Rheumatic fever as an indicator of child health

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We should be celebrating as after a half a century we can see signs of making progress. Acute rheumatic fever (ARF) has declined instead of endlessly climbing as it has in the last decade.1 It is a visible and significant marker of inequality. While we wait for a child-centred society, better housing and a fair wage for all, we have a medical intervention first proven in 1950 to prevent this disease, namely treating streptococcal pharyngitis.2 Making sure every child and adolescent at risk of ARF has access to adequate healthcare spawned the school clinic idea.

But it is far more than this. ARF, long gone in most OECD countries, signals we have crowded inadequate housing where group A streptococci (GAS) spreads readily and the poorest of our population missing doctors' visits because of costs (debts at the doctors will put off taking up the free child visits) (www.health.govt.nz–NZ Health Survey 2015). Why so much emphasis on this disease? Like severe respiratory disease in babies leading to bronchiectasis, adults suffer long-term consequences with a documented shorter life span. This is inhumane but also is economic insanity. Those carrying the burden of ARF are a third of our young. But unlike severe respiratory disease, which is viral and can only be controlled by better housing to limit spread, at least ARF has an identified trigger, GAS pharyngitis, for which we have scientific evidence that it is preventable. We have been sitting on this for a very long time, adding potentially preventable complex rheumatic heart disease cases to our hospital workloads and destroying people's lives (and productivity). Fine tuning how we continue to deliver the sore throat intervention is now the challenge.

There are many other examples of preventable or treatable infectious diseases where we have failed to put the solutions in place. Infectious diseases are historically diseases of the poor and people in crowded circumstances such as armies or slums. Glomerulonephritis in mostly Māori or Pasifika children following skin infection leads to long-term renal failure in some, osteomyelitis is an unequal burden in the disadvantaged, bronchiolitis burdens our hospitals every winter, skin infections are skewed to the poor and so it goes on.3 Our meningococcal epidemics firmly linked to housing are legendary globally.4,5 For some of these there have been vaccine solutions.4,6 Most are diseases of the past in the better off. Unlike non-infectious conditions, the solutions are often well tried and tested; they may be primordial, eg, housing, as was demonstrated by Singapore. We just fail to apply them.

Why the inordinate delay in controlling ARF? The New Zealand Rheumatic Fever Working Party in the 1980’s, partnering with the Māori Women's Welfare League, proposed solutions and wrote scientific articles. Secondary prophylaxis was successfully instigated in most areas but primary care said the solution for prevention of first attacks did not lie with them, despite sore throats being in the top 10 reasons for presentation. So a new paradigm of delivery of healthcare was proposed. This was possible because most ARF presents in primary school-aged children. It was intended that this eventually might spawn a whanau ora approach with the school child being the introduction into a family setting. The focus to begin was a randomised trial evaluating the new paradigm, namely school clinics, to better deliver a known modality (penicillin treatment of GAS pharyngitis to prevent ARF) compared to the then current model of care (general practice).7 The trial demonstrated a modest but insignificant decrease of ARF most likely due to cross contamination.7 GAS has nearly a 50% chance of spreading to close household contacts. Some children in the clinic schools had siblings in the control schools, so modifications were necessary.
to the model. Māori in Northland elected to commence sore throat management in schools before the end of the trial, citing “too many in the graveyard”. ARF in that small community has virtually disappeared. Other Māori communities followed suit outside of Auckland starting before the national programme. A national workshop funded by the Heart Foundation led to a published “Advice to the Ministry of Health” recommended pathway to ARF control. (www.paediatrics.org.nz) A meta-analysis of mostly poor quality community intervention studies corroborated the observed effect in studies in the US armed forces and an inner city population, viz that a 60–80% reduction was possible.8 Smaller regions and later Auckland introduced prevention programmes centred on primary schools where disease was concentrated, with funding partnerships between the Ministry of Health and DHBs. Guidelines for sore throat management (and ARF care) emerged. Many regions eventually planned improved healthcare access beyond pharyngitis using school clinics.

Internationally, ARF has disappeared in better-off countries since WW2 with improved housing and free access to healthcare such as the UK or in the LBJ Great Society initiatives introducing free primary care through Medicaid for the poor.8 There have been some notable successes in developing countries where access including medicine is free and careful health promotion messages have been promulgated to communities and healthcare personnel. Evaluation has not been rigorous. Recently published from New Zealand is the first high-quality evidence supporting control of first presentation ARF in the community.6 Diagnosis and treatment of streptococcal pharyngitis management in a school clinic setting using oral amoxicillin can reduce first presentation cases of ARF, a global first and a proof of principle. Such evidence has been surprisingly lacking nationally or internationally up until now. The only evidence was from army studies in the 1950’s and 1960’s using injectable penicillin, which many countries acted on.7 As rheumatic heart disease (RHD) is now on the WHO agenda, this is an important contribution to the global effort. New Zealand can take some credit for a substantial contribution to this.

Our rigorous evaluation of an enhanced school clinic programme model (year 1–8) with added features to control GAS spread and cross contamination was possible where ARF is most concentrated in New Zealand (south Auckland) and 90% of children at high risk of ARF are in schools with clinics. A multi-variable model relying on the programme rolling out over time produced concrete high-quality evidence, the first globally, that sore throat management in a community setting, namely in a school, reduces ARF by a significant amount (88/100,000 to 37/100,000 p 0.008).8 Two thirds of ARF in this population are Pasifika.

What are we doing about it? We now have an evidence base for the success of school clinics where ARF is concentrated. Schools identified with a population at high risk of ARF in several DHBs in the North Island still do not have clinics. The MOH funding model for metropolitan Auckland led to less than adequate funds available for the region, especially central Auckland (Auckland DHB), which should be urgently addressed. The enhanced school clinic model in ADHB was not funded adequately and ~50% of schools at high risk do not have any sort of clinic. Two thirds of this population are Pasifika. Acting on evidence is pressing if we are to continue to progress.

Overall though, the extraordinarily good news is that after 50 years, ARF control in young Māori who carry two thirds of the national ARF burden has reduced by a significant amount meeting government targets (www.health.govt.nz). From the perspective of DHBs, most ARF cases (~75%) occur in the north of the North Island viz Northland, Waikato and the Auckland metropolitan region. The former two regions have also met government targets. The remaining third of ARF nationally is carried by Pasifika populations mostly in Auckland where the school clinic model has been incompletely implemented. ARF control in urban Pasifika presents different challenges, but overall success in south Auckland tells us it is possible. We should remember that very high rates of meningococcal vaccine in this population were achieved. There is no doubt more needs to be done to fine-tune control. Research findings suggest ongoing control of cross sectional pharyngeal GAS prevalence is an important marker.9
How do we judge success of the government’s investment in the RF Prevention programme? Data has generally been poor from traditional sources such as hospital discharge or the notifiable disease datasets. Despite ARF becoming a notifiable disease in 1986, little attention has been paid until recently. Moxon et al in this week’s Journal outline the complexity. Every case deserves careful scrutiny by skilled personnel when there are now <100 per year. The case definition is an estimate of probability rather than a laboratory test, so requires special attention.

Are there other solutions? The intriguing question suggesting GAS skin infection may have a role comes from Australian researchers where purulent skin disease in Aboriginal populations is rampant.10 In our evaluation cohort, skin infection accounted for <10% of antibiotic usage.9 Thus we suggest a direct role for skin infection appears unlikely in our population. However, types of GAS (emm types) associated with ARF suggest diverse types potentially of both pharyngeal and skin origin, unlike those traditionally described as “rheumatogenic” (and solely pharyngeal), described in epidemics in the US armed forces.11 Further data will be forthcoming with essential controls. There is a latent period of approximately three weeks between the GAS pharyngitis episode and the onset of ARF, so it is difficult to be sure a particular GAS emm is indeed the triggering GAS.12 In this week’s Journal, researchers highlight more similarities than differences between pharyngeal GAS strains in areas at low compared to high risk of ARF. The emms from published national data temporally associated with ARF, though seen in all three regions contributing strains in the study, did not correlate with the actual ARF incidence rate. The low ARF incidence region had the same number of ARF-associated emms as the high ARF incidence regions.9 Conversely in the pre-penicillin era, some GAS strains in a residential hospital were found not to cause recurrent ARF even with repeated patient exposure. However, skin seems likely to be a reservoir for GAS in our environment.

There is no doubt vaccines are a better pathway to reducing inequalities.14 Progress towards vaccines for GAS and also RSV is slow. We have now a top-quality immunisation programme.

Why this disease and not one of many others? Well it seems this relatively uncommon disease has many aspects which tell us about child health in this country. It tells that there are crowded and cold poorly built and maintained houses, repeated infections unattended to, lack of knowledge that sore throats do indeed matter, lack of access to healthcare at appropriate times and places without barriers of debts from other family members, and often insufficient household income to guarantee food on the table and petrol in the car.

If we can make progress with this indicator of child health and not lose our nerve, we have some broader hopes for the future. Only some hope though, because the commonest preventable infection is viral bronchiolitis in babies, most likely only controlled by better housing, and that is another story.

You may say all these issues only affect a minority of New Zealand kids. Well, actually it is a third of all New Zealand children, and they happen to be largely but not entirely Māori and Pasifika. Don’t take the foot off the pedal, New Zealand. We need these kids healthy and from the economist’s perspective also working to pay for superannuation if nothing else.

The ultimate goal should be progressive or proportionate universalism, as is well recognised by the OECD (2011) as the best pathway to reducing poverty and inequity. Investment in children should be universal and non-partisan as it is for the elderly. It is humane but it is also economic sense.
REFERENCES:

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