigarettes by 2023.[6] Some clinical trials have shown modest improvements in smoking cessation with the use of e-cigarettes in combination with existing approaches (nicotine replacement therapy[7] or when accompanied with behavioural support[8]).[7–9] Other studies have

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shown no significant reduction particularly in unmotivated smokers, and despite widespread availability and promotion in the UK since 2006 a recent report has demonstrated no significant reduction in population cigarette consumption attributable to e-cigarette availability.[10] More long-term research into the effectiveness of e-cigarettes with regard to smoking cessation and long-term outcomes is needed.

E-cigarettes are not without risk.[11] It is difficult balancing the potential usefulness of e-cigarettes as a smoking cessation tool with the harm they may have on the airways themselves. It is also important to be mindful of nicotine addiction, as it is becoming apparent that nicotine can have significant health risks on its own.[12,13] E-cigarettes are designed to enable the inhalation of nicotine, which is associated with the accompanying nicotine addiction. A detailed summary of arguments against a tobacco harm reduction strategy as a population-based strategy can be found in the European Respiratory Society (ERS) position paper on ENDS.[14] The accompanying editorial summarises the seven key arguments[15] which include: a lack of evidence for effective smoking cessation; the fact that most e-cigarette users (60–80%) continue to smoke; uncertainty around the safety of these products—with the uncertainty being the degree of harm rather than the presence of harm; and finally consideration of the impact of the entire population—with reference to uptake of e-cigarette use among adolescents/non-smokers.

In contrast in August 2015, Public Health England (PHE) commissioned a report of the available evidence related to e-cigarettes.[16] This review built on previous evidence summaries in a report in 2014 also by PHE.[17] The 2015 report can be largely summarised by the following quote: "In a nutshell, best estimates show e-cigarettes are 95% less harmful to your health than normal cigarettes, and when supported by a smoking cessation service, help most smokers to quit tobacco altogether". Since the release of this report, this questionable quantification of vaping safety has been widely utilised, including in the 2018 updated Public Health Report reviewing evidence related to e-cigarettes and heated tobacco products.[18]

How did the quantification of 95% safer emerge and why is it unfounded?

This quantification of safety was largely based on two reports.[19,20] The first, a report estimating the harms of nicotine-containing products by Nutt et al.[19] In this study, a multi-criteria decision analysis model (MCDA) including 14 harm criteria was applied to 12 nicotine-containing products. An international expert panel convened over two days to create a score of the harm of each of these nicotine-containing products.

Several limitations of this approach have been acknowledged by the authors themselves, others have been discussed in an editorial by The Lancet.[21] Some of the limitations includes "…lack of hard evidence for the harms of most products on most of the criteria". Components of the total product harm scoring included categories such as '*product-related mortality*' and '*product-specific morbidity*'—these relating to death or disease due to the use of a nicotine-containing product. It makes sense that e-cigarettes scored low in these main categories because aspects of disease or death related to vaping had not yet emerged at the time of this evaluation.

Another weakness was the panel of experts used in evaluating these measures with the authors acknowledging that there "was no formal criterion for the recruitment of the experts". In addition, at least two authors had affiliations with e-cigarette distributors. In fact, the editors added a note to this report relating to this conflict of interest and concluding that "the scientific community has to discuss the demarcation between potential conflicts of interest related to companies producing addictive drugs and companies producing therapeutics".[17]

Finally, part of the evaluation of the measures of harm in this study are based on value judgements. The quantification of harm can be informed by data; however, the weighting requires value judgements to be made. This means that these measures are not an exact science and can be easily influenced by the opinions and values of the panel as well as by their opinion of the harms of each product evaluated.

The second paper referenced in the original report was a summary of evidence by West et al.[20] This report was co-authored by the two prominent authors from the 2015 PHE report—McNeill and Hajek—making it a somewhat circular argument. The West report provides a short summary of selected literature that was presented to the UK All-Party Parliamentary Group on Pharmacy in July 2015. The section related to *safety* in this document references the above paper by Nutt et al[19] quoting the estimated extent of harm to be "around 1/20th" compared to that of conventional cigarettes. The minimal incidence of harm as of 2015 was also mentioned, including a small number of people who reported acute adverse reactions to vaping, poisoning due to consumption of nicotine liquid and sequelae of exploding e-cigarette batteries and devices.

Toxicity of e-cigarettes aerosols

An author's note related to the 2015 PHE report specified that the '95% safer than smoking' quantification was based on the facts that: "harmful, including carcinogenic, chemicals are either absent or found at much lower levels (<5% or <1%) compared to cigarette smoke and that the main chemicals present in e-cigarettes have not been associated with any serious risk".[22] While this information can substantiate a valid claim that e-cigarettes have lower levels of harmful chemicals, it is difficult to validate a claim that they are 95% safer. Many toxicological studies have found evidence that harmful and hazardous chemicals are present in e-liquids and aerosols. So far, several known carcinogens have been found in e-cigarette aerosols, including formaldehyde, acetaldehyde, acrolein and heavy metals to name a few. As a result, most reports conclude a high level of uncertainty regarding the safety of e-cigarettes.[11]

The key components of e-liquid are propylene glycol, glycerol, flavourings and nicotine—although without any regulations in place and no requirement for labelling exactly what chemicals are within the e-liquid other chemicals could be added. The number of chemicals within the aerosol itself has been found to be much greater than this seemingly simple list, with some studies showing upwards of 50 different chemicals within e-cigarette aerosol.[23] Compounds that have been identified include tobacco-specific nitrosamines (TSNAs), aldehydes, metals, volatile organic compounds (VOCs), phenolic compounds, polycyclic aromatic hydrocarbons (PAHs), flavorings, tobacco alkaloids and drugs.[11] Determining the chemical composition of >400 brands and >15,500 flavours available is challenging.[24] Another complexity is the large variation in vaporising temperatures due to user preference, device and variable power settings. Coils can reach temperatures of 300°C–350°C or higher under certain conditions and vary between different e-cigarettes.[4] When heating occurs, the liquid undergoes a phase change to a vapour to enable inhalation. At these high temperatures, it is likely that the chemicals undergo a range of chemical reactions changing the composition of the vapour, and possibly producing hazardous chemicals and degradation products. Finally, the vaping topography (the inhalation pattern) can vary widely depending on the user (and the experimental protocol) and has been found to alter the chemical composition of e-cigarette aerosol.[25]

The National Academies of Sciences, Engineering and Medicine (NASEM) report, released in 2018, implemented an extensive systematic review of the literature across several aspects of e-cigarettes.[11] In surveying the literature for the toxicity of e-liquid chemicals, the NASEM report concluded that propylene glycol is unlikely to be associated with adverse health impacts.[11] Glycerol appears to be generally safe, however pyrolysis (that is, the thermal decomposition of chemicals at high temperatures) of propylene glycol and glycerol results in the creation of toxic carbonyl compounds, including formaldehyde, acetaldehyde and acrolein.[26] In addition, carbon monoxide can be formed as a degradation product and has recently been found in e-cigarette aerosol.[27] It has also been detected in exhaled breath of EC users, although at levels substantially lower (around 20%) of that seen in cigarette smokers.[18] The absence of carbon monoxide in e-cigarettes was thought to be particularly positive as the presence of this gas in conventional cigarettes reduces oxygen uptake[28] and is thought to be linked to cardiovascular disease, however the

health implications at these lower levels remains to be determined.[29,30] E-liquid flavourings in most cases are considered GRAS—generally recognised as safe—for ingestion, although their impact on health during long-term repeated inhalation is unknown. Some flavourings have already been identified as dangerous, for example cinnamon (cinnamaldehyde)[31] and buttered popcorn (diacetyl). Diacetyl is considered safe to ingest, however inhalation of diacetyl has been associated with *bronchiolitis obliterans*, a rare and serious disease of the lungs.[32] Metals found within e-cigarette aerosol include cadmium, chromium, lead, manganese and nickel.[33] These metals are thought to arise from the heating coil and soldered material within the e-cigarette device. These metals are highly toxic for multiple organs through inhalation, however only a few studies have evaluated the specific health effects of metals in e-cigarettes. Exceptions are the studies on copper nanoparticles from e-cigarettes on mitochondrial oxidative stress and DNA fragmentation[34] and cobalt exposure with giant cell interstitial pneumonia.[35] To assist with navigating this often-contradictory topic the NASEM report provided a "levels of evidence framework for conclusions", which quantified the level of evidence. Below we include the conclusions from the chapter related to the toxicology of e-cigarette constituents, highlighting that to date e-cigarettes produce lower levels of toxic substances compared to conventional cigarettes but should not be considered harmless (Figure 1).

Since the publication of the NASEM report several studies in human airways have demonstrated e-cigarettes damage to airways in novel ways compared to traditional cigarettes, for example Ghosh et al[36] and Butt et al.[37] In addition, e-cigarettes produce a similar imbalance in proteases and anti-proteases that are seen in traditional cigarettes.[36,38] The imbalance of proteases and anti-proteases is associated with long-term emphysema. A recent animal study demonstrated a significant increase in lung cancer development as a result of exposure to nicotine containing e-cigarette aerosol when compared to those exposed to ambient air or an e-liquid aerosol not containing nicotine,[13] once again raising concerns about the long-term effects from e-cigarette exposure.

The outbreak of lung injury associated with vaping in the US has documented 2,809 hospitalised cases of severe lung illness with 68 of these fatal, according to the CDC as of February 18, 2020. The terms 'vaping-associated lung injury'[37] or 'vaping-related acute lung injury' (VpALI) have been coined for patterns of acute lung injury consistent with e-cigarette users.[39] The most common symptoms are shortness of breath, which may be accompanied by a dry cough and eventually could lead to severe respiratory distress as seen in the cases in the US. A recent assessment of the pathology in the New England Medical Journal[37] suggests that VpALI represents a form of chemical pneumonitis due to one or more inhaled toxic substances contained within e-cigarette aerosol. A number of different types of lung

Figure 1: Conclusions from the National Academies of Sciences, Engineering and Medicine (NASEM) report related to the toxicology of e-cigarette constituents, indicating evidence of harmful chemicals within aerosols.[11]

Conclusion 5-1. There is ***conclusive evidence*** *that in addition to nicotine, most e-cigarette products contain and emit numerous potentially toxic substances.*

Conclusion 5-2. There is ***conclusive evidence*** *that, other than nicotine, the number, quantity, and characteristics of potentially toxic substances emitted from e-cigarettes are highly variable and depend on product characteristics including device and e-liquid characteristics) and how the device is operated.*

Conclusion 5-3. There is ***substantial evidence*** *that except for nicotine, under typical conditions of use, exposure to potentially toxic substances from e-cigarettes is significantly lower compared with combustible tobacco cigarettes.*

damage have been observed and a standard definition for VpALI is still awaited. Vitamin E acetate has been proposed as a significant culprit behind many of these VpALI cases.[40] A lot is still unknown about this outbreak of respiratory disease and one needs to keep an open mind that it may be caused by any one of a large number of chemicals in the inhaled vapour. The large heterogeneity of both the construction of e-cigarettes and the substances aerosolised could mean that other pulmonary manifestations may still become uncovered.

A consensus of the science

The current scientific consensus is that e-cigarettes are probably safer than conventional cigarettes, but e-cigarettes are not without harm! This highlights the need for regulations relating to the manufacturing and sales of these products. In addition, safe operating conditions of e-cigarettes need to be developed, for example having restrictions of the power/temperature as higher temperatures increase the creation of more dangerous chemicals. Non-factual based predictions of comparative safety, such as the '95% safer' quantification, are not helpful for the risk estimation of e-cigarettes and should not be used when discussing or promoting e-cigarettes. Taking up vaping is not safe. A quote from the recent ERS recommendation related to tobacco harm reduction using e-cigarettes sums up its recommendations: "The human lungs are created to breathe clean air, not 'reduced levels of toxins and carcinogens', and the human body is not meant to be dependent on addictive drugs. ERS cannot recommend any product that is damaging to the lungs and human health".[15]

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REFERENCES:

1. World Health Organization. WHO Report on the Global Tobacco Epidemic. Switzerland; 2017.
2. Banks E, Joshy G, Weber MF, Liu B, Grenfell R, Egger S, et al. Tobacco smoking and all-cause mortality in a large Australian cohort study: findings from a mature epidemic with current low smoking prevalence. BMC Med. 2015; 13:38.
3. Ministry of Health. Annual Update of Key Results 2017/2018. Wellington; 2019.
4. Chen W, Wang P, Ito K, Fowles J, Shusterman D, Jaques PA, et al. Measurement of heating coil temperature for e-cigarettes with a "top-coil" clearomizer. PLoS One. 2018; 13(4):e0195925.
5. Kaisar MA, Prasad S, Liles T, Cucullo L. A decade of e-cigarettes: Limited research & unresolved safety concerns. Toxicology. 2016; 365:67–75.
6. Herzog B, Gerberi J, Scott A. Equity Research , "Tobacco Talk" -- Q4 U.S. Vapor Retailer Survey 2015.
7. Walker N, Parag V, Verbiest M, Laking G, Laugesen M, Bullen C. Nicotine patches used in combination with e-cigarettes (with and without nicotine) for smoking cessation: a prag-

matic, randomised trial. Lancet Respir Med. 2019.

8. Hajek P, Phillips-Waller A, Przulj D, Pesola F, Myers Smith K, Bisal N, et al. A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy. N Engl J Med. 2019; 380(7):629–37.
9. Bullen C, Howe C, Laugesen M, McRobbie H, Parag V, Williman J, et al. Electronic cigarettes for smoking cessation: a randomised controlled trial. Lancet. 2013; 382(9905):1629–37.
10. Beard E, Brown J, Michie S, West R. Is prevalence of e-cigarette and nicotine replacement therapy use among smokers associated with average cigarette consumption in England? A time-series analysis. BMJ Open. 2018; 8(6):e016046.
11. National Academy of Sciences. Public Health Consequences of E-Cigarettes: A consensus study report of The National Academies of Sciences Engineering Medicine. Washington; 2018.
12. Chung S, Baumlin N, Dennis JS, Moore R, Salathe SF, Whitney PL, et al. Electronic Cigarette Vapor with Nicotine Causes Airway Mucociliary Dysfunction Preferentially via TRPA1 Receptors. Am J Respir Crit Care Med. 2019; 200(9):1134–45.
13. Tang MS, Wu XR, Lee HW, Xia Y, Deng FM, Moreira AL, et al. Electronic-cigarette smoke induces lung adenocarcinoma and bladder urothelial hyperplasia in mice. Proc Natl Acad Sci U S A. 2019; 116(43):21727–31.
14. ERS Tobacco Control Committee. ERS Position Paper on Tobacco Harm Reduction. 2019.
15. Pisinger C, Dagli E, Filippidis FT, Hedman L, Janson C, Loukides S, et al. ERS and tobacco harm reduction. Eur Respir J. 2019; 54(6).
16. McNeill A, Brose L, Calder R, Hitchman S, Hajek P, McRobbie H. E-cigarettes: an evidence update. London: Public Health England; 2015.
17. Britton J, Bogdanovica I. Electronic cigarettes. London: Public Health England; 2014.
18. McNeill A, Brose L, Calder R, Bauld L, Robson D. Evidence review of e-cigarettes and heated tobacco products 2018. London: Public Health England; 2018.
19. Nutt DJ, Phillips LD, Balfour D, Curran HV, Dockrell M, Foulds J, et al. Estimating the harms of nicotine-containing products using the MCDA approach. Eur Addict Res. 2014; 20(5):218–25.
20. West R, Hajek P, McNeill A, Brown J, Arnott D. Electronic cigarettes: what we know so far. www.smokinginengland.info/reports/; 2015.
21. E-cigarettes: Public Health England's evidence-based confusion. Lancet. 2015; 386(9996):829.
22. McNeill A, Hajek P. Underpinning evidence for the estimate that e-cigarette use is around 95% safer than smoking: authors' note. 2015.
23. Herrington JS, Myers C. Electronic cigarette solutions and resultant aerosol profiles. J Chromatogr A. 2015; 1418:192–9.
24. Hsu G, Sun JY, Zhu SH. Evolution of Electronic Cigarette Brands From 2013–2014 to 2016–2017: Analysis of Brand Websites. J Med Internet Res. 2018; 20(3):e80.
25. Beauval N, Verriele M, Garat A, Fronval I, Dusautoir R, Antherieu S, et al. Influence of puffing conditions on the carbonyl composition of e-cigarette aerosols. Int J Hyg Environ Health. 2019; 222(1):136–46.
26. Stein Y, Antal Jr M, Jones Jr M. A study of the gas-phase pyrolysis of glycerol. Journal of Analytical and Applied Pyrolysis. 1983; 4(4):283–96.
27. Casebolt R, Cook SJ, Islas A, Brown A, Castle K, Dutcher DD. Carbon monoxide concentration in mainstream E-cigarette emissions measured with diode laser spectroscopy. Tob Control. 2019.
28. Klausen K, Andersen C, Nandrup S. Acute effects of cigarette smoking and inhalation of carbon monoxide during maximal exercise. Eur J Appl Physiol Occup Physiol. 1983; 51(3):371–9.
29. D'Alessandro A, Boeckelmann I, Hammwhoner M, Goette A. Nicotine, cigarette smoking and cardiac arrhythmia: an overview. Eur J Prev Cardiol. 2012; 19(3):297–305.
30. Leone A, Landini L. Vascular pathology from smoking: look at the microcirculation! Curr Vasc Pharmacol. 2013; 11(4):524–30.
31. Clapp PW, Lavrich KS, van Heusden CA, Lazarowski ER, Carson JL, Jaspers I. Cinnamaldehyde in flavored e-cigarette liquids temporarily suppresses bronchial epithelial cell ciliary motility by dysregulation of mitochondrial function. Am J Physiol Lung Cell Mol Physiol. 2019; 316(3):L470–L86.
32. Holden VK, Hines SE. Update on flavoring-induced lung disease. Curr Opin Pulm Med. 2016; 22(2):158–64.
33. Hess CA, Olmedo P, Navas-Acien A, Goessler W, Cohen

JE, Rule AM. E-cigarettes as a source of toxic and potentially carcinogenic metals. Environ Res. 2017; 152:221–5.

34. Lerner CA, Rutagarama P, Ahmad T, Sundar IK, Elder A, Rahman I. Electronic cigarette aerosols and copper nanoparticles induce mitochondrial stress and promote DNA fragmentation in lung fibroblasts. Biochem Biophys Res Commun. 2016; 477(4):620–5.

35. Fels Elliott DR, Shah R, Hess CA, Elicker B, Henry TS, Rule AM, et al. Giant cell interstitial pneumonia secondary to cobalt exposure from e-cigarette use. Eur Respir J. 2019; 54(6).

36. Ghosh A, Coakley RC, Mascenik T, Rowell TR, Davis ES, Rogers K, et al. Chronic E-Cigarette Exposure Alters the Human Bronchial Epithelial Proteome. Am J Respir Crit Care Med. 2018; 198(1):67–76.

37. Butt YM, Smith ML, Tazelaar HD, Vaszar LT, Swanson KL, Cecchini MJ, et al. Pathology of Vaping-Associated Lung Injury. N Engl J Med. 2019; 381(18):1780–1.

38. Ghosh A, Coakley RD, Ghio AJ, Muhlebach MS, Esther CR, Jr., Alexis NE, et al. Chronic E-Cigarette Use Increases Neutrophil Elastase and Matrix Metalloprotease Levels in the Lung. Am J Respir Crit Care Med. 2019; 200(11):1392–401.

39. Fonseca Fuentes X, Kashyap R, Hays JT, Chalmers S, Lama von Buchwald C, Gajic O, et al. VpALI-Vaping-related Acute Lung Injury: A New Killer Around the Block. Mayo Clin Proc. 2019; 94(12):2534–45.

40. Taylor J, Wiens T, Peterson J, Saravia S, Lunda M, Hanson K, et al. Characteristics of E-cigarette, or Vaping, Products Used by Patients with Associated Lung Injury and Products Seized by Law Enforcement - Minnesota, 2018 and 2019. MMWR Morb Mortal Wkly Rep. 2019; 68(47):1096–100.

Medical considerations for supporting elite athletes during the post-peak phase of the New Zealand COVID-19 pandemic: a New Zealand sporting code consensus

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In late December 2019, a cluster of atypical pneumonia cases in Wuhan China resulted in the identification of novel coronavirus SARS-CoV-2 and a disease known as COVID-19.[1] The novel virus has spread rapidly across the globe, and continues to pose unique clinical and scientific challenges. Spread by droplets from symptomatic and asymptomatic individuals, and able to survive on surfaces for up to 72 hours,[2] COVID-19 has a reproduction number, or key indicator of infectivity, ranging from one to more than four.[3] Its infectivity has been shown to be influenced by a range of social distancing measures.[4] The clinical presentation of COVID-19 varies from mild upper respiratory symptoms, to a terminal pneumonic process recalcitrant to current treatments. The effectiveness and sustainability of serological responses are yet to be determined and there is currently no vaccination or COVID-19 specific treatment available.[5]

New Zealand identified its first case of COVID-19 on 28 February, and the WHO declared a pandemic on 12 March 2020. By mid-March all international arrivals in New Zealand were required to self-isolate, New Zealanders overseas were being encouraged to return home, and on 19 March New Zealand's borders were closed to almost everyone except New Zealanders. The Government released a four-level public health strategy for managing the pandemic on 21 March, and at midnight on 25 March, New Zealand entered a Level Four Alert. This meant that other than essential workers, New Zealanders were required to 'stay at home', businesses were closed and exercise was limited to the home or immediate neighbourhood.

As a consequence of these stringent but necessary measures, elite athletes have been challenged by the cessation of all domestic and international sport including the postponement of the 2020 Olympic Games. This has resulted in disruption to training and competition schedules with a concomitant impact upon the mental and physical wellbeing of athletes, coaches and other support personnel.[6] Elite athletes and their coaches are not immune to mental health issues, which may be exacerbated by the inability to train and compete, as well as the broader pandemic lifestyle constraints.[7,8]

Known for their propensity to exertional bronchial hyperreactivity, elite athletes also demonstrate relative immune compromise associated with high training load and these factors could increase susceptibility to COVID-19.[9,10] Further, following relative inactivity there are data linking resumption of training with increased risk of injury,[10] thereby increasing the vulnerability of elite athletes as training resumes.[6] Recognition of the unique demands of elite sport, athlete immune status and relative injury/illness risks are the genesis of guidelines to support the health and wellbeing of elite athletes. International sporting federations, sports medicine practitioners and kindred organisations have begun to develop protocols, relevant for specific countries and sport disciplines during the pandemic.[6,11]

Over the ensuing months New Zealand athletes will transition from the relative isolation of home-based training, to 'new normal' interaction with coach and support personnel. The process of transition will carry challenges and risks unique to each individual and their sport. Sport New Zealand, High Performance Sport New Zealand (HPSNZ) and other sporting bodies have established population-based guidelines for the resumption of sport and exercise at the various COVID-19 Levels, consistent with Government public health regulations, that are in turn informed by the New Zealand Ministry of Health (MOH).

This document provides evidence and consensus-based guidelines relevant to the medical support of New Zealand elite athletes during the transition to a 'new normal' in the New Zealand environment. The following recommendations have resulted from consultation between the medical officers of New Zealand's major sporting codes, Sports Medicine New Zealand and other health specialists. The specific foci of the consensus are the medical considerations relevant to the transition period characterised by a gradual re-opening of elite sporting facilities and a resumption of group-based training. While specific details of New Zealand COVID-19 levels may vary over time and potentially by location, this document assumes a situation whereby isolation 'bubbles' are no longer operating for the majority of the population.

Ethics and advocacy

Medical practitioners working in elite sport must continue to act as advocates for the wellbeing of athletes, while balancing the public health imperatives of a pandemic. During these unprecedented times in which the support of elite athletes must be contextualised on a 'new-normal landscape', and when difficult decisions involving conflicting needs must be made, it is critical that practitioners place medical ethics at the fore. When ethical values and principles inform decision making processes, those decisions carry a legitimacy that ultimately facilitates alignment and impact.[12]

To ensure the best outcomes, both how decisions are made and what decisions are made should be informed by ethics and values recognisable and shared by the broader community. This includes respecting the ethical principles of justice, non-maleficence, beneficence and autonomy. However, the ethical values that guide our decision-making should also take into account broader considerations of openness, inclusiveness, reasonableness, responsibleness and responsiveness (for a full discussion of ethical considerations during a pandemic, readers are directed to "Getting Through Together. Ethical Values for a Pandemic").[12]

Healthcare facilities in the elite sporting environment

Healthcare facilities for elite athletes in New Zealand were closed during Level Three and Four, and consulting for both medicine and physiotherapy during this period was conducted by tele-health. Consistent with a graduated approach to the loosening of restrictions, at Level Two, the majority of sporting and healthcare facilities for elite athletes re-opened. Numerous public health requirements remain in place, including the need for physical distancing, public gathering restrictions, contact tracing and the need for at-risk individuals to remain at home.

Given the novel nature of the public health situation, the safe delivery of health services from training facilities and high-performance environments requires careful consideration and preparation.

Access to healthcare facilities should be regulated with a recommended single point of entry and exit, with incidental transit through healthcare facilities avoided. Access should ideally require someone inside the facility to admit individuals after ringing a 'doorbell' or equivalent. The triage of all patients from a car park, or equivalent area outside the healthcare facility will ensure each individual is appropriate to enter the centre. The triage may involve questions regarding the nature of the consultation, any change in their health status with respect to COVID-19 symptoms and contact with any potential COVID-19 patient since their last visit. While the use of routine temperature assessment in combination with triage questions may increase the sensitivity to detecting an early infection, its isolated use as a screening tool has been questioned.[13] Notwithstanding the logistical challenges, an elevated temperature either in isolation or in combination with an affirmative response to any triage question would warrant further discussion and may influence any decision to allow the patient to enter the healthcare facility.[14]Waiting areas should not be utilised, with patients entering the centre only when the consultation space and respective clinician are ready. In the interests of accurate contact tracing, should this be necessary, accurate records of all clinic attendees must be documented with due respect for confidentiality.

To allow appropriate physical distancing and minimise potential infection transmission, numbers of staff and patients in any healthcare facility should be restricted. Each facility will need to determine an effective ratio concomitant with the separation of areas such as open-plan physiotherapy and massage therapy workspaces. Administrative workspaces must also allow appropriate physical distancing. To facilitate this, operating models will require flexibility that enables individuals to work from home, in rotating shifts, or to perform non-clinical duties in other workspaces.

That SARS-CoV-2 can survive on surfaces for several days[2] means that cleaning of clinical and administrative areas within a healthcare facility requires particular consideration. Attention should be paid to the protocols for daily intensive cleans, between patient cleaning, and regular centre cleaning. Use of alcohol-based or equivalently evidenced cleaning products is recommended,[15] with responsibility and accountability for cleaning clearly articulated and monitored.

Medical practitioners working in elite sport also have a responsibility to ensure that appropriate hygiene strategies are established across all areas of the training and sporting environment to mitigate against infection transmission. Practitioners should view the pandemic as an opportunity to enhance sport-wide hygiene practices including cleaning strategies, approaches to clinical and communal team areas, blood and respiratory pathogen transmission control, and the implementation of public health measures.

Clinical consultations

In order to minimise contact time within healthcare facilities, consultations should, when possible, be performed using telehealth. When necessary to assess in person, it is recommended that preliminary history gathering still be completed by telehealth. This could be completed while the athlete is in the carpark, prior to performing an examination within the healthcare facility. In an effort to keep in-person consultation times below 15 minutes, post-examination discussions and communication should also be completed by phone or conference calling. Investigations and prescriptions should be instigated electronically when possible.

In the elite sport environment, it is common for coaches and other support staff to be included in some athlete consultations. During this period, it is recommended that consultations are a one-on-one event only, with telehealth modalities used to include additional individuals as required.

During periods where SARS-CoV-2 continues to potentially circulate in the community, it is recommended that any individual presenting with symptoms consistent with infectious disease be managed through an established alternative clinical pathway, outside of elite sporting facilities. Symptoms consistent with a possible infection, detected through the telehealth history taking or the mandatory triage process, could be referred to the individual's general practitioner, or other healthcare provider as determined by regional approaches to COVID-19 detection and management.

Personal protective equipment (PPE)

SARS-CoV-2 is known to be transmitted up to 48 hours before the development of symptoms and may be disseminated up to metres during coughing and sneezing.[16] When treating elite athletes, close contact is routine, demanding the careful consideration of the use of PPE.

At Level Two, when elite sporting facilities and associated medical facilities reopened, there were low levels of circulating COVID-19 in the community. Based on MOH guidelines, the use of full, hospital-level PPE is unlikely to be necessary for routine consultations, particularly where potentially infectious athletes are triaged via telehealth and managed externally.

The New Zealand Government does not currently recommend the routine use of facemasks in the community unless an individual is experiencing respiratory symptoms or is diagnosed with COVID-19.[17] However, in the context of the sports medicine clinic, the use of a face mask may mitigate droplet spread from a hitherto asymptomatic individual. Therefore, to allay the concerns of any patient or provider, it is recommended that at least in the early post-peak pandemic phases during consultation and treatment, patients and practitioners wear protective medical facemasks in accordance with their appropriate use and in full knowledge of their limitations. This assumes development of clear protocols for facemask use in specific elite sport settings. Given the low prevalence in New Zealand, the health checks on athletes at entry to elite sport facilities and the pragmatic realities of consulting in the elite environment, full face shields are not currently recommended.

Load management, mitigation and monitoring

It is well recognised that periods of relative inactivity or modified training load can have a negative impact on musculoskeletal adaptation and cardiorespiratory fitness.[18] Subsequently, there is a relative increase in risk of re-injury upon the resumption of training (HPSNZ Performance Health unpublished data) related to both athlete-specific intrinsic factors, and the rate of load application. Irrespective of the cause of reduced training load, the risk of injury on return may be mitigated by the careful multi-disciplinary planning for the reintroduction of training volume and intensity, taking into consideration both individual and squad-based factors. Within the constraints of COVID-19 restrictions, maximising approaches to recovery, including physiological monitoring, nutrition, sleep and soft tissue therapies will support the optimisation of training load.

Immune function

While the immediate immunological and antibody response to SARS-CoV-2 infection is yet to be fully understood,[19] it is important that an elite athlete's immune system is not impaired when returning to the training environment.

The effectiveness of an athlete's immune system is influenced by multiple intrinsic and extrinsic factors but compromised immune systems place individuals at greater risk of infection when exposed.[20] An individual's underlying medical status and/or routine use of certain medications may influence the efficacy of their immune function, and those individuals should be identified, with their particular circumstances carefully considered when addressing a return to training and group activities in the post-peak pandemic phase. This is particularly relevant when supporting para-athletes, in whom chronic health conditions may increase infection susceptibility and consequence. Similarly, training volume and intensity is well recognised to have an impact on immune function, and all athletes will respond uniquely to a given training situation.[10] Finally, in addition to training load and volume, stress resulting from poor sleep quality, inadequate nutrition, low mood and ineffective recovery strategies may all negatively impact upon an individual's immune function.

Healthcare providers are well positioned and have a responsibility to facilitate a multi-disciplinary approach to optimising an individual elite athlete's immune function. This will require advanced planning and coordination within individual sporting codes.

Monitoring COVID-19 status

Polymerase chain reaction (PCR) testing is currently utilised in New Zealand for confirming the presence of SARS-CoV-2 infection in a symptomatic individual, and

determining the presence of infection in the broader asymptomatic population. Despite its potentially low detection sensitivity in asymptomatic individuals, some medical bodies are advocating for the routine and regular testing of elite athletes with PCR in order to ensure athletes are not contagious.[11] In the current New Zealand environment, with no or low rates of identified community transmission, the routine or regular use of PCR testing in elite athletes is not considered necessary. However, while some organisations may choose to utilise PCR testing as part of a broader strategy, this must not be at the expense of other infection control measures.

While antibody seroconversion has been observed following SARS-CoV-2 infection, it is unclear how long this is sustained, and whether it confers lasting immunity.[21,22] Furthermore, at the time of writing, there is no valid means of assessing an individual's immunity to SARS-CoV-2. Current serological tests for IgG and IgM have proven to be unreliable in many countries, and as yet no testing procedure has been approved in New Zealand. Therefore, the routine use of serology (IgG/IgM) to evaluate SARS-CoV-2 status of elite athletes is not currently indicated in New Zealand.

The potential impact of asymptomatic SARS-CoV-2 infections on the heart and other organs remains to be elucidated, but this detail may inform future decisions on the need to understand the COVID-19 status of elite athletes. Furthermore, given the high respiratory rates and close proximity often associated with elite sport, athletes may pose a high risk of virus transmission when either pre-symptomatic or asymptomatic. Subsequently, recommendations on monitoring may change as the impact of symptomatic and asymptomatic infections on the heart and other organs becomes clear, immunological knowledge expands, New Zealand infection rates change, or new technology becomes available.

Athlete psychological wellbeing

It is well recognised that athletes have a similar or slightly higher risk of mental health issues including anxiety and depression when compared to the general population.[7] Periods of uncertainty, isolation and transition may exacerbate symptoms in those with known susceptibility, or elevate symptoms in those with no previous mental health issues.[23]

A high level of awareness is required by all support personnel interacting with athletes at this time. Atypical behaviour, lack of engagement, loss of motivation, as well as physical changes such as loss of appetite and poor sleep, may all indicate a change in mental state. In addition to maintaining a high level of vigilance for mental health issues, medical practitioners, working closely with psychologists should consider the use of brief mental health assessments (such as the 'DASS-21') as part of a routine post-level four health screening approach.

The use of general wellbeing data (including sleep quality, mood, energy), often collected and collated by a range of disciplines within elite sport, should be rationalised through-out the COVID-19 pandemic. In collaboration with the relevant psychologists, medical practitioners should have an established protocol for reviewing wellbeing data throughout this period.

Vaccination

While intensive research and development is underway, the development of vaccines for pre-existing coronavirus has proven difficult,[24] and there is currently no effective vaccine for COVID-19. When there is a New Zealand Government approved COVID-19 vaccine and approach to public vaccination, it is recommended that elite athletes and support staff are vaccinated.

Unless contraindicated, completion of the New Zealand Immunisation Schedule and an annual influenza vaccination is recommended for elite athletes and their support personnel.

Medications and COVID-19

While concerns have been expressed that medications that alter immune function (eg, glucocorticoids) may increase susceptibility to COVID-19 infections, based on current evidence it is recommended that the ongoing management of chronic health conditions is not altered due to pandemic considerations.

Non-steroidal anti-inflammatory drugs (NSAIDs) are among the most frequently prescribed medication to elite athletes.[25] While evidence is sparse that NSAIDs may exacerbate infections, the pandemic may

provide an opportunity for a more judicious approach to NSAID prescription, particularly when managing upper respiratory symptoms.[26]

Regardless of symptoms, when prescribing to athletes during this period, it is important that medical practitioners are cognisant of the impact of medication on the immune system.[27]

COVID-19 positive athletes

It is important that healthcare providers in elite sport have strategies to manage athletes who may either be infected, or who have recovered from COVID-19.

Acute COVID-19 infections should be managed in accordance with MOH guidelines, including case-reporting and quarantine. Specialist hospital support may be indicated depending on the clinical situation. Given the uncertain clinical outcomes of COVID-19 and the lack of data on the influence of exercise, elite athletes with confirmed COVID-19 should not be performing physical exercise until provided with a medical clearance from the appropriate public health authority.

Prior to returning to elite sport, but after symptoms resolution and receiving a public health clearance, an elite athlete diagnosed with COVID-19 requires review by their sport-specific medical practitioner.

SARS-CoV-2 binds to cells in the lung via receptors such as angiotensin-converting enzyme 2 (ACE2), but those same receptors are also found in many other organs including the heart.[28] Acute myocarditis has been described in previous coronavirus outbreaks,[29] and the clinical outcome of COVID-19 patients with cardiovascular comorbidities is poor.[28] As a result, international sports medicine bodies have recommended the intensive cardiac evaluation of elite athletes prior to returning to sport training.[11,30,31] In the New Zealand environment, it is recommended that any athlete diagnosed with COVID-19 has a cardiology review prior to resuming training. Upon receiving a cardiological clearance, the individual athlete's clinical course should be considered when planning a graduated return to training, and reintegration into a training environment.

It is important that the development of any stigma associated with COVID-19 infection be avoided, by normalising and promoting the healthcare process as a standard approach, and ensuring an understanding of the COVID-19 infection by all staff and athletes.

Managing a COVID-19 related death

While it is likely that elite New Zealand athletes have been infected with COVID-19, to date there have been no reported deaths. If New Zealand is able to maintain a low rate of community transmission, it is hoped that this situation will continue. However, practitioners working within elite sporting organisations should ensure that there is an appropriate response strategy for the unexpected death of an athlete, family member or someone within the sporting organisation. That strategy should include the immediate access to counselling and psychological support.

Travel

During the immediate post-peak pandemic period, it is anticipated that international travel will be negligible and internal travel within New Zealand will be minimised. Medical practitioners must ensure that during any sport-related internal travel, appropriate hygiene strategies are established and normalised within team environments. This may include the intensified use of hand sanitiser/hand washing, regular cleaning of surfaces, cough and sneeze etiquette, and any travel-specific physical distancing or contact tracing requirements. Ensuring adequate sleep and nutrition, along with the avoidance of heavy training loads immediately prior to travel, will facilitate healthy travel outcomes.

The future and nature of international sport-related travel requires further consideration as the pandemic evolves.

Education/information sharing

Ensuring that elite athletes, coaches and support staff are well informed regarding both COVID-19, the relevant sporting considerations and the public health requirements of differing COVID-19 levels is important for optimising athlete health, wellbeing and compliance. In addition to publicly available health messages, the provision of sport-specific information and education should utilise a range of modalities, and where possible could involve the use of key athletes to deliver relevant messages.

Finally, as athletes resume squad-based training, it is recommended that in conjunction with coaching staff, sport-specific medicine, psychology and athlete life specialists provide an interactive education and information sharing session to support the athlete and coach transition from relative isolation.

Conclusion

The novel virus causing COVID-19 has already had an unprecedented impact on international health, economies and sport. With a clear COVID-19 national strategy and its early implementation, New Zealand has to date avoided the devastating levels of infection and death witnessed overseas. However, the COVID-19 pandemic is a global challenge whose course, in the absence of an effective vaccine, is difficult to predict.

There is a desire from sporting organisations, athletes and the public for sport, exercise and training to resume as soon as appropriate. This includes the desire for elite athletes to return to training and ultimately competition. Health support embedded within elite sporting organisations must also consider broad public health consequence and align with Government guidelines for delivering health services. Medical practitioners will play a key role in interpreting and applying Government regulations in the various sporting codes.

Medical practitioners will undoubtedly assist in the emergence of elite sport from COVID-19 restrictions, through supporting both athlete's health and sporting organisations readiness for the 'new normal'. When considering those factors outlined above, practitioners should routinely support an inter-disciplinary approach to athlete care, incorporating the views of coaching staff, medicine, psychology, athlete life, physiology, nutrition and strength and conditioning expertise. This document facilitates that integrated process by providing a framework for medical practitioners and sporting organisations to consider, as elite sporting activity gradually resumes.

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www.nzma.org.nz/journal-articles/medical-considerations-for-supporting-elite-athletes-during-the-post-peak-phase-of-the-new-zealand-covid-19-pandemic-a-new-zealand-sporting-code-consensus

REFERENCES:

1. Munster VJ, Koopmans M, van Doremalen N, et al. A Novel Coronavirus Emerging in China - Key Questions for Impact Assessment. New England Journal of Medicine. 2020; January 24.
2. van Doremalen N, Morris DH, Holbrook MG, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. New England Journal of Medicine. 2020; March 17:1–3.
3. Liu Y, Gayle AA, Wilder-Smith A,Rocklov J. The reproductive number of COVID-19 is higher compared to SARS coronavirus. Journal of Travel Medicine. 2020:1–4.
4. Flaxman S, Mishra S, Gandy A, et al. Estimating the nmber of infections and the impact of non-pharmaceutical interventions on COVID-19 in 11 European countries. Imperial College COVID-19 Response Team. 2020.
5. Mungroo MR, Khan NA, Siddiqui R. Novel Coronavirus: Current Understanding of Clinical Features, Diagnosis, Pathogenesis, and Treatment Options. Pathogens. 2020; 9.
6. Eirale C, Bisciotti G, Corsini A, et al. Medical recommendations for home-confined footballers' training during the COVID-19 pademic: from evidence to practical application. Biology of Sport. 2020; 37:203–207.
7. Beable S, Fulcher M, Lee AC, Hamilton B. SHARP-Sports mental Health Awareness Research Project: Prevalence and risk factors of depressive symptoms and life stress in elite athletes. J Sci Med Sport. 2017.
8. Kim SSY, Hamilton B, Beable S, et al. Elite coaches have a similar prevalence of depressive symptoms to the general population and lower rates than elite athletes. BMJ Open Sport & Exercise Medicine. 2020; 6.
9. Hull J, Loosemore M, Schewellnus M. Respiratory Health in Athletes: facing the COVID-19 challenge. Lancet Respiratory Medicine. 2020; Published on-line April 8.
10. Schwellnus M, Soligard T, Alonso JM, et al. How much is too much? (Part 2) International Olympic Committee consensus statement on load in sport and risk of illness. Br J Sports Med. 2016; 50:1043–52.
11. Federation ISM, Recommendations relating to sport and Covid-19, http://www.fmsi.it/images/img/archivio/CS_Raccomandazioni_FMSI_20200404.pdf, Editor. 2020: Italy.
12. Moore A, Kirkman A, Aradagh M, et al, Getting Through Together. Ethical Values for a Pandemic, Committee NEA, Editor. 2007: Ministry of Health.
13. Quilty B, Clifford S, Group. CnW, et al. Effectiveness of airport screening at detecting travellers infected with novel coronavirus (2019-nCoV). European Communicable Diseases Bulletin. 2020.
14. Htun HL, Lim DW, Kyaw WM, et al. Responding to the COVID-19 outbreak in Singapore: Staff Protectin and Staff Temperature and Sickness Surveillance Systems. Clinical Infectious Diseases. 2020.
15. Baka A, Cenciarelli O, ECDC Technical Report: Interim guidance for environmental cleaning in non-healthcare facilities exposed to SARS-CoV-2. 2020, ECDC: http://www.ecdc.europa.eu/sites/default/files/documents/coronavirus-SARS-CoV-2-guidance-environmental-cleaning-non-healthcare-facilities.pdf
16. Bourouiba L. Turbulent Gas Clouds and Respiratory Pathogen Emissions. Potential Implications for Reducing Transmission of COVID-19. JAMA. 2020; Published online March 26, 2020.
17. NZ MOH, Personal protective equipment use for non-health essential workers. Information on using personal protective equipment (PPE) in non-health essential workplaces.2020 Date: April 2 2020: http://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-information-specific-audiences/covid-19-advice-essential-workers-including-personal-protective-equipment/personal-protective-equipment-use-non-health-essential-workers
18. Rodriguez-Fernandez A, Snachez-Sanchez J, Ramirez-Campillo R, et al. Effects of short-term in-season break detraining on repeated-sprint ability and intermittent endurance according to initial performance of soccer player. PLoS ONE. 2018. 13(8): e0201111. http://doi.org/10.1371/journal.pone.0201111
19. Wang F, Hou H, Luo Y, et al. The laboratory tests and host immunity of COVID-19 patients with different severity of illness. JCI Insight. 2020; April 23.
20. Gleeson M, Pyne DB, Elkington LJ, et al. Developing a multi-component immune model for evaluating the risk of respiratory illness in athletes. Exercise Immunology Review. 2017; 23:52–64.

21. Wolfen R, Corman WM, Guggemos W, et al. Virological assessment of hospitalized patients with COVID-2019. Nature 2020; http://doi.org/10.1038/s41586-020-2196-x (2020).

22. Abbasi J. The Promise and Peril of Antibody testing for COVID-19. JAMA. 2020;April 17, 2020.

23. Pfefferbaum B,North CS. Mental Health and the Covid-19 Pandemic. New England Journal of Medicine. 2020;April 13, 2020.

24. Fehr AR,Perlaman S. Coronaviruses: an overview of their replication and pathogenesis. Methods in Molecular Biology. 2015; 1282:1–23.

25. Tsitsimpikou C, Tsiokanos A, Tsarouhas K, et al. Medication use by athletes at the Athens 2004 Summer Olympic Games. Clinical Journal of Sports Medicine. 2009; 19:33–38.

26. NICE, COVID-19 rapid evidence summary: acute use of non-steroidal anti-inflammatory drugs (NSAIDs) for people with or at risk of COVID-19, Excellence NIfHaC, Editor. 2020: www.nice.org.uk/guidance/es23.

27. Fitzpatrick J. NSAIDs and corticosteroid injections during the COVID pandemic: what Sport and Exercise Medicine Physicians (and sports physios) should know. British Journal of Sports Medicine. 2020;March 21.

28. Xiong T-Y, Redwood S, Prendergast B,Chen M. Coronaviruses and the cardiovascular system: acute and long-term implications. European Heart Journal. 2020; 2020:1–3.

29. Alhogbani T. Acute myocarditis associated with novel Middle East respiratory syndrome coronavirus. Annals of Saudi Medicine. 2016; 36:78–80.

30. Biffi A, Bigard X. How to manage the cardiovascular risks related to Covid-19 in riders? UCI. 2020.

31. Baggish AL, Drezner JA, Kim JH, et al. The resurgence of sport in the wake of COVID-19: cardiac considerations in competitive athletes. British Journal of Sports Medicine. 2020; April, 2020.

Ocular complications from primary varicella infection

Aaron Yap, Joanne L Sims, Rachael L Niederer

Varicella-zoster virus (VZV) is one of eight herpes viruses known to cause human infection. VZV infection has two distinct forms: primary varicella infection (chickenpox) and herpes zoster (shingles). Primary varicella infection results in a diffuse vesicular rash, while herpes zoster occurs as a result of endogenous reactivation of latent VZV, which typically manifests as a unilateral dermatomal rash. Prior to the introduction of the varicella vaccine, national seroprevalance data in developed countries showed that over half of the population are infected by chickenpox by the age of three, and by the age of 15, seroprevalence is over 90%.[1,2]

The typical course of primary varicella infection starts off with a prodromal phase of fever, malaise, pharyngitis and loss of appetite. This is followed by the development of a generalised vesicular rash. The course can be complicated by skin infections, neurological complications, pneumonia and hepatitis.[3] Ocular complications such as conjunctivitis, uveitis, ophthalmoplegia, retinal necrosis and optic neuritis have also been reported.[4–7]

The aim of this study was to determine the rate of ocular complications secondary to primary varicella infections at Auckland District Health Board. Secondly, we compiled a case series of severe ocular complications that required long-term treatment or have resulted in permanent vision loss.

Methods

A 10-year retrospective case series of all subjects reviewed at the Department of Ophthalmology, Auckland District Health Board with ocular complications secondary to primary varicella infection was undertaken. The inclusion criteria were a preceding chickenpox infection. The exclusion criterion was the presence of another more likely diagnosis or cases classified as herpes zoster.

The majority of cases were identified from previous discharge records, according to a clinical coding of "chickenpox", "VZV" or "varicella", from the period of March 2009 to March 2019. A standardised proforma was used to extract relevant data from the clinical records. Ethical approval was obtained from the Auckland District Health Board ethics approval committee.

Results

A total of 30 subjects were reviewed with complications secondary to primary VZV infection in this 10-year period. The problems were unilateral in 24 cases (80%) and bilateral in six cases (20%). The total number of eyes involved was 36. The median age at presentation was six years old (range 3–48 years old). There were 18 females (62.1%) and 11 males (37.9%). In terms of ethnicity, New Zealand Europeans were most commonly affected (60.0%), followed by Indians (16.7%), Pacific Islanders (13.3%), Māori (6.7%) and Chinese (3.3%). The median duration from onset of rash to ocular symptom onset was five days and some variation was seen according to site of ocular involvement (range 1–136 days).

The clinical presentation of subjects are listed in Table 1. The most common presentation was conjunctivitis, which was usually mild and self-limiting. There were two cases of preseptal cellulitis, which required hospital admission and treatment with antibiotics. The majority of subjects with uveitis had an uncomplicated course after being treated with topical steroids. There were seven cases that went on to develop serious complications, including one case of moderate vision loss (visual acuity ≥6/15) and two cases of severe vision loss (visual acuity ≥6/60).

Table 1: Clinical presentation.

Ocular involvement	Number of eyes	Onset after rash (days)	Therapy
Lid lesions	3	1–2	Topical antibiotics
Conjunctivitis	10	1–11	Topical antibiotics and lubricants
Conjunctival pox	5	2–10	Topical antibiotics and lubricants
Preseptal cellulitis	2	4–6	Intravenous antibiotics
Uveitis	12*	7–41	Topical steroids +/- oral antiviral treatment +/- topical cycloplegic agent
Keratitis	3*	8–136	Topical steroids and antivirals
Early cataract	3*	300+	Cataract extraction and intraocular lens implantation
Optic neuritis	1	26	Systemic steroids
Glaucoma	1*	300+	Intraocular pressure lowering medication and glaucoma tube drainage surgery
Autoimmune retinopathy	2	28	Systemic steroids and mycophenolate mofetil

*Some subjects had more than one complication.

Case 1

A five-year-old New Zealand European girl presented with left eye photophobia, redness and irritation one week after a chickenpox infection. On presentation, her left eye had small pseudodendrites, grade 1 anterior chamber reaction and stromal keratitis. Her left eye visual acuity was 6/7.5 She was started on a tapering course of topical steroids. She then developed chronic uveitis and raised intraocular pressures (IOP). She remained on topical steroids for two years before transitioning to systemic immunosuppression with Methotrexate. Her IOP remained poorly controlled despite being on maximal medical therapy (three classes of IOP lowering drops and oral Azetozolamide). She developed a left cataract secondary to chronic uveitis. At the age of eight, she had a left eye combined cataract and glaucoma drainage implant (Molteno tube) surgery. Her best corrected visual acuity improved from 6/38 to 6/30. Despite this treatment, she ended up developing corneal scarring and band keratopathy. Her final left visual acuity was counting fingers.

Case 2

A three-year-old Māori girl was referred from her general practitioner with a red left eye and persistent discharge. She was diagnosed with chickenpox approximately four months prior. She was initially managed as a bacterial conjunctivitis with chloramphenicol drops after a difficult examination. A repeat examination one month later revealed left disciform keratitis. She was started on long-term topical steroids and topical acyclovir, as well as a six-month course of oral acyclovir. Her Snellen visual acuity deteriorated to 6/36 and she was prescribed Atropine 1% eye drops daily to her fellow eye to manage amblyopia. She remained on the same treatment for a further three years. Over that time, she developed worsening central cornea scarring. At the age of six, she underwent a partial thickness corneal transplant (deep anterior lamellar keratoplasty). She was weaned off topical steroids a year after the operation and her last recorded Snellen visual acuity was 6/18.

Case 3

A 48-year-old Indian man presented with bilateral red and painful eyes a week after having chickenpox. His right and left visual acuity was 6/7.5 and 6/6 respectively. His intraocular pressures (IOP) were elevated at 48mmHg and 29mmHg respectively. On slit lamp examination, his right eye had pseudodendrites, mixed fine and large corneal keratic precipitates, as well as a grade 2 anterior chamber cell reaction. His

left eye had a grade 1 anterior chamber cell reaction. There were no signs of inflammation in the vitreous or retina. Gonioscopy revealed open iridocorneal angles.

He was diagnosed with bilateral hypertensive uveitis secondary to primary varicella infection and was started on hourly topical steroids and Brimonidine eye drops twice daily to both eyes. He continued to have a chronic bilateral uveitis, ocular hypertension and secondary cataracts, which required treatment with topical steroids, oral acyclovir, two pressure lowering eye drops and oral acetazolamide. He underwent bilateral cataract operations in the subsequent two years. Prior to his second operation, he developed recurrence of his right anterior uveitis, which was successfully treated with oral steroids. His final visual acuity was 6/6 in his right eye and 6/7.5 in his left eye.

Case 4

A two-year-old, normally fit and well, Samoan boy was initially admitted under the paediatric team for left eye swelling and redness six days after developing chickenpox. He was started on intravenous Augmentin and Aciclovir. He was reviewed by the acute eye service and was found to have a swollen left eyelid with surrounding cellulitis. His CT orbit scan showed preseptal collections but no extension into the orbit. His wound swabs grew Streptococcus pyogenes, which was sensitive to penicillin. After three days of medical treatment, his left eyelid remained swollen and he developed an upper eyelid abscess. He underwent an incision and drainage procedure of this abscess. Intraoperative findings included copious amounts of pus in loculations. He recovered well after that and had mild residual scarring on his left upper eyelid.

Case 5

A 16-year-old New Zealand European female presented with painful eye movements and blurred vision in her left eye one month after a chickenpox infection. Visual acuity was hand movements in the left eye and 6/6 in the fellow eye. She had a left relative afferent pupillary defect (RAPD) and optic nerve head swelling. She was treated with three daily doses of 1g intravenous methylprednisolone (IVMP) followed by a tapering course of oral steroids over one week. Bartonella and syphilis serology was negative. An MRI brain scan revealed left optic neuritis with no other foci of demyelination. Two weeks later, her visual acuity improved to 6/5 and she had trace left RAPD and mild disc swelling. Her visual field test results at this point were normal. Her final diagnosis was a post-infectious optic neuritis.

Case 6

A 28-year-old Indian man initially presented to his optometrist after noticing left blurry vision following a chickenpox infection. His vision was 6/6 in both eyes and there were no signs of ocular inflammation on slit lamp examination. Three months later, he presented to the eye clinic after suddenly noticing poor vision in his left eye. His visual acuity was 6/6 on the right eye and hand movements in his left eye. On examination, he had occasional vitreous cells and atypical macular appearances in both eyes. Further tests including fundus autofluoroscence, optical coherence topography and electrophysiology suggested outer retinal inflammation that tracked along the retinal blood vessels. This led to outer retinal thinning and retinal dysfunction, especially in the left eye. Retinal auto-antibodies tests, Quantiferon gold, whole body CT scan and MRI brain scan results came back normal. He was diagnosed with autoimmune retinopathy and started on a course of oral prednisone and Mycophenolate Mofetil, which managed to slow the progression of visual field loss on his right eye. He had further right eye visual field loss a year later, after failing to attend appointments and stopping his medication. Fortunately, his clinical course stabilised after restarting treatment and he maintained a visual acuity of 6/6 in his right eye and count fingers in his left eye.

Case 7

An eight-year-old Cook Island Māori girl presented with two days of an itchy, red left eye as well as a dilated left pupil a week after a chickenpox infection. On examination, she had a mildly injected left conjunctiva, grade 2 anterior chamber cells and an irregular, dilated left pupil. She was diagnosed with a left acute anterior uveitis, and was started on topical steroid eye drops four times daily and oral acyclovir 800mg four times daily. On follow-up appointments a week and one month later, her anterior

chamber reaction improved, but her left pupil remained dilated. Her final left visual acuity was 6/12. Unfortunately, she failed to attend further follow up appointments.

Discussion

Ocular complications from primary varicella infection are rare. According to a 2013 census, the acute eye clinic at Greenlane Clinical Centre caters for an Auckland population of 1,400,000, with 21% being under the age of 15.[8] The total number of chickenpox cases over 10 years would be 407,000 after applying the seroprevalence rate of 83% for those aged 10–14 from an Australian study.[2] We collected 30 patients with ocular complications from primary varicella over 30 years. Furthermore, 15 out of 30 referred patients only had conjunctivitis or lid lesions, which would have settled with observation. Based on these figures, there is an estimated 1 in 27,000 cases of primary varicella that would require active treatment for ocular complications. A similar study carried out at a paediatric ophthalmology clinic in Canada showed that out of the 24 children referred for review, only six subjects required topical steroid treatment for uveitis and one required oral antibiotics for a secondary bacterial skin infection.[4]

In our case series, two young subjects developed chronic disciform keratitis that progressed to corneal scarring and permanent vision loss. Lowenstein described a similar case in a four-year-old boy who made a full recovery.[9] Another case report by Willhemus in 1991 showed that three out of five patients with disciform keratitis required a prolonged course of topical steroid. However, none of them suffered from severe vision loss.[10] Prompt diagnosis is critical to the outcome in these cases, and subjects presenting with red eye following primary varicella require assessment of vision and referral as necessary.

The delayed onset of stromal keratitis following primary varicella infection suggests an immunologic cause, rather than infective. Frandsen theorized that it was driven by the activation of the immune system 10–14 days after the initial infection towards remnant virus.[11] Hence, the course may be prolonged and recurrent compared to ocular complications that arise during the early phase of chickenpox, such as conjunctival vesicles and conjunctivitis.

Bacterial superinfection during the acute phase of chickenpox infection is common. In fact, our case four shared close similarities to another case report, with both being the same age and having the same treatment.[12] Group A streptococci, which includes Streptococcus Pyogenes, and Staphlycoccus aureus are the most common causative pathogens.[13] The former being able to cause streptococcal toxic shock syndrome that requires rapid fluid resuscitation and intensive care admission.[14]

Our case of optic neuritis closely resembles previous case studies. However, the disease can manifest in a few different ways. The visual symptoms can present before,[15] during the acute phase of rash (within seven days)[16] or a few weeks after rash resolution.[17] It can be unilateral[15,16] or bilateral.[17–20] Most affected individuals have full recovery of visual acuity,[15,17,19,20] but some have long-term visual loss[16] It can be associated with other neurological complications such as acute transverse myelitis,[18] encephalomyelitis,[19] ataxia,[20] and retinopathy.[16] Optic disc changes have been documented even before the onset of visual symptoms.[19]

Pupillary dilatation following chickenpox infection can occur in isolation or with other ocular manifestations.[21,22] Affected patients have been found to have poor recovery and permanent loss of accommodative ability. However, most achieve good visual acuity with corrective lenses.

Autoimmune retinopathy is rare type of retinopathy, characterised by vision loss, visual field deficits, photoreceptor dysfunction and the presence of circulating anti-retinal antibodies. The fundal appearance is usually normal with minimal inflammation.[23] Our case is the only published case of autoimmune retinopathy following primary varicella infection. Although the anti-retinal antibodies tests were negative, the diagnosis was made based on the electroretinogram findings, observed clinical improvement on immunosuppressants and absence of any other ocular signs.[24]

The ocular complications of primary varicella infection are rare with 1 in 13,500 cases requiring assessment by ophthalmology and only 1 in 27,000 necessitating active treatment. Half of referrals to the eye clinic for primary varicella eye sequelae were mild cases of conjunctival or lid involvement, which can be treated conservatively.

Our case series demonstrates that ocular complications from primary varicella infection can be severe and permanent. Three subjects developed vision loss from disciform keratitis, and another one had vision loss from autoimmune retinopathy. Our other subjects recovered their vision on appropriate treatment, although some were left with long-term sequelae. Primary care clinicians should refer all patients with eye pain, floaters, redness or drop in visual acuity, especially if this persists for more than a week following a primary varicella infection.

Competing interests:
Nil.

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REFERENCES:

1. Wutzler P, Färber I, Wagenpfeil S, et al. Seroprevalence of varicella-zoster virus in the German population. Vaccine. 2001 Oct 12; 20(1–2):121–4.
2. Gidding HF, MacIntyre CR, Burgess MA, Gilbert GL. The seroepidemiology and transmission dynamics of varicella in Australia. Epidemiology & Infection. 2003 Dec; 131(3):1085–9.
3. Gnann JW Jr. Varicella-zoster virus: atypical presentations and unusual complications. J Infect Dis 2002; 186 Suppl 1:S91.
4. Jordan DR., Noel LP, Clarke WN. Ocular involvement in varicella. Clin Pediatr (Phila). 1984 ; 23(8) :434–436.
5. Loewenstein A. Specific inflammation of the cornea in chickenpox. The British journal of ophthalmology. 1940 Aug; 24(8):391.
6. Paton L. Neuro-retinitis after Chicken-pox. Proceedings of the Royal Society of Medicine. 1918; 11(Sect Ophthalmol):12.
7. Sharf B, Hyams S. Oculomotor palsy following varicella. Journal of Pediatric Ophthalmology and Strabismus. 1972 Nov 1; 9(4):245–7.
8. Stats NZ. QuickStats about a place. [Internet]. New Zealand; 5th March 2013 [cited 10th September 2018]. Available from: http://archive.stats.govt.nz/Census/2013-census.aspx
9. Loewenstein A. Specific inflammation of the cornea in chickenpox. The British journal of ophthalmology. 1940 Aug; 24(8):391.
10. Wilhelmus KR, Hamill MB, Jones DB. Varicella disciform stromal keratitis. American journal of ophthalmology. 1991 May 1; 111(5):575–80.
11. Frandsen E. Chickenpox in the cornea. Acta ophthalmologica. 1950 Mar; 28(1):113–20.
12. Santos-Juanes J, Medina A, Concha A, et al. Varicella complicated by group A streptococcal facial cellulitis. Journal of the American Academy of Dermatology. 2001 Nov 1; 45(5):770–2.

13. Aebi C, Ahmed A, Ramilo O. Bacterial complications of primary varicella in children. Clinical infectious diseases. 1996 Oct 1; 23(4):698–705.
14. Cowan MR, Primm PA, Scott SM, et al. Serious group A β-hemolytic streptococcal infections complicating varicella. Annals of emergency medicine. 1994 Apr 1; 23(4):818–22.
15. Lee CC, Venketasubramanian N, Lam MS. Optic neuritis: a rare complication of primary varicella infection. Clinical infectious diseases. 1997 Mar 1; 24(3):515–6.
16. Tappeiner C, Aebi C, Garweg JG. Retinitis and optic neuritis in a child with chickenpox: case report and review of literature. The Pediatric infectious disease journal. 2010 Dec 1; 29(12):1150–2.
17. Hatch HA. Bilateral optic neuritis following chicken pox: Report of case with apparently complete recovery. The Journal of pediatrics. 1949 Jun 1; 34(6):758–9.
18. Miller DH, Kay R, Schon F, et al. Optic neuritis following chickenpox in adults. Journal of neurology. 1986 Jun 1; 233(3):182–4.
19. Selbst RG, Selhorst JB, Harbison JW, Myer EC. Parainfectious optic neuritis: report and review following varicella. Archives of neurology. 1983 Jun 1; 40(6):347–50.
20. COPENHAVER RM. Chickenpox with retinopathy. Archives of Ophthalmology. 1966 Feb 1; 75(2):199–200.
21. ROGERS JW. Internal ophthalmoplegia following chickenpox. Archives of Ophthalmology. 1964 May 1; 71(5):617–8.
22. Appel I, Frydman M, Savir H, Elian E. Uveitis and ophthalmoplegia complicating chickenpox. Journal of Pediatric Ophthalmology and Strabismus. 1977 Nov 1; 14(6):346–8.
23. Grange L, Dalal M, Nussenblatt RB, Sen HN. Autoimmune retinopathy. American journal of ophthalmology. 2014 Feb 1; 157(2):266–72.
24. Prime Z, Sims J, Danesh-Meyer H. Presumed autoimmune retinopathy following chickenpox; a case report. International ophthalmology. 2018 Oct 1; 38(5):2187–90.
25. Womack LW, Liesegang TJ. Complications of herpes zoster ophthalmicus. Archives of Ophthalmology. 1983 Jan 1; 101(1):42–5.
26. Hunt JR. The Paralytic Complications of Herpes Zoster of the Cephalic Extremity: A Preliminary Report on the Herpetic Inflammations of the Geniculate, Glossopharyngeal, Vagus and Acoustic Ganglia. Journal of the American Medical Association. 1909 Oct 30; 53(18):1456–7.
27. Bloom SM, Snady-McCoy L. Multifocal choroiditis uveitis occurring after herpes zoster ophthalmicus. American journal of ophthalmology. 1989 Dec 1; 108(6):733–5.
28. Sternberg JP, Knox DL, Finkelstein D, et al. Acute retinal necrosis syndrome. Retina (Philadelphia, Pa.). 1982; 2(3):145–51.
29. Sharf B, Hyams S. Oculomotor palsy following varicella. Journal of Pediatric Ophthalmology and Strabismus. 1972 Nov 1; 9(4):245–7.

Simultaneous ischaemic and haemorrhagic strokes in a hypertensive man: a manifestation of cerebral small vessel disease

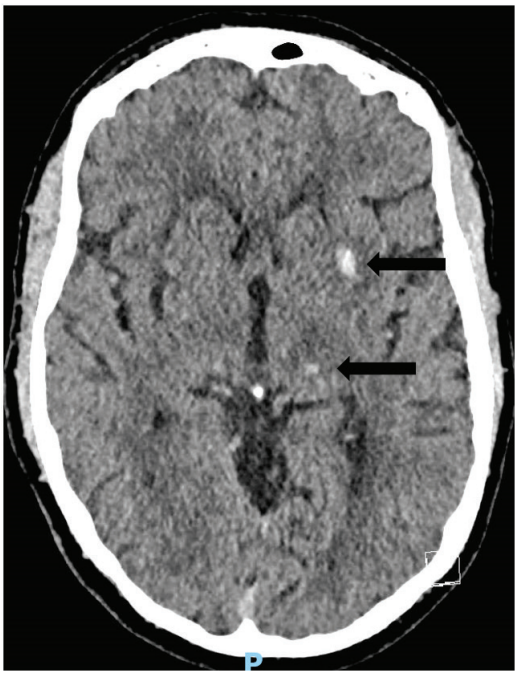
Karim M Mahawish, Almond Leung

We present a case of a 63-year-old man who presented with a left hemiparesis and severe hypertension. Computed tomography (CT) of the brain demonstrated areas of haemorrhage within the left basal ganglia and thalamus. Magnetic resonance imaging (MRI) of the brain demonstrated recent infarcts in the right corona radiata in addition to the recent haemorrhages and background extensive vasculopathy with microhaemorrhages and white matter hyperintensities (WMH). The final diagnosis was hypertensive small vessel disease causing simultaneous ischaemic and haemorrhagic strokes. With optimisation of blood pressure control and physiotherapy, the patient made a full recovery and remained symptom-free during follow-up.

Case report

A 63-year-old man with a history of hypertension presented with left arm and leg weakness. He had discontinued his antihypertensive medication four years prior and had not had any further monitoring. On examination, blood pressure (BP) was 272/141mmHg and he had a mild left hemiparesis grade 4/5. Blood parameters were unremarkable and electrocardiogram demonstrated left ventricular hypertrophy. CT brain demonstrated two areas of haemorrhage within the left basal ganglia and thalamus (Figure 1) and CT angiogram did not demonstrate aneurysm, arteriovenous malformation or thrombus. The patient was commenced on a labetalol infusion to achieve a target systolic of <180mmHg.

Figure 1: Admission CT brain demonstrating acute haemorrhage into the left basal ganglia and thalamus.



An MRI brain demonstrated two areas of restricted diffusion within the right corona radiata (Figure 2) and haemorrhage in the left cerebral hemisphere as well as background extensive vasculopathy (Figure 3). Vasculitic screen, HIV, syphilis, cerebrospinal fluid analysis and genetic testing including cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) were unremarkable. Likewise, investigations into secondary causes of hypertension were negative. Echocardiogram demonstrated marked left ventricular hypertrophy, however no cardiac source of thrombus. At the time of

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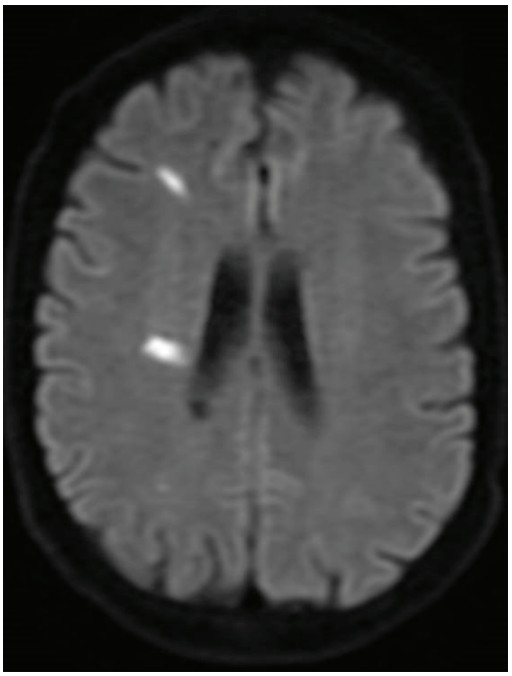
discharge, blood pressure was controlled by amlodipine 10mg OD, cilazapril 2.5mg OD and doxazosin 2mg OD. At follow-up three months later, he was back to normal and had returned to work. At this stage, blood pressure had normalised and clopidogrel 75mg daily started.

Figure 2: MR diffusion weighted sequence demonstrating two areas of restricted diffusion in the right corona radiata.



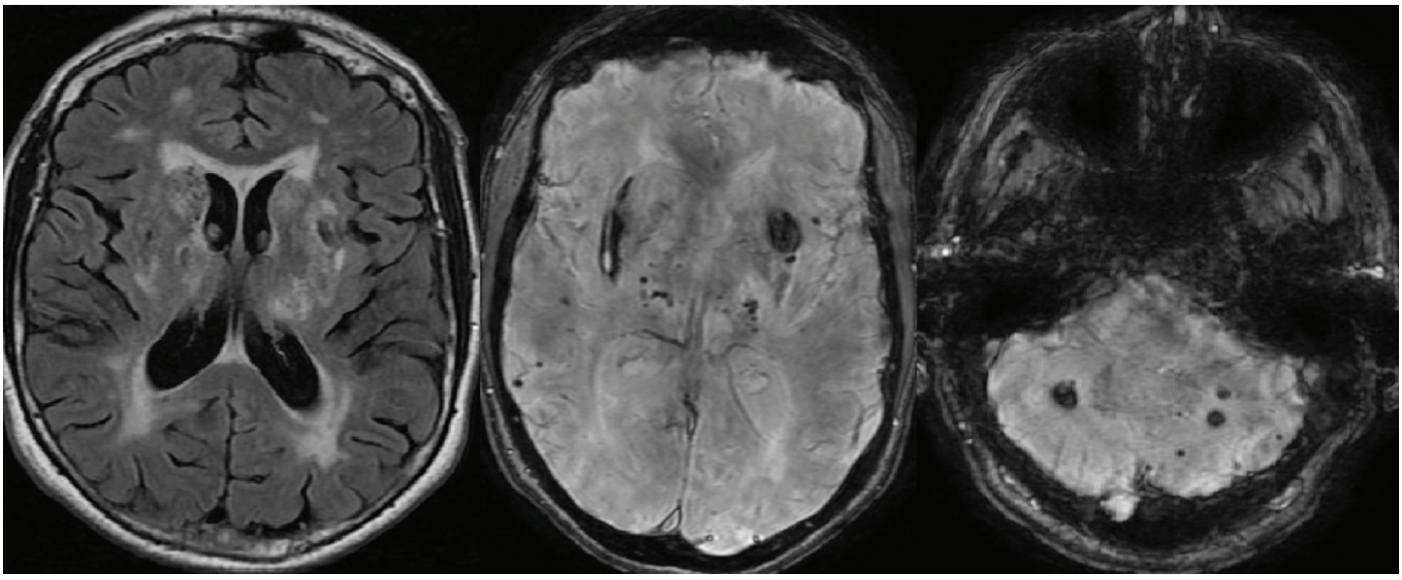
Discussion

Simultaneous ischaemic and haemorrhagic strokes are very rare with few case reports described in the literature; one case describes a patient with hypertension and atrial fibrillation,[1] and intracranial artery dissection was implicated in another.[2]

The pathophysiology of small vessel disease is complex. Hypertension leads to proliferation of smooth muscle and infiltration of blood borne cells into subendothelial areas resulting in luminal narrowing causing hypoperfusion or small vessel occlusion. Additionally, hypertension degrades elastic fibres within the media, resulting in accumulation of cellular and connective tissue components, making vessels stiffer. The pathophysiology resulting from the hypoperfusion or increased pulse pressure causes the radiological findings of lacunes, WMH and microhaemorrhages and manifest clinically as strokes and/or deteriorating cognition.[3]

The target lowering of BP to 180mmHg was a clinical judgement based on available evidence balancing the risk of compromising collateral perfusion of the ischaemic penumbra and minimising haematoma expansion. The China Antihypertensive Trial in Acute Ischaemic Stroke (CATIS) which randomised patients to 10–25%

Figure 3: MR fluid attenuation inversion recovery (left image) demonstrating small vessel ischaemia; SWI (centre and right) demonstrating numerous areas of hypoattenuation consistent with previous haemorrhage.



systolic BP lowering versus no antihypertensive therapy was neutral for the primary end-point of significant disability at 14 days. Further, the INTERACT 2 trial was neutral for the primary outcome of significant disability with systolic BP below 180mmHg versus 140mmHg. The lesions identified on the CT were confidently thought to be haemorrhages as opposed to perivascular calcifications; the distinction can at times be difficult in which case urgent MRI is required. In this man, thrombolytic therapy was contraindicated; thrombectomy would be an option had an intracranial thrombus been demonstrated.

The MRI demonstrated extensive vasculopathy, raising a number of differentials including amyloid angiopathy and CADASIL. Microhaemorrhages are one radiological manifestation of small vessel disease and is only detectable on blood sensitive MRI sequences, eg, gradient echo T2* or the even more sensitive 'susceptibility weighted imaging' (SWI). A number of MRI-based studies have demonstrated that predominantly deep cerebellar microhaemorrhages are due to hypertensive vasculopathy,[6] while strictly superficial cerebellar microhaemorrhages are associated with amyloid angiopathy.[7] The clinical presentation, investigation results and clinical course support hypertensive small vessel disease as the pathophysiology of stroke in our patient.

Competing interests:
Nil.

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REFERENCES:

1. Balci K, Utku U, Asil T, Unlu E. Simultaneous onset of hemorrhagic and ischemic strokes. Neurologist. 2007 May; 13(3):148–9.
2. Kim JH, Jung YJ, Chang CH. Simultaneous Onset of Ischemic and Hemorrhagic Stroke Due To Intracranial Artery Dissection. J Cerebrovasc Endovasc Neurosurg. 2017; 19(2):125–128.
3. Nam KW, Kwon HM, Jeong HY, et al. Cerebral Small Vessel Disease and Stage 1 Hypertension Defined by the 2017 American College of Cardiology/American Heart Association Guidelines. Hypertension. 2019; 73(6):1210–1216.
4. He J, Zhang Y, Xu T, et al. Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients with Acute Ischemic Stroke. The CATIS Randomized Clinical Trial. JAMA. 2014; 311(5):479–489.
5. Anderson CS, Heeley E, Huang Y, et al. "Rapid blood-pressure lowering in patients with acute intracerebral hemorrhage". The New England Journal of Medicine. 2015; 368(25):2355–2365.
6. Kinoshita T, Okudera T, Tamura H, et al. Assessment of lacunar hemorrhage associated with hypertensive stroke by echo-planar gradient-echo T2*-weighted MRI. Stroke. 2000; 31(7):1646–50.
7. Pasi M, Pongpitakmetha T, Charidimou A, et al. Cerebellar Microbleed Distribution Patterns and Cerebral Amyloid Angiopathy. Stroke. 2019; 50(7):1727–1733.

An unexpected case of disseminated tuberculosis from tumour necrosis factor inhibition

Danny Con, Andrew Gador-Whyte, Robert MacGinley

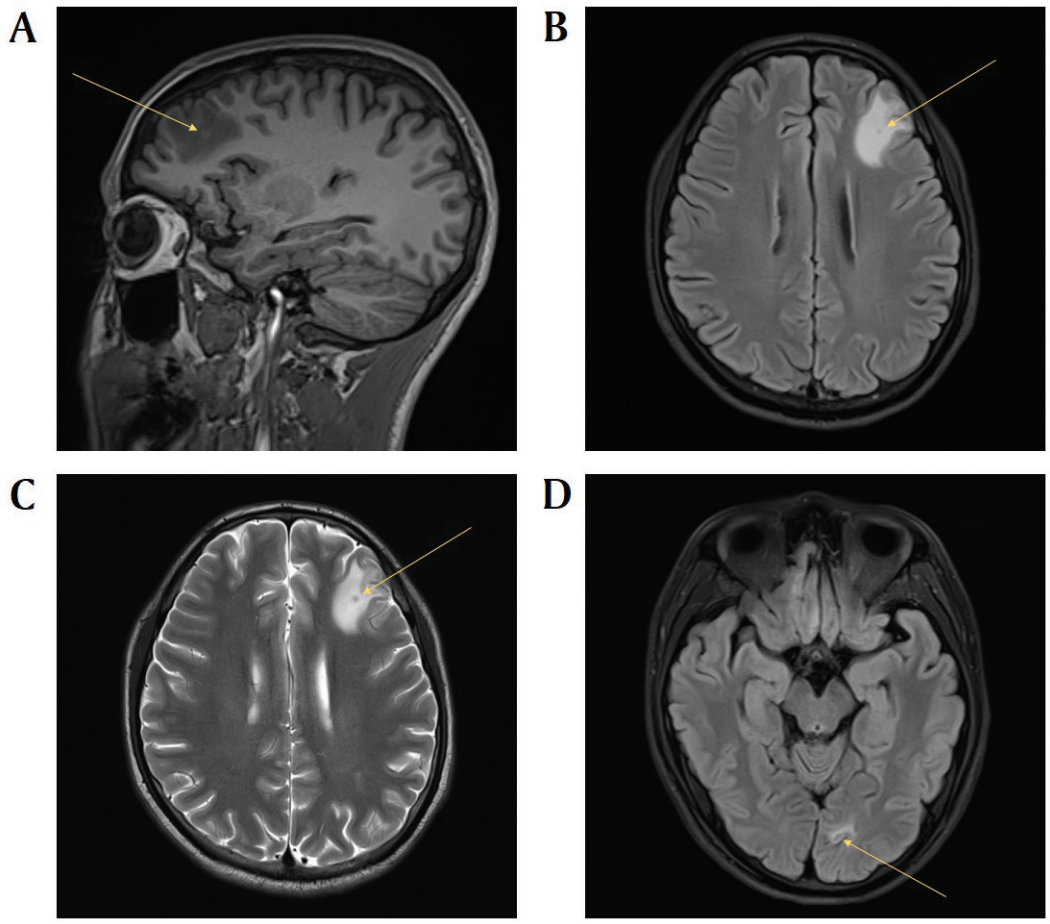
The risk of latent tuberculosis (TB) infection (LTBI) reactivation is increased with the use of tumour necrosis factor inhibition (TNFi) and often presents with extrapulmonary infection.[1,2] Although uncommon, false-negative LTBI screening with interferon gamma release assay (IGRA) does occur and can mislead clinicians to delaying a diagnosis of LTBI reactivation,[3] especially given the systemic nature of active TB with often unusual presentations. A high index of suspicion of TB is thus needed when patients present with a systemic febrile illness and extensive testing should be undertaken to localise disease and direct therapy.

We report a 26-year-old South Korean-born, Australian man (migrated at age seven) who presented with a two-week febrile illness associated with dyspnoea, palpitations, night sweats, weight loss, myalgia and a non-productive cough. Nine months prior, he had the unusual diagnosis of posterior uveitis secondary to retinal vasculitis for which he was treated with and responded to adalimumab 40mg fortnightly, oral methotrexate 20mg weekly and tapering prednisolone. Prior to treatment, his pre-biologic screening with chest x-ray and IGRA (QuantiferonFERON-TB Gold) had been negative for LTBI. His posterior uveitis had responded to treatment and resolved seven months prior. He worked as a carpenter and had no known TB contacts or recent travel.

Initial evaluation revealed raised inflammatory markers (ESR 92mm/hr, CRP 122mg/L), hypervolemic hyponatremia (sodium 124mmol/L) and, a transaminitis without cholestasis (ALT 231IU/L) and negative blood cultures. Chest x-ray revealed a pleuro-pericardial effusion with globular cardiomegaly, as well as right middle lobe consolidation which was confirmed on CT. An urgent pericardiocentesis produced 680mL of blood-stained exudate (lactate dehydrogenase 510units/L, protein 54g/L) that had benign cytology and was negative for bacteria on Gram and acid-fast stains. Transthoracic echocardiography revealed moderate biventricular dysfunction without thrombus or vegetation. A differential diagnosis of a systemic rheumatological condition, either related to the known posterior uveitis, or in relation to autoantibody formation from anti-TNF therapy, was considered, however extensive autoimmune panel revealed only a low-positive ANA with nucleolar staining pattern and positive anti-smooth muscle antibody. Colchicine was commenced for a presumed viral pleuro-pericarditis although serology was negative for causes such as adenovirus and HIV.

Two days later, he demonstrated new confusion and ongoing pyrexia. Broad spectrum antibiotics were started. Magnetic resonance imaging of the brain confirmed two cerebral abscesses (Figure 1) although cerebrospinal fluid analysis was unremarkable (glucose 3.0mmol/L, protein 0.26g/L, 0×10^6 polymorphs). Due to the low sensitivity of acid-fast staining, additional nucleic acid amplification testing of the initial pericardial fluid sample was performed for Mycobacterium tuberculosis (GeneXpert® Ultra, Cepheid, Sunnyvale CA, US) and confirmed pericardial tuberculosis. Repeat pleural drainage and subsequent onset of productive cough allowed additional pleural fluid and sputum testing, which confirmed both pleural and pulmonary tuberculosis, although

Figure 1: Magnetic resonance imaging of the brain demonstrating 3mm left frontal lobe abscess with surrounding cerebritis and associated early osteomyelitis of the abutting frontal bone, as well as a 6mm left posterior lobe abscess with minimal oedema.



(A) T1-weighted MP-RAGE sequence sagittal view of left frontal abscess; (B) T2-weighted TSE sequence (dark fluid) axial view of left frontal abscess; (C) T2-weighted TSE sequence axial view of left frontal abscess; (D) T2-weighted TSE sequence (dark fluid) axial view of left posterior lobe abscess.

insufficient volume precluded testing on CSF. A final diagnosis of disseminated TB with pericardial, pleural, pulmonary and (presumed) central nervous system involvement was made and treatment was commenced with rifampicin, isoniazid, pyrazinamide, moxifloxacin (for central nervous system penetration) and prednisolone (for pericardial involvement), with symptoms resolving over two weeks.

We postulate that this man likely had LTBI acquired in South Korea, which has a high incidence, and that his initial IGRA testing was likely a false-negative. It remains a further possibility that this man's initial diagnosis of posterior uveitis was actually TB uveitis rather than retinal vasculitis. The sensitivity of a test is defined as the proportion of patients with a disease that tests positive, which has been reported to be 63-90% for IGRA.[4–6] When the disease is common (or when the patient has a high pre-test probability of the disease), even a modest sensitivity will translate to a high false-negative rate. It is therefore vital for clinicians to understand the diagnostic accuracy of all medical investigations and the expected interplay with clinical suspicion. In this case, despite a high pre-test probability for TB due to his known risk factors (birth in a high incidence country and significant immunosuppression), the index of suspicion remained falsely low and led to a delay in testing and diagnosis, due only to the single negative IGRA test nine months prior. Moreover,

intraocular TB infections are thought to be a paucibilliary immune-mediated process, suggesting that this man's initial improvement with immunosuppression may not be entirely unexpected.[7,8] A positive IGRA relies on the host immune response, and therefore false-negatives may occur with immunosuppression that commonly occurs in patients with rheumatological conditions, [5, 6] and decreases to as low as 9% in immunocompromised individuals.[3,9] Therefore, sequential IGRA testing to improve sensitivity prior to biologics may have been necessary to rule out LTBI.[1] This case highlights the importance of maintaining a high index of suspicion for an atypical infection in a patient treated with immunosuppressive therapy despite negative screening, especially when a confluence of systemic symptoms can present as diagnostic challenges, to facilitate early management before multiple organ involvement ensues.

Competing interests:
Nil.

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REFERENCES:

1. Dobler CC. Biologic Agents and Tuberculosis. Microbiol Spectr, 2016. 4(6).
2. Dixon WG, et al. Drug-specific risk of tuberculosis in patients with rheumatoid arthritis treated with anti-TNF therapy: results from the British Society for Rheumatology Biologics Register (BSRBR). Ann Rheum Dis, 2010; 69(3):522–8.
3. Noguera-Julian A, et al. Tuberculosis disease in children and adolescents on therapy with anti-tumor necrosis factor-alpha agents: a collaborative, multi-centre ptbnet study. Clin Infect Dis, 2019.
4. Darby J, Black J, Buising K. Interferon-gamma release assays and the diagnosis of tuberculosis: have they found their place? Intern Med J, 2014; 44(7):624–32.
5. Pai M, Zwerling A, Menzies D. Systematic review: T-cell-based assays for the diagnosis of latent tuberculosis infection: an update. Ann Intern Med, 2008; 149(3):177–84.
6. Kik SV, et al. Predictive value for progression to tuberculosis by IGRA and TST in immigrant contacts. Eur Respir J, 2010; 35(6):1346–53.
7. Tagirasa R, et al. Autoreactive T Cells in Immunopathogenesis of TB-Associated Uveitis. Invest Ophthalmol Vis Sci, 2017; 58(13):5682–5691.
8. Ahn SJ, et al. The usefulness of interferon-gamma release assay for diagnosis of tuberculosis-related uveitis in Korea. Korean J Ophthalmol, 2014; 28(3):226–33.
9. Belard E, et al. Prednisolone treatment affects the performance of the QuantiFERON gold in-tube test and the tuberculin skin test in patients with autoimmune disorders screened for latent tuberculosis infection. Inflamm Bowel Dis, 2011; 17(11):2340–9.

Health advice for counselling: would parvovirus infection in puppies affect children and women?

Kam Lun Hon, Karen Ka Yan Leung

On Lunar New Year's eve of 2020, an owner of two two-month-old puppies sought advice about her ill puppy with vomiting and mild loose stools. The veterinarian advised that her dog would probably not survive and immediate "hospitalisation" was needed. The puppty was anaemic, and although white cell and platelet counts were normal, he tested positive for canine parvovirus by blood PCR and died two days later. The other puppy was initially well but developed similar symptoms two days later and subsequently also tested positive for parvovirus by PCR. The puppy was "hospitalised" and received intravenous fluids, immunoglobulins, antiviral, antibiotic and symptomatic (antiemetic and antidiarrhoeal) treatments. He recovered in three days. The owner remained well but was concerned about human transmission of parvovirus to pregnant women or children. To aid understanding, management and counselling, a PubMed search was performed using the keywords 'parvovirus' and 'puppies' and we have identified 13 relevant publications out of the 161 search results. Parvoviruses can infect both animals and humans, and we present a comparison of their characteristics.[1–3]

Canine parvovirus is a member of species *Carnivore protoparvovirus 1* in the genus *Protoparvovirus*. Parvovirus is spread by contact with infected dog's faeces. Symptoms include lethargy, severe diarrhoea, fever, vomiting, loss of appetite and dehydration.[2] Disease of the myocardium is seen in puppies infected with canine parvovirus 2 between the ages of three and eight weeks.[2] The gastrointestinal tract and lymphatic system can be affected leading to vomiting, diarrhoea and immunosuppression.[2] It causes a particularly deadly disease among young puppies with about 80% fatality.

Humans can be infected with Parvovirus B19. Parvovirus B19 is a member of species *Primate erythroparovirus 1* in the geneus *Erythroparovirus*, it infects red blood cell precursors and was the first parvovirus shown to cause human disease.[3,4] Parvovirus in human adults is usually asymptomatic. Other manifestations can include mild respiratory tract illness, polyarthropathy syndrome and transient aplastic crisis.[5] Paediatricians are familiar with parvovirus infections in children as it may manifest with visible effects, such as fifth disease (erythema infectiosum or 'slapped-cheek'); petechial, papular-purpuric gloves-and-socks syndrome (PPGSS), and rarely aplastic anaemia.[3] Parvovirus infection may affect 1—5% of pregnant women.[6] It is associated with severe foetal anaemia, which can lead to hydrops fetalis and may result in miscarriage or stillbirth.[3] The risk of foetal loss before 20 weeks' gestation is 14.8% and falls to 2.3% after 20 weeks' gestation.[6]

There is no evidence of human transmission of canine or feline parvovirus.[1–3] Parvovirus B19 only infects humans; dogs and cats cannot get parvovirus B19 from an infected person. While pet dogs and cats can be vaccinated against canine parvovirus, there are no approved vaccine for humans against the parvovirus B19. Parvoviruses are resistant to most household disinfectants; but household bleach containing sodium hypochlorite are shown to be effective at one in 30 dilution with a contact time of at least 10 minutes.[7,8] Pet keepers can rest assured that there is no evidence that canine parvovirus can affect humans.

Competing interests:
Nil.

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REFERENCES:

1. Neu N, Duchon J, Zachariah P. TORCH infections. Clin Perinatol. 2015; 42(1):77–103.
2. Pereira GQ, Gomes LA, Santos IS, Alfieri AF, Weese JS, Costa MC. Fecal microbiota transplantation in puppies with canine parvovirus infection. J Vet Intern Med. 2018 Mar; 32(2):707–11.
3. Qiu J, Söderlund-Venermo M, Young NS. Human parvoviruses. Vol. 30, Clinical Microbiology Reviews. American Society for Microbiology; 2017:43–113.
4. Servey JT, Reamy BV, Hodge J. Clinical presentations of parvovirus B19 infection. Am Fam Physician. 2007 Feb; 75(3).
5. Kimberlin D, Long S, Brady M, Jackson M. Human Parechovirus Infections. In: Red Book 2018: Report of the Committee on Infectious Diseases. 2018:602–6.
6. Giorgio E, De Oronzo MA, Iozza I, Di Natale A, Cianci S, Garofalo G, et al. Parvovirus B19 during pregnancy: a review. J Prenat Med [Internet]. 2010 Oct [cited 2020 May 23]; 4(4):63–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22439064
7. Cavalli A, Marinaro M, Desario C, Corrente M, Camero M, Buonavoglia C. In vitro virucidal activity of sodium hypochlorite against canine parvovirus type 2. Epidemiol Infect. 2018; 146(15):2010–3.
8. Greene C, Decaro N. Infectious Diseases of the Dog and Cat. 4th ed. Greene C, editor. Elsevier Saunders; 2012:67–80.

Is snacking the new eating norm for New Zealand children? An urgent call for research

Christy O'Toole, Ryan Gage, Christina McKerchar, Viliami Puloka, Rachael McLean, Louise Signal

Up-to-date evidence on dietary intake and habits is important for informing policy. However, in recent years there has been a distinct lack of research on children's snacking patterns in New Zealand. The 2002 Children's Nutrition Survey[1] is markedly outdated. The survey did not investigate snacking as a distinct eating occasion, and was therefore unable to assess the relationship between snacking and children's energy intake. Other research related to snacking has been limited to secondary analyses of the 2002 survey data,[2] a small study (n=44) of five-year-old children[3] and comparative analyses of snack foods (eg, nuts).[4] While we know that most New Zealand children consume 'snacks' (eg, potato chips and candy bars),[1] there is no estimate of the frequency of snacking among children. Moreover, little is known about the context of snacking in children's lives, including sources of snack foods, timing of consumption and behaviours conducive to snacking (eg, screen time). In this research letter, we summarise what is currently known about snacking and outline reasons why more research is needed in this area.

Snacking is most commonly defined as the consumption of foods and drinks between regular meals, although other definitions have been used.[5] Snacking contributes an important source of energy and nutrients for both children and adults. The health effects of snacking can depend on the type of food consumed and the nature of consumption. On one hand, snacking can provide children with an indispensable source of energy to support growth, learning and physical activity. Consuming healthful snacks (eg, fruit) also provides valuable nutrients and can help support a healthy weight.[5] Yet, snacking on energy-dense, nutrient-poor (EDNP) foods contributes to poor dietary quality and excess weight gain.[5]

The need for more research on snacking is driven by several changes in recent years that affect food availability for children. Many parents today are more time scarce, which increases their preference for 'convenience food', such as fast food and processed snack foods, many of which are high in salt and sugar.[6] Serving sizes for fast food, which children often snack on, have also increased.[7] The global rise of ultra-processed foods also presents concerns. These items account for over half the total dietary intake in UK, US and Canada,[8] and represent the largest proportion of packaged foods in New Zealand supermarkets.[9] Moreover, the rise of online grocery shopping, home delivery and exposure to online marketing have drastically transformed the food environment for children. This trend has likely been reinforced by the events of COVID-19. However, the effect of these factors on children's dietary patterns is not clear.

An updated Children's Nutrition Survey is urgently needed to help answer questions about children's eating patterns. However, we argue that additional research is warranted in New Zealand to better understand snacking behaviours. Most importantly, research should investigate the context of snacking in children's lives, including the source of snacks, timing of consumption and prevalence of associated activities (eg, screen use). Such detail can be difficult to obtain using surveys, owing to recall bias and high respondent burden. Suitable methods could use food diaries or wearable cameras paired with recall methods.[10] Such research could help inform policies that both 1) reduce children's opportunities for snacking on energy-dense, nutrient-poor foods and 2) increase consumption of healthier snacks.

Competing interests:
Nil.

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REFERENCES:

1. Ministry of Health. NZ Food NZ Children: Key results of the 2002 National Children's Nutrition Survey. Wellington: Ministry of Health; 2003.
2. Rockell JE, Parnell WR, Wilson NC, et al. Nutrients and foods consumed by New Zealand children on schooldays and non-schooldays. Public Health Nutr. 2011; 14(2):203–208.
3. Chee L. The role of "snacks" in the diets of 5-year old children in Dunedin, New Zealand. Dunedin, Otago, New Zealand, University of Otago; 2016.
4. Pearson KR, Tey SL, Gray AR, et al. Energy compensation and nutrient displacement following regular consumption of hazelnuts and other energy-dense snack foods in non-obese individuals. Eur. J. Nutr. 2017; 56(3):1255–1267.
5. Njike VY, Smith TM, Shuval O, et al. Snack Food, Satiety, and Weight. Adv Nutr. 2016; 7(5):866–878.
6. Djupegot IL, Nenseth CB, Bere E, et al. The association between time scarcity, sociodemographic correlates and consumption of ultra-processed foods among parents in Norway: a cross-sectional study. BMC Public Health. 2017; 17(1):447.
7. Eyles H, Jiang Y, Blakely T, et al. Five year trends in the serve size, energy, and sodium contents of New Zealand fast foods: 2012 to 2016. Nutr J. 2018; 17(1):65–65.
8. Monteiro CA, Cannon G, Levy RB, et al. Ultra-processed foods: what they are and how to identify them. Public Health Nutr. 2019; 22(5):936–941.
9. Luiten CM, Steenhuis IH, Eyles H, et al. Ultra-processed foods have the worst nutrient profile, yet they are the most available packaged products in a sample of New Zealand supermarkets. Public Health Nutr. 2016; 19(3):530–538.
10. Gemming L, Ni Mhurchu C. Dietary under-reporting: what foods and which meals are typically under-reported? Eur. J. Clin. Nutr. 2016; 70(5):640–641.

Can we teach psychiatry in medical school in a better way?

Nicholas R Wilson

As a final year medical student who has finished their psychiatry medical school training through the University of Auckland, I feel able to comment on the current teaching model, being aware that my perspective is but my own over a short space of time. At the heart of my concern around the current teaching model is the lack of recognition and teaching about the deficiencies of the psychiatry model.

The 2018 *Lancet* meta-analysis on whether anti-depressants work, showed that almost all outperform a placebo in trials.[1] A significant question that these studies do not answer is whether there is any long-term benefit or not of these medications, as most studies have a short duration (<6 months); the cost of long studies and the duration to publish being a barrier. The effects of anti-depressants on those with mild depression is almost insignificant (it is greater in those with more significant depression),[2] yet this makes up a large proportion of prescribing. Studies around anti-depressant effectiveness don't factor in the withdrawal effects with stopping an anti-depressant medication. The side effects from mental health medications can be very significant, such as with medications used to treat diagnoses of bipolar disorder and schizophrenia. I couldn't find any published research on how often mental health diagnoses in individuals are changed, but this is a regular occurrence in clinical psychiatry. A holistic evaluation of the upsides and downsides of anti-depressants and other psychiatric medication is not easy for studies to establish, and therefore personal experiences and population-level outcomes seems important to engage with to supplement whether our approaches in diagnosis and management are effective.

The recent government enquiry into mental health and addiction found numerous concerns about the mental health system including wait times, concerns with access and a limited range of options.[3] Issues with mental health are found in all parts of society. The rate of suicides in New Zealand has increased consecutively over the past six years to the highest rate since 1999.[4] This despite rates of SSRI prescribing (an anti-depressant) increasing from 2014 to 2018.[5] It is now recommended that we talk before we prescribe for mild cases of depression.

There is a huge amount of positive work that people that work in this field do. I could name many workers in this field that I have personally been able to study under who I saw do many wonderful things in this field. I am very grateful for the opportunities these people have given me as a student with their time and effort while working. Without these opportunities students wouldn't get a chance to be exposed to many of these problems.

In the context of where we are in history, it appears to me that there are great needs in mental health in New Zealand. The current models of mental health taught in medicine seem adequate at best, but hardly rising to meet the needs of our community. It feels to me that we could do much better, but we would have to find new ways to approach these issues, and to let go of approaches that bring little effective benefit to make use of our limited time. Being open and honest about the limitations of the psychiatric model may allow for the emergence of inspirational ideas and better critical thinking by our "leaders of tomorrow" in evaluating solutions for these problems. Just because the solutions are not at hand, does not meant that they are not close by.

Competing interests:
Nil.

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REFERENCES:

1. Andrea Cipriani, Toshi A Furukawa, Georgia Salanti, Anna Chaimani, Lauren Z Atkinson, Yusuke Ogawa, et al. Comparative Efficacy and Acceptability of 21 Antidepressant Drugs for the Acute Treatment of Adults With Major Depressive Disorder: A Systematic Review and Network Meta-Analysis. 2018; 16(4):420–9.
2. Stone M, Kalaria S, Richardville K, Miller B. Components and trends in treatment effects in randomized placebo-controlled trials in major depressive disorder from 1979 to 2016. J American Society of Clinical Psychopharmacology. 2018.
3. Government Enquiry into Mental Health and Addiction. Chapter 2: What we heard - the voices of the people 2018 [Available from: http://mentalhealth.inquiry.govt.nz/inquiry-report/he-ara-oranga/chapter-2-what-we-heard-the-voices-of-the-people/2-10-access-wait-times-and-quality/
4. Coronial Services of New Zealand. Annual provisional suicide statistics for deaths reported to the Coroner between 1 July 2007 and 30 June 2019 2019 [Available from: http://coronialservices.justice.govt.nz/assets/Documents/Publications/Provisional-Figures-August-2019.pdf
5. BPAC. Depression or distress? Examining SSRI prescribing in primary care 2019 [Available from: http://bpac.org.nz/2019/ssri.aspx

Gonorrhoea: Some Notes on the Evil Results of its Abortive Treatment in the A.I.F.

By FRANK MACKY, M.B., B.S. (Melb.).

The wastage due to venereal disease was early recognised by the A.I.F., and a special hospital under the name of the 1st Australian Dermatological Hospital was organised and despatched to Egypt in 1915 and later moved to Bulford on the Salisbury Plains. From an even earlier date efforts had been made to devise some suitable form of abortive treatment for gonorrhoea—some form of treatment by which it was hoped a large proportion of cases might be cured at their units without evacuation to hospital.

In 1915 practically the only guide to medical officers in this matter was a pamphlet issued for use on transports in which the treatment depended (as far as abortine measures are concerned) on injections of nitrate of silver of varying strength. Among the units this pamphlet was not regularly followed, and where effort was made it was individual and varied widely in character, silver nitrate, however, largely remaining the basis.

In 1917 a better organised attempt was made. Early treatment depots were organised in every camp, where prophylactic and abortive measures were carried on and were available to the men night and day. A routine was carefully worked out and strict orders issued for its adoption by all such early treatment depots. The method was several times changed during the two years that followed, but the principle remained, of which the following· were the main points:

1. Only those cases presenting the earliest signs and not exceeding 24 hours in duration were to be attempted.
2. A limited course (4–6 days) of abortive treatment was laid down in timetable form.
3. All cases not cured at the end of this time were to be sent immediately to No. 1 A.D.H.

These measures were rewarded with a well-deserved success, according to the monthly figures compiled, and at certain periods only 3 per cent. of cases treated had to be sent to hospital for further treatment. From the Army point of view this is a fine result. From the patient's point of view (as will appear more fully later) it is not an unqualified success, and had a more stringent standard of care been insisted on, I am convinced the cures would have dropped to more like 40 per cent. than 97 per cent.

However, it is with the "failures" only that I wish to deal, and these notes are compiled from experience of the findings at hospital—not at the depots.

EARLY TREATMENT METHODS.

It is necessary to give a short summary of the various methods of early treatment practised on patients admitted from the depots both before and since the establishment of the routine of 1917. They fall under two main heads:

1. Irrigations with pot. permang. solutions (1-4000-1-8000)—modifications of Janet's original method.
2. Anterior injections of silver preparations, either in-organic or organic—
   (a) Injections of silver nitrate (1–5 per cent.). This is an old method advocated by Ricord, Engelrath, and others, mostly used in A.I.F. before 1917.
   (b) Argyrol "seals," a method by which an injection of 5–10 per cent. argyrol was retained by sealing the meatus with collodion

or adhesive plaster. The original 1917 method for early treatment depots.

(c) Plug and massage method. A gauze dressing impregnated with 10 per cent. argyrol (or other similar solution) is passed by means of a probe into the urethra and left in situ in apposition to the inflamed area. Introduced in 1918.

Both seals and plugs were usually repeated twice daily for four days and retained for four hours. Condy's irrigations were used in conjunction with the other methods.

The above methods reflect an attempt to deal with the problem of rapid disinfection at a progressively earlier stage of the disease, the last being an attempt to place a contact antiseptic dressing on the urethral mucous membrane at a time when the limit of the backward spread of the infection lies within the anterior 1½–2 inches of the urethra.

CASES IN WHICH EARLY TREATMENT FAILED TO PRODUCE CURE.

As indicated above, a definite time limit was laid down for each method, at the end of which, if uncured, the case should have gone to hospital. As the system became properly organised a majority of the cases admitted to hospital had had some form of treatment. Many had had an official course of early treatment which had failed—normal failures. But the official course was often unwisely exceeded—I have notes of cases who had triple and quadruple courses—and the opportunity has frequently occurred of examining the defects of each system as thrown into bold relief by overtreatment—abnormal failures.

In general all failures fall into two large groups:

1. Generalised acute or sub-acute gonorrhoea (with or without extension complications), showing on admission profuse discharge, turbid urine, and dysuria.
2. Chronic gonorrhoea (gleet)—i.e., gonorrhoea with localised lesions and often extension complications as well.

The common extension complications are, of course, prostatitis, vesiculitis, and epididymorchitis.

CLINICAL CONDITION AFTER VARIOUS FORMS OF EARLY TREATMENT.

1. After Irrigation Only.—Failures after this method usually arrive at hospital in a condition of sub-acute confirmed gonorrhoea. The discharge is abundant and yellow and consists of pus cells with a few epithelial cells. Gonococci may be difficult to find after even short courses of irrigations, Posterior urethritis—usually sub-acute—may be present, and a sub-acute prostatitis in 35 per cent. of cases. Other extension complications are less common on admission after this than after other forms of treatment. Such cases cannot be at once examined with the urethroscope, but subsequent examination usually discloses little beyond the common mild littritis, and there is no mechanical damage to the urethra. This method has none of the drawbacks of the "silver" methods. It is safe, and can be used with advantage at a stage when rapid-disinfection methods are too late.
2. Rapid Disinfection Methods.—
   (a) Injections with silver nitrate.—This is the most drastic and painful of the various methods of early treatment. The silver injections are followed by an intense inflammatory reaction in which, in successful cases, the gonococci perish. The discharge is examined when the reaction is subsiding, and if gonococci are present the attempt has failed. On admission to hospital there is usually a free purulent discharge, often blood-stained. There may be active haemorrhage. The urethra is tender for a variable distance from the meatus, which is oedematous, pouting and inflamed. The whole penis may be oedematous and inflamed, with dysuria and chordee. Periurethral abscess is not uncommon. The discharge

consists of pus cells and numerous gonococci can be detected. A period of antiphlogistic treatment must precede any active treatment or endoscopic examination. The condition then found is quite characteristic. Commencing about one inch from the meatus, there is a patchy loss of the elasticity of the mucus-membrane, becoming a definite submucous infiltration as the peno-scrotal angle is approached, where the condition frequently stops short. Embedded in these thickened patches are groups of inflamed and discharging glands of Littré. Gonococci can usually be demonstrated with ease from pus taken direct from such glands. The cure of these cases demands a slow and systematic dilatation, a process to which an excess of silver seems to render the urethra peculiarly resistant.

(b) After "Seal Up" Method.—The normal method consists of 5–15 per cent. argyrol sealed in for four hours—one or two daily for a maximum of five days—when if gonococci remain the patient is sent to hospital. But occasionally an enthusiastic medical officer retained a patient, probably at the patient's urgent request, and persisted in the treatment until as many as 45 seals had been given or some complication such as epididymitis developed. The folly of this procedure cannot be too strongly condemned. Extensive damage invariably results. The immediate failures of this method present some characteristic features:—(1) A tough contracted meatus often needing meatotomy before dilation can proceed; (2) a marked increase in the incidence of extension complications, especially epididymitis; (3) haemorrhage from the urethra is common; (4) endoscopically, tough surface infiltration of a quality never seen in ordinary cases. I have seen this in all grades, culminating in the above-mentioned "'record" case where 45 seals had been given in two and a-half weeks. The anterior urethra back to the angle was palpable as a firm cord. Endoscopically it had the rigidity and appearance of leather, but was friable and bled freely unless handled with extreme care. It was studded with discharging follicules.

The gleet cases I refer to later.

(c) After "Plug and Massage" Treatment.—This method largely replaced the above method in 1917–18, though it did not eliminate its risks: It is a revival in modified form of a method described by Bouseau in 1897. The argyrol is retained in contact with the mucus membrane by passing down a plug of gauze steeped in solution. An attempt is made to determine by palpation for tenderness the limit—say 2in.—to which the inflammation has extended. The plug is designed and inserted so as to remain in contact with the whole of this area. It remains for a variable period up to four hours and is passed out by micturition. As before, negative slides were depended on as a standard of cure.

In my experience every failure after this treatment has shown on endoscopic examination the above-described "tanning" effect of argyrol to perfection. The difference is that the damage is limited abruptly to the area of contact with the plug-in effect, a tubular stricture one to two inches long which may be wide enough to admit an F 24 bougie, but is almost incapable of further dilatation. It is always the seat of an intense littritis.

Extension complications are commoner than in a series of untreated cases. I have twice seen periurethral abscess at the deep end of the stricture band.

Gonococci can be found in the discharge from the inflamed glands of Littré when difficult to detect in meatal slides. The loop of a platinum cautery is a convenient instrument for obtaining these specimens.

During subsequent dilatation these bands are prone to develop fissures in the floor of the urethra or patches of granuIation and polypoid formations at the deeper end.

SUMMARY OF CONFIRMED CASES.

We therefore find that the cases of confirmed gonorrhoea following attempts at abortive caustic treatment present certain features in common: (1) A marked littritis worse than that found in the average untreated case; (2) more or less serious damage to the mucus membrane involving fibrosis and favouring secondary infection; (3) an increased incidence of extension complications.

The attempt at rapid cure failed because disinfection of Littre's gland failed, and such methods must fail unless instituted before these glands become infected. Invariably the cases where abortive treatment has failed are worse and more difficult to cure than cases not so treated. Good results are claimed and have no doubt been obtained, but most careful selection of cases is essential, especially as regards the factor of the time elapsing since the onset of symptoms.

The opinion of Georges Luys may here be quoted ("Text Book of Gonorrhoea," page 298): "The gonococci penetrate…with great rapidity into the substance of the epithelium. A really abortive treatment would therefore imply the destruction of the epithelial layers, as otherwise…the gonococci would not all be killed immediately. Such therapy…would work such havoc that the advantage derived…would not justify its use."

CASES OF GLEET FOLLOWING EARLY TREATMENT.

In dealing with this important group of cases a further word of explanation is necessary on the usual practice in early treatment depots. The routine was: (1) A course of antiseptic (caustic) injections; (2) microscopical examination of slides from the meatus on the fourth and sixth days; (3) if gonococci present, transfer to hospital; (4) if gonococci were not found, a course of Condy's irrigations, etc., up to fourteen days was given, and if the discharge still continued and was free from gonococci the patient was discharged to duty as urethritis catarrhal (chemical) and was informed that his gleet would soon disappear.

These gleet cases can be subdivided:

1. A large group never had a gonococcal infection at all and daily recovered from a chemical urethritis.
2. A second group were definite cures what have shown no symptoms since. They have shown no signs on thorough examination later.
3. A large group relapsed into a sub-acute condition almost immediately or following the first route-march or excess of alcohol, and have been included earlier in these notes.
4. Some men were not satisfied to be discharged with a gleet and were sent to Bulford at their own request for re-examination. These all showed marked secondary infection, two organisms being prominent—a large gram +ve diplococcus and a small gram -ve bacillus. These infections are quickly controlled by irrigations with oxycyanide of mercury. Gonococci could be found in nearly half the cases. This was not surprising, as slides from the meatus were commonly the only ones examined in the depots. Very little importance can be attached to negative meatal slides unsupported by other evidence of cure.
5. The fifth group were seen by us at a much later period. These were the cases who went back to duty incompletely cured. Many of them saw some of the heaviest fighting through without developing acute symptoms, and yet the gleet continued and on re-examination gonococci could be demonstrated in one case in five. The absence of acute relapse in these cases is a very significant fact. It emphasises the importance of this group as a source of infection and the great responsibility that devolves on the medical officer who, having merely examined a few meatal slides, glibly assures the man that his gleet is perfectly harmless. The majority of these men would have married without question had they not been sent compulsorily to hospital, where we were asked to decide their fitness to return to Australia.

It is difficult to condense into a small space one's experience with this interesting and instructive series of cases and the large amount of work that had to be done both in the clinic and in the laboratory for each patient. They were required to pass each test in the following routine, more than once repeated in most items:—Macroscopic and microscopic examination of morning discharge and all night urine; rectal examination of prostate vesicles and Cowper's glands and slides from the expressed secretions; endoscopic examination of anterior and posterior urethra; reaction slides after dilatation and silver nitrate injections; complement deviation tests on serum cultures.

This extensive examination, as has been noted above, revealed the gonococcus in about 20 per cent. of cases. The endoscopic examination showed a definite chronic littritis to be a regular finding in these cases, either with or without other lesions, and whether gonococci could be demonstrated or not. There are very few exceptions to the rule that a gleet signifies a lesion of the anterior urethra—littritis easily the commonest; strictures, submucus fibrosis, polypi and paraurethral ducts accounting for most of the remainder. Almost any lesion of the posterior urethra can occur and persist without meatal discharge; and many lesions were found in these examinations, including polypi on the verumontanum, soft infiltrations of the roof, stricture both in front of and behind the verumontanum, and the inflammatory signs which accompany vesiculitis and prostatitis. But no matter what else was found, this obstinate chronic littritis was usually found too, indicating quite clearly that the condition which we have seen present in the sub-acute cases and aggravated by early treatment persists indefinitely when not treated. In some cases the damage is slight and does not progress with sufficient rapidity to cause marked constriction in the first twelve months. It is impossible to indicate the dividing-line between those cases that will remain as simple chronic littritis for life and those that will, if untreated, progress in the course of years to stricture formation. But some of the more severe cases illustrate that this can happen quite early, and I quote the following case as an illustration:—

A.J.M., Pte., A.I.F., age 23.—Admitted with gleet seven months ago; single exposure in London. Four days later purulent discharge developed. Reported to early treatment depot at once. Had twelve days' treatment with "seals," "plugs," and irrigations. Discharged with gleet, which has remained ever since. Has had no relapse or acute symptoms. No previous venereal history. On examination, moderate mucoid morning discharge; nothing during the day. Contains numerous epithelial cells, few pus cells, abundant secondary organisms—no gonococci detected; urine clear, few filaments in first glass, slight obstruction in passing, which patient states has been present for two months, but does not seem to be getting any worse. Endoscopic: Anterior 1½in. perfectly normal; ducts not inflamed; very few visible; no paraurethral ducts; at 1½in. sudden band stricture ¼in. wide surmounted by a granulation polyp and ulcerated slightly on the deeper aspect. Posterior to stricture: Intense chronic littritis with wide gaping discharging ducts and much fibrosis. Bulb normal. Posterior urethra not examined. Following this examination gonococci reappeared in the meatal discharge. Dilatation was slow. Discharged from hospital after four months' treatment.

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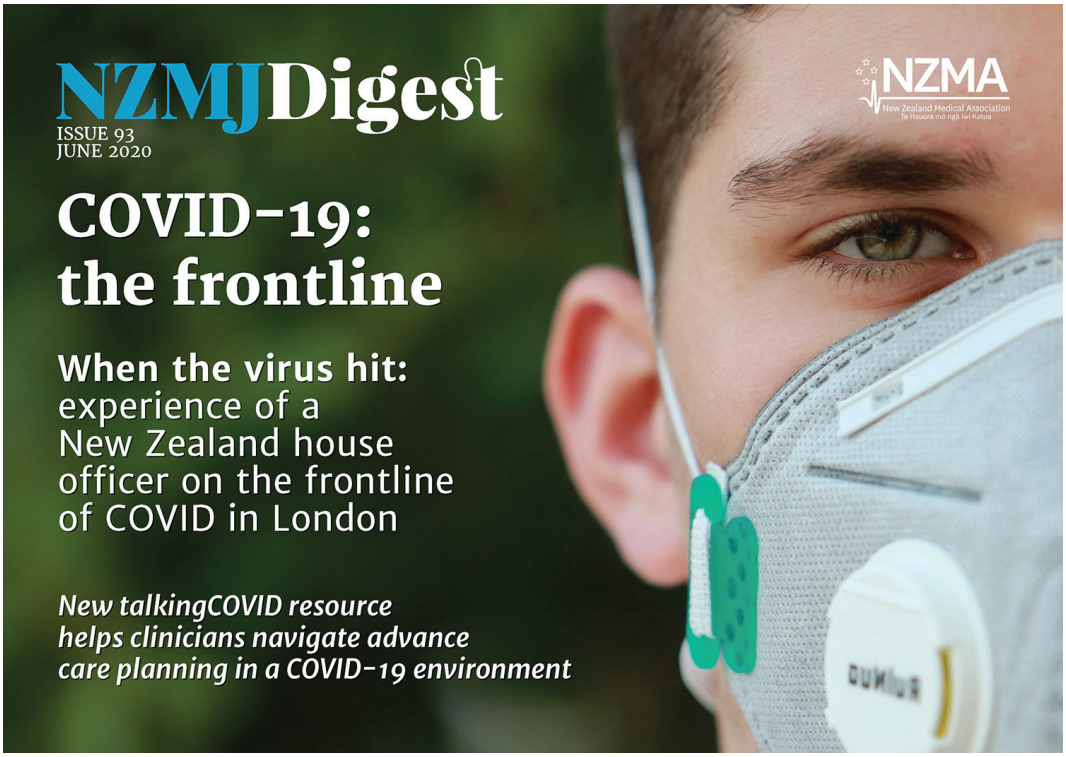

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