THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

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This Issue in the Journal

Paediatric driveway run-over injuries: time to redesign?
Kai Hsun Hsiao, Clinton Newbury, Nita Bartlett, Rangi Dansey, Philip Morreau, James Hamill

Vehicles hitting children in residential driveways are an important and preventable cause of child injury and death in New Zealand. Our study investigated the demographic and environmental characteristics relating to these accidents. We found that children aged 0–4 years, particularly toddlers, were most commonly hit, and that these injuries typically occurred on the child's own home driveway with the driver most commonly being a parent or relative. We also found that long driveways, shared driveways, unfenced driveways, and driveways that were used as play areas were a common feature of the driveways where such injuries occurred. We believe that physical separation of driveways from children's play and living areas (whether by fencing, changing driveway layout, or other means) would help in preventing these injuries.

Opportunistic immunisation of paediatric inpatients at Rotorua Hospital: audit and discussion
Rowena Gilbert, Katharine Wrigley

Immunisation rates in New Zealand are disappointingly low, with only 76% of 2 year olds being up to date with their immunisations, even though most New Zealand parents are not opposed to immunisation. It is important to use all possible opportunities to bring children up to date with their immunisations, including hospital stays. We studied the notes of children admitted to Rotorua Children´s Unit over a 6-month period, and found that catch-up immunisation was very rarely given. We have made a number of suggestions for improving practice, which are being introduced within this unit, including better systems for identifying which children are behind with their vaccines, and training of staff. We hope that our experience and suggestions will prompt other hospitals in New Zealand to evaluate their performance and introduce systems for catch-up immunisation.

Preventing winter falls: a randomised controlled trial of a novel intervention
Lianne Parkin, Sheila M Williams, Patricia Priest

Anecdotal reports suggest that pedestrians who wear socks over top of their footwear are less likely to slip and fall in icy conditions. To remedy a surprising lack of scientific evidence for this novel use of socks, we undertook a trial on icy hillside footpaths in Dunedin. Pedestrians travelling in a downhill direction were randomly allocated to either put socks on over their shoes or to continue on their way as normal. Two-thirds of these pedestrians had previously fallen on ice. The sock-wearing group

found the footpath significantly less slippery, and displayed greater confidence, than the comparison group. While it may create some embarrassment for the image-conscious, this simple, cheap intervention has the potential to improve public health by reducing winter falls in the pedestrian population.

Infant and perinatal outcomes of triplet pregnancy in Auckland: better than expected?
Malcolm Battin, Michelle Wise, Anne DeZoete, Peter Stone

The triplet birth rate has increased since the 1970s but a triplet pregnancy has significant implications for the mother, the infant, and society as a whole. There has been a lack of good quality data on neurodevelopmental outcomes for triplets born prematurely. We report that surviving triplets born <1500g were normal in 66%, had mild abnormality in 17%, moderate abnormality in 15%, and severe abnormality in only 2%. Although triplets represent a significant burden, the outcome particularly in those <1500g at birth compares favourably with that reported.

Pacific Islands Families: Child and Parental Physical Activity and Body Size—design and methodology
Melody Oliver, Philip J Schluter, Janis Paterson, Gregory S Kolt, Grant M Schofield

This paper outlines a study to characterise the physical activity patterns of Pacific children and identify factors related to physical activity and sedentary behaviours in Pacific children, within the Pacific Islands Families study (a birth cohort study of Pacific infants born at Middlemore Hospital, South Auckland, in 2000). This study involved using accelerometers to gather an objective measure of physical activity in the children and their mothers when the children were aged 6 years. This is a unique opportunity to investigate objectively-determined physical activity patterns in young Pacific children and their mothers, and identify activity associates and determinants from cross-sectional and longitudinal data sources, and is the first study of its kind internationally.

Sudden unexpected infant death and bedsharing: referrals to the Wellington Coroner 1997–2006
Alistair Escott, Dawn E Elder, Jane M Zuccollo

This paper reviews 54 sudden and unexpected deaths that occurred in the first year of life, over the decade from 1997–2006, that were referred to the Wellington-based coronial paediatric pathology service and which for which there was no clear medical diagnosis found. Overall, 50% of infants had been placed to sleep in a non-recommended sleep position and bed sharing was associated with 53.7% of deaths. Sudden unexpected death in infancy in the Wellington region over this time period has been associated with unsafe sleep environments and sleep positions. Every effort should be made to ensure that information about safe infant sleep practices reaches the caregivers of those infants who are particularly at risk.

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Driveway accidents in New Zealand

Spencer W Beasley

The mortality rate from trauma to children in New Zealand may be relatively low compared with many developing nations, but when more appropriately compared with that of other OECD countries, New Zealand ranks the worst.[1]

Our ongoing record with driveway accidents represents a "blackspot" in New Zealand's attempts to create a safe environment for its children. It is to our shame that we have the highest reported rate of driveway accidents in the world.

It is now almost 7 years since this journal[2] published a report of 77 separate driveway accidents causing 6 deaths in a 4-year period in Auckland. Even then, the accompanying editorial[3] lamented that New Zealand lagged behind some of its closest neighbours in developing effective accident prevention programmes for children, and as a result of this, predicted that it might be a long time before measures would be introduced to reduce the toll.

Sadly, the article by Hsaio and colleagues[4] in this issue of the *NZMJ* confirms that prediction to be correct: it would appear that nothing much has changed apart from another 93 children injured and a further 9 fatalities up until December 2005 in the Auckland region alone.

Admittedly, this is a complex problem, but Hsaio and colleagues[4] have confirmed it is one for which a number of solutions are already evident. Initiatives that could be introduced that might be expected to reduce driveways fatalities in children are summarised in the following table.

Factor	Comment	Initiative required
Behaviour	Risks not appreciated by parents and public Preschool children have free access to driveways for play	Targeted education programme Greater publicity of incidents Better data on demographics Prevent children from playing in driveways
Driveway design	Many driveways traverse child play areas Paths adjacent to front doors	Review design of state housing Have garage at front of property Separate children's play areas from driveways (e.g. fences) Avoid driveways immediately adjacent to front door of house
Car design	Inability to see small children behind car when reversing	Short distance proximity sensors Reversing mirrors Rear cameras

Behavioural modification and increased community awareness of the risk may be assisted through better public education programmes. They might include parent education classes (commencing at the time of antenatal classes, as it is these people who will soon have young children), increased media publicity about these types of accident and their contributing factors, and improved driver education.

There seems little doubt that the design of certain suburbs is a major contributing factor, particularly where it is common for housing to have a long driveway that passes close to the house entrance and is used for play. Thus physical barriers between homes and driveways, or locating garages and carports closer to roadways and away from front doors, have merit. This might necessitate cooperation between developers of new housing and those responsible for reviewing council regulations.

In achieving this goal, legislators need to be cognisant that those at greatest risk tend to be from the lowest socioeconomic groups. These people are the least likely to be able to afford the structural changes to their houses and driveways required to separate children from them. Nor are they likely to own vehicles with proximity sensors and rear cameras that improve visibility during reversing.

We might encourage our Ministry of Health, as we did in 2002, to follow the example of the Victorians in Australia and develop a nationwide injury surveillance system. We need to have information on the extent to which this is a nationwide problem. Indeed, more data would make it easier to identify more precisely the risks, and better target intervention to areas where they will be most effective, particularly in an environment of scarce health dollars.

The importance of good data collection and being able to monitor the effects of any interventions should not be underestimated. Sometimes initiatives that are introduced with the best of intentions have done little to improve the safety of children, and occasionally have inadvertently increased their risk. For example, the requirement that domestic hot water should be above 60°C to reduce the risk of *Legionella* (which it probably does not, as domestic hot water is virtually never the source of infection) has increased the risk of scalds in children, as this journal has previously warned.[5]

In addition, there needs to be closer collaboration between accident prevention researches (and groups such as the Injury Prevention Research Centre of the University of Auckland and the Injury Prevention Research Unit of the University of Otago) with industry and legislators.

Surely we must now be at the point where we need to introduce genuine and serious steps to reduce this appalling carnage on our driveways.

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Immunisation in hospital: an opportunity repeatedly missed

Elizabeth Wilson

New Zealand struggles to achieve immunisation coverage rates sufficient to generate herd immunity. As a result, the population remains vulnerable to epidemics of measles and pertussis, and individuals susceptible to vaccine preventable diseases. A succession of Ministry of Health targets have failed to be met and ethnic disparities persist with lowest coverage rates among Māori.[1] Missed opportunities for immunisation in primary care have been identified as a major contributor to low immunisation rates[2] and for any one patient those opportunities may be multiple.[3]

In this issue of the *New Zealand Medical Journal*, Wrigley and Gilbert[4] present their findings of an audit at Rotorua Hospital of opportunistic immunisation of 3 to 24-month-old children in hospital. This was performed as a chart review so may under-record the times that immunisation plans were discussed, but not documented. However, the clear figure emerges that of 119 children known by ward staff to be incompletely immunised for age, only four were then immunised in hospital, a discussion was recorded in 15 and 5 were referred to their general practitioner on discharge. In addition, 40 of the under-immunised children had had at least one previous admission to the children's ward suggesting repeatedly missed opportunities.

So why is immunisation so neglected for hospital inpatients? There is undoubtedly a perception that immunisation belongs in the territory of primary care so perhaps immunisation in hospital constitutes "poaching". General practitioners (GPs) receive a small subsidy for giving vaccinations but this does not ensure timeliness of administration, a factor known to be important regarding the risk of pertussis in infancy.[5] There is also a reluctance to immunise sick children, but there are very few true contraindications to administration of vaccines to children with intercurrent illnesses, with or without fever.[6]

Junior hospital staff may feel less confident discussing immunisation than primary care staff, although even this latter group has been shown to harbour misconceptions regarding contraindications to immunisation.[7] A frequently heard objection to giving a vaccine is that there is no nurse on duty who has done a vaccinator course. This is not strictly a barrier as any registered nurse or doctor can give a prescribed vaccine. However, it is much better to have a few staff who do all the vaccinations as they will become familiar with the schedule, the age- appropriate vaccines, and their different packaging and delivery: it is no good arranging vaccination in hospital if the wrong vaccine is charted, dispensed, or a component left in the box.

But the greatest factor is simply that the issue is not addressed: an immunisation history is an essential component of every paediatric admission clerking yet the Rotorua study found no documentation in 16% of the 369 patient charts audited. The advent of the National Immunisation Register (NIR), rolled out from 2004, should put an end to all excuses about not having access to a patient's immunisation record. But currently the register is underutilised by hospitals : if either electronic or faxed

information were linked to every admitted patient's record opportunistic immunisation could more readily occur in hospital or be arranged at the GP's post discharge.

The authors of the Rotorua study correctly identify from the literature[8,9] actions that could improve delivery, but I believe this should be taken further. Each paediatric ward or department needs an immunisation champion, preferably a nurse, who takes responsibility for identifying incompletely immunised children and arranging the catch up vaccines in consultation with the medical staff. In addition, consideration should be given to what extra vaccines (beyond the routine schedule) should be offered : for example whilst conjugate pneumococcal vaccine has finally been introduced for infants there are still be many children with qualifying medical and surgical conditions[8] who should have received it.

Another example is the influenza vaccine which is vastly underutilised in children despite its being licensed down to six months of age and children carrying a high morbidity from this infection as well as being supreme, prolonged transmitters to others. Varicella vaccine, too expensive for many families to afford, could be given to many medically fragile children with frequent admission to hospital. It is also known that infants and children in tertiary care are at greater risk of being unimmunised that their healthy counterparts.[9] It takes active management of immunisation to ensure that premature infants, babies with congenital defects requiring prolonged hospital stay (who may never register with a GP) and those who may require solid organ transplant, not only receive routine immunisations on time but any recommended extra vaccines, possibly on an accelerated schedule.

There are thus three identifiable groups of infants and children who are a captive audience for immunisation when in hospital: the high users of Primary Care (but always "too sick" to immunise); the high users of hospital care who tend also to be the same disadvantaged groups that access primary care poorly or not at all; and the medically disadvantaged chronic and tertiary care patients.

The majority of under-immunisation in New Zealand does not arise from opposition to vaccination and those in greatest need of immunisation are missing out. If the gap between actual and desired coverage rates and ethnic disparities in coverage are to be reduced, hospital paediatric departments need to use the opportunity that the NIR now presents to ensure that documentation is accurate, and catch-up immunisation can either be initiated in hospital or at least made part of every discharge plan.

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Influenza A(H1N1)09: New Zealand's response to the pandemic threat

Lance C Jennings

In April 2009 a novel influenza A(H1N1) virus came to the world's attention when it caused outbreaks in humans in Mexico and USA. Within 2 weeks, New Zealand's public health authorities were being challenged. The return of a group of schoolchildren with symptoms of influenza to Auckland on April 25 from Mexico triggered the activation of New Zealand's Influenza Pandemic Action Plan (NZIPAP).[1]

On April 29, the World Health Organization (WHO) raised the pandemic threat to Phase 5 followed by New Zealand declaring it a notifiable and quarantinable disease on April 30. The WHO was initially reluctant to declare a pandemic, largely based on the perceived mildness of the disease. However, with the obvious widespread community spread in Southern Hemisphere countries entering their traditional influenza seasons, the WHO declared a Pandemic (Phase 6) on June 11.[2] New Zealand has responded to this threat with perhaps one of the country's largest public health responses ever attempted.

The perception that the pandemic being caused by the novel (H1N1)09 virus is trivial is of concern. Influenza can be a serious disease, and annually we are affected by seasonal influenza outbreaks and epidemics of varying severity, population burden in terms of absenteeism from school or work, and individual burden in terms of severe illness, hospitalisation, and death. On average, 300 New Zealanders die each year directly or indirectly as a result of influenza. The virus associated with the current pandemic is causing illnesses with classic influenza signs and symptoms of mild to moderate severity (including high fever, headache, malaise, and cough—often with nausea, vomiting, and diarrhoea).

Estimates of up to 50% of the population being infected by this virus over the coming months will undoubtedly be associated with increasing numbers of people (especially those with underlying medical conditions) with severe illness requiring hospitalisation and possibly dying from this virus. We should not become complacent about this novel A(H1N1)09 virus, because influenza A viruses have a track record of unpredictability, however at the same time we should not panic as the threat can be managed with strong Ministry of Health and Government leadership.

The virus

This novel virus was dubbed "swine influenza" by the media because of the virus' origins from known swine influenza A virus lineages. Several influenza A virus subtypes circulate in pigs (e.g. H1N1, H1N2, H3N1, H3N2) causing a highly contagious acute respiratory disease, but they rarely infect humans. However since 1998 a North American triple reassortant H1N1 swine virus has been circulating and associated with human infections.

Analysis of the newly emerged A(H1N1)09 virus has shown that 6 of the viruses 8 genomic segments were derived from the North American swine virus, with the 2 remaining segments being derived from Eurasian swine viruses.[3,4] Through these reassortments, this virus has gained the ability to spread efficiently between humans.

Characteristically influenza A viruses become genetically unstable when they move out of their natural host and continue to evolve. Ten clades of A(H5N1) 'avian' virus have evolved and are now circulating in domestic poultry since this viruses movement away from it's natural aquatic avian host in 1996. Historical data from the 1918 pandemic suggest that the A(H1N1) 'Spanish' virus caused a mild wave, followed several months later by a second pandemic wave associated with increased pathogenicity.

The question remains as to whether this A(H1N1)09 virus will return as successive waves of seasonal influenza as with the 1957 H2N2 and 1968 H3N2 pandemic viruses, or will it return with increased pathogenicity? (the sting in the "scorpion's" tail so to speak).

New Zealand's pandemic response

Containment strategies—New Zealand's pandemic planning has evolved since 1997 (when it was initially a response framework) to the operational Action Plan (NZIPAP) of today.[1,5,6] The phases of this plan are straightforward, with initial efforts focused on containment: "keeping it out" and "stamping it out".

Following the entry into New Zealand of the first confirmed cases on April 25, the response focus was on border management with the identification and follow-up of symptomatic international travellers and their immediate contacts. Controls at international airports—along with the use of isolation, quarantine, and oseltamivir (Tamiflu™) for treatment of laboratory confirmed cases and prophylaxis of their contacts—appeared to delay community transmission of this novel virus through May into June.

This situation may have reflected the virus's inherent epidemiological characteristics which we do not fully understand. Regardless, it bought valuable time to strengthen the public health services' frontline capacity, the diagnostic capacity in the countries' five virology laboratories, and other aspects of the primary, secondary health care, and other government department's responses.

Pivotal to the public health response was the laboratory identification of the novel (H1N1)09 virus. Molecular tests (RT-PCR) were (and remain) the most sensitive assay for the detection of this virus. Initial identification involved the exclusion of seasonal influenza A(H3N2) and (H1N1) subtypes, and confirmation by genetic sequencing, however by the second week of May New Zealand virus laboratories were able to specifically identify the (H1N1)09 virus and shorten the time for result availability to within 24 hours. Rapid influenza antigen detection methods, including the rapid antigen tests (RAT)[7] and direct fluorescent antibody (DFA) tests have been shown to be less sensitive and of restricted value.

Both border management and containment strategies are not widely supported by the WHO, except containment at the source of the emergence of a novel virus.[8] New Zealand is well placed as it is an island nation and has a well developed pandemic

action plan and public health infrastructure. For these reasons, the early distribution of public health information with clear instructions on what travellers should do if they developed influenza symptoms within 7 days of travel on all flights into New Zealand, and the placing of clearly identifiable public health staff at all international airports, were achievable and actively carried out.

The cases identified were largely individuals developing symptoms who contacted the public health service or their general practitioner, triggering the vigorous public health follow-up, respiratory sample collection, laboratory confirmatory testing, and subsequent contact tracing of confirmed cases. This approach was apparently successful for 6 weeks. Could we have done better?

It is interesting to review the maritime quarantine strategies carried out in the Pacific region during the 1918/19 pandemic. The Western Samoa maritime quarantine was broken in 1918 by the *SS Tahune*, from Auckland resulting in the introduction of virus and a 22% mortality, while neighbouring American Samoa maintained full quarantine which kept the virus out until 1921. No deaths were recorded in American Samoa.[9] This is clearly supportive of our border management approach.

In 2008 an Otago University Pandemic Influenza Research Group undertook a very extensive research project funded by the US CDC to assess screening methods for influenza in arriving airline passengers. A pilot study by Duncan and colleagues,[10] and subsequent main study outcomes which included an initial screening of more than 18,000 passengers arriving at Christchurch International Airport from June–September 2008 (not yet published), clearly are in support of New Zealand's border management. Results indicate that it is at least feasible to also detect people with influenza symptoms at our international borders.

Management strategies—The rapid spread of A(H1N1)09 in Victoria, Australia during the last week of May and continuing global spread placed increasing pressure on the countries 'keep it out' strategy. By the week of June 16 it become clear that community spread was occurring in Auckland, Wellington and Christchurch, and containment efforts were stressing both the public health service and virology services. Movement to the "management" phase of New Zealand's response was not announced until June 19, however.

Although swine flu clinics were already in action in more severely affected communities of Christchurch and Wellington, this allowed the establishment of community-based assessment centres (CBACs) and the response to focus on individuals more severely affected by influenza and needing antiviral treatment or hospitalisation.

Wellington, closely followed by Christchurch, were the first communities in New Zealand to experience an escalation in community transmission. A possible reason for this may relate to the specific communities initially affected. In Christchurch, the (H1N1)09 virus was introduced into the Samoan community on about June 3 by a member of that community returning from Melbourne with the virus. The subsequent amplification of infection amongst this closely linked community probably then resulted in the seeding of schools, work, and other communities in Christchurch, followed by exponential spread through the community.

In Wellington, communities in Porirua and Wainuiomata have been severely affected, clearly indicating that this virus is amplified in socioeconomic communities were crowding may exist. In Canada, outbreaks of (H1N1)09 amongst indigenous Inuit Indians were associated with severe disease and hospitalisation, providing a clear warning that certain New Zealand Pacific Island and Māori populations may also be at greater risk from this virus.

Pharmaceutical preparedness

Pharmaceutical interventions, which include antivirals and vaccines, clearly separate our ability to respond to the current pandemic as compared to influenza pandemics in the past, particularly the 1918–19 pandemic.

New Zealand's pandemic preparedness planning has ensured that an antiviral (oseltamivir) stockpile, sufficient treatment doses for 31% of the population has been put in place. Oseltamivir from the stockpile has been used extensively during the containment phase, and now for the treatment of more serve illnesses during the management phase. Individuals travelling to affected countries have also been able to access oseltamivir by prescription, placing pressure on the private market supplies.

Pharmacy distribution of oseltamivir to individuals with influenza symptoms through pharmacist prescribing (a novel strategy pioneered with seasonal influenza over the past two winters) has been reviewed.[11] It has been proposed that Pharmacists should be able to make a clinical evaluation by telephone, rather than the currently required face-to-face clinical evaluation. This strategy would complements the commonsense advice to stay at home if you are sick.

Because of international concerns about the development of resistance in the (H1N1)09 virus to oseltamivir, and the co-circulation of seasonal (H1N1) virus known to be resistant to oseltamivir, the national stockpile has been reviewed and now contains zanamivir (Relenza™). The development of widespread resistance of the seasonal influenza A(H1N1) virus to oseltamivir (through the H275Y mutation) is not believed to be directly linked to drug usage, although drug induced resistance can occur. To date, drug induced resistance has resulted in viruses which are unable to spread and are of no clinical relevance. It is prudent though to maintain virological surveillance and flexibility in our pharmaceutical response strategies, especially as oseltamivir resistance in an A(H1N1)09 viral isolate has now been reported.[12]

Our best protection against influenza is receiving an influenza vaccine; however, pandemic vaccines with current technologies cannot be produced until the novel pandemic virus has emerged, and are unlikely to be commercially available for 4 to 6 months and after the first wave of a pandemic.[13] As part of the NZIPAP, a 100,000-dose stockpile of influenza A(H5N1) whole virus cell-culture derived pre-pandemic vaccine, and a forward purchasing agreement with CSL for the supply of an egg-derived split virus pandemic vaccine, are in place.

Vaccine manufacturers are expected to have influenza A(H1N1)09 vaccines available from August 2009.Their availability following the likely peak of our New Zealand pandemic should not delay any decision to acquire such a vaccine however it will inevitably delay any decision to utilise such a vaccine. Indeed, this may be to our

advantage, it will allow more time for human trial data to become available, and a more complete safety and efficacy assessment to be made by Medsafe.

Looking to the future

Of major concern is our inability to predict the evolution of influenza A viruses, especially now that there is an additional novel influenza A virus capable of causing disease in humans which is spreading globally.

The simple concept of influenza A virus evolution through point mutations (as with antigenic drift) or through gene reassortment (antigenic shift) may be more complex and also involve other genetic recombination events.[14]

The circulation among humans globally of this novel A(H1N1)09 virus along with seasonal H1N1 and H3N2 viruses—and in parallel the highly pathogenic A(H5N1) and A(H9N1) avian viruses in domestic poultry (both of which are capable of causing human infections associated with high mortality) and the swine influenza A lineages—is possibly unprecedented

We must not become complacent about influenza and continue pandemic preparedness activities at all levels in our community. The education initiatives on basic respiratory hygiene among school children, such as the 'Sneeze Safe' programme (www.sneezesafe.co.nz) and handwashing and social distancing (staying at home when you have symptoms of influenza) will have longer term benefits to the health of New Zealanders.

Similarly, initiatives by the National Influenza Strategy Group (NISG) have seen an unprecedented increased uptake of seasonal influenza vaccine, which in the face of the co-circulation of seasonal H1N1 and H3N2 viruses, will lessen the likelihood of individuals suffering from multiple influenza A virus infections.

New Zealand is also well placed to contribute to the global research efforts on influenza to understand these viruses, their evolution and the disease that they cause The call for a research agenda has been made and pandemic research priorities identified,[15] however little progress has been made toward achieving this.

Early on in this pandemic, New Zealand had the third largest number of cases globally, however our focus (and rightly so) was on mounting a public health response. Had a research capacity been identified in advance, optimal use of the collected case history, epidemiological, surveillance and virological data could have been made more widely available and especially to the international community.

A review of our national efforts to keep out, contain and manage this novel (H1N1)09 pandemic will be essential as our experience will not only benefit the further evolution of our pandemic action plan, but also the global community, especially the Northern hemisphere countries as they enter their winter influenza seasons.

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Paediatric driveway run-over injuries: time to redesign?

Kai Hsun Hsiao, Clinton Newbury, Nita Bartlett, Rangi Dansey, Philip Morreau, James Hamill

Abstract

Aims To investigate the demographic, accident, and environmental characteristics associated with driveway run-over injuries in order to identify potentially modifiable factors and prevention strategies.

Methods Retrospective review of all children less than 15 years old who were hospitalised or killed due to a driveway run-over injury in the Auckland region of New Zealand over the 50-month period, November 2001 to December 2005. Data was collected on the demographics, accident and environmental characteristics, and parental awareness. Data was obtained from clinical records and telephone interviews with parents.

Results A total of 93 cases were identified, including 9 fatalities. The median age was 2 years with 73% under 5 years old. Children of Pacific Island and Māori ethnicity comprised 43% and 25% of cases respectively. Injuries occurred predominately on the child's home driveway (80% of cases). In 64% the driveway was the usual play area for the child. Only 13% of driveways were fenced. 51% were long driveways extending through the section, and 51% were shared with other properties. 51% of properties were rented and of these 57% were government houses.

Conclusion The absence of physical separation between driveways and children's play and living areas may predispose to driveway injuries. Further research is needed to investigate the ideal way to implement such separation in current properties and future property developments.

A significant and often overlooked proportion of child pedestrian injuries occur on domestic driveways.[1–3] These injuries typically involve young children and most commonly occur in the child's own home driveway.[1] Adding to the tragedy is the fact that the driver of the vehicle is most often a parent or close relative.[1]

Driveway injuries appear to be associated with higher mortality and less favourable outcomes than other types of child pedestrian trauma.[4,5] In fatal cases, death usually occurs at the scene of the accident.[4]

Given the severity of injuries and high mortality rate, primary prevention would be desirable. Various prevention strategies have been suggested including fencing, proximity sensors, visual aid devices and public education.[1,4,6–11]

The purpose of the present study is to investigate the demographic, accident and environmental characteristics associated with driveway injuries in order to identify potentially modifiable factors and prevention strategies that could lead to a safer driveway environment for children.

Materials and Methods

A retrospective review was undertaken of all children less than 15 years old who were hospitalised or killed due to a driveway injury in the Auckland region during the 50-month period from November 2001 to December 2005.

Driveway injury was defined as an injury caused by contact with a non-stationary motor vehicle occurring on a driveway. A driveway was defined as any passageway providing vehicle access between the road and the adjoining property. This definition of 'driveway' excludes injuries occurring in other off-road locations such as carparks, parks, reserves and farms. Also excluded were cases transferred from outside the Auckland region and cases not admitted into hospital, that is, cases seen only in the Emergency Department then discharged.

Cases were identified from three sources: Starship Children's Hospital Trauma Registry, Middlemore Hospital Trauma Registry and the Auckland City Coroner's database. Starship Children's Hospital is the tertiary referral hospital and the paediatric trauma centre for the region. Middlemore Hospital admits paediatric orthopaedic and burns cases. These two units are responsible for all paediatric trauma admissions within the greater Auckland region.

Data was collected on the demographics, accident and environmental characteristics, and parental awareness. Data was obtained from clinical records and telephone interviews with parents. Parents/caregivers of the children in the identified cases were approached with an initial introductory letter and after obtaining verbal consent, a structured telephone interview was conducted. In selected cases where consent was granted, injury sites were visited by the primary investigator to clarify the property characteristics and driveway layout. Population data for the Auckland region was obtained from Statistics New Zealand.[12]

Statistical analysis was performed using the Pearson's Chi-square test or Fisher's exact test for categorical variables and the Mann-Whitney U test for continuous variables.

The study received ethical approval from the Auckland Regional Ethics Committee.

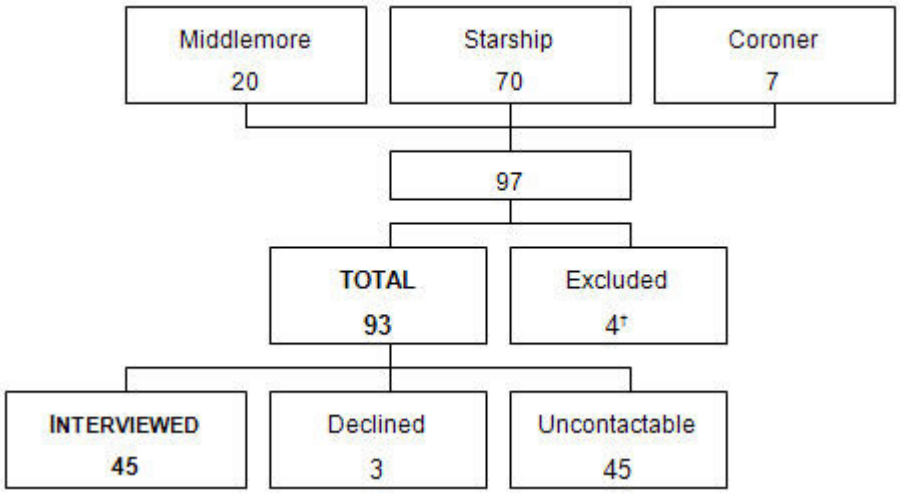
Results

A total of 93 children were injured or killed over the 50-month period (Figure 1). Fifty-eight children initially presented to Middlemore Hospital Emergency Department, but of these, 37 were transferred to Starship Hospital for admission and one fatal case went to the coroner. Of the 93 cases, 7 were fatal. This equates to a mortality rate of 0.63/100 000 children per year, and an injury rate of 8.4.

Demographics—The 0–4 years age group were over-represented, comprising 73% of cases versus 33% of the paediatric population. The Pacific Island and Māori ethnic groups were over-represented: Pacific Islanders represented 43% of driveway run-over cases, significantly higher than their Auckland population of 14%, and Māori represented 25% of cases compared to 10% of the population.

Injury location—The majority of injuries (56%) occurred in South Auckland (which comprises 39% of the paediatric population in the Auckland region).[13] The injury occurred at the child's own home in 80% (n=74) of cases.

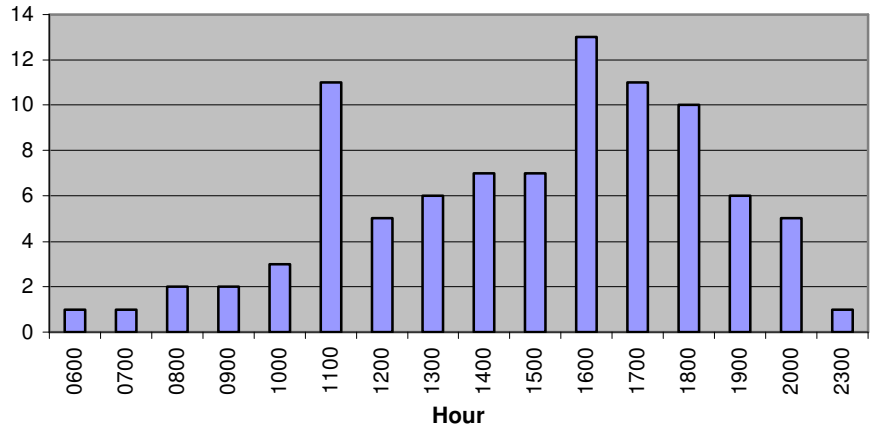
Figure 1. Patient numbers



Middlemore: admissions to Middlemore Hospital; **Starship:** admissions to Starship Children's Hospital; **Coroner:** fatal cases; † Injury occurred outside the Auckland region.

Time: Accidents tended to occur in the afternoon, especially between 4pm and 7pm, 37% (n=34) (Figure 2). There was also a second peak around 11am. 43% (n=40) occurred in the summer months, correlating with better weather and longer daylight hours, with peak frequency in December (n=19).

Figure 2. Number of accidents by hour of day†



† Time of the accident could not be established for two of the cases.

Driver and vehicle characteristics (**Table 1**)**—**In about two-thirds of cases, the driver was related to the child, most commonly the parent, 36% (n=34). The type of

vehicle most frequently involved was the car, 65% (n=60). However, vans were over-represented in these accidents.

Table 1. Vehicle and driver characteristics (N=93)

Variables	n	%	LTSA† data (%)
Vehicle type			
Car	60	65	77.2
Van	18	19	5.8
Four wheel drive/SUV	9	10	10.1
Light truck/Ute	4	4	6.9
Unknown	2	2	–
Driver			
Father	19	20	–
Mother	15	16	–
Neighbour	17	18	–
Extended family	24	26	–
Friend	6	6	–
Commercial	1	1	–
None	3	3	–
Other	4	4	–
Unknown	4	4	–

† Relative proportions of each vehicle type registered to the Land Transport Safety Authority (LTSA) of New Zealand in the Auckland region in 2005.

Interviewed subgroup—Of the 93 cases identified, 45 (48%) were able to be contacted and gave consent for interview (Figure 1). The characteristics of the interviewed subgroup did not differ significantly from total study population (Table 2). The remaining results presented below pertain to the interviewed subgroup (N=45).

Home ownership—The properties where injuries occurred were predominantly rental houses (51%), of which 57% were owned by the government housing agency, Housing Corporation New Zealand. Rental accommodation comprises 36% of houses in the Auckland region.[12]

Table 2. Characteristics of the total study population compared to the interviewed subgroup

Age and gender	Total (N=93)		Interviewed (N=45)		P value
Age in years, median (LQ, UQ)	2 (1, 5)		2 (1,3)		0.7
Gender (female:male)	42:51		20:25		0.9
Ethnicity	**n**	**%**	**n**	**%**	**P value**
Māori	23	25	7	16	0.3
Pacific Island	40	43	22	49	0.6
European	23	25	11	24	1.0
Asian	5	5	4	8	0.5
Other	2	2	1	2	1.0
Injury location	**n**	**%**	**n**	**%**	**P value**
North Auckland	11	12	9	20	0.2
West Auckland	14	15	7	16	1.0
Central Auckland	12	13	6	13	1.0
East Auckland	4	4	1	2	1.0
South Auckland	52	56	22	49	0.5

Age (Mann-Whitney U test); Gender (Pearson Chi-squared test); Ethnicity (Fisher's exact test, two-tailed); Injury location (Fisher's exact test, two-tailed); LQ: lower quartile; UQ: upper quartile.

Scene characteristics (**Table 3**)**:** Shared driveways (51%) and driveways which extended through the length of the property (51%) predominated. A typical driveway led up from the road past the front lawn and side of the house to the garage/carport in the rear section, and was readily accessible from the front lawn, back lawn and house. Only a small minority (13%) of driveways were fenced or physically separated in any other way from the house and lawn.

Table 3. Driveway and property characteristics (N=45)

Characteristic	n	%
Rental property	23	51
Government-owned rental property	13	29
Shared driveway	23	51
Driveway extending through section	23	51
Driveway with blind corner	2	4
Physical separation from house	6	13
Unfenced	39	87
Usual play area of child	29	64
No other play area on property	9	20

Supervision—In nine cases (20%), the driver actively checked that the child was in a safe location and that the driveway was clear prior to moving the vehicle. In these cases the child was able to easily gain access to the driveway and dart out into the path of the moving vehicle: The drivers often reported that the child had suddenly darted out into the path of their vehicle from inside the house or from a location out of the driver's view such as from behind another parked vehicle.

Discussion

Strategies in preventing driveway run-over injuries are numerous, but largely fall into three groups: Modifying behaviour (driver and parental education), modifying vehicles and modifying environment.

Education and public awareness campaigns, with messages promoting awareness of driveway safety, parental supervision and driver care, have been repeatedly suggested and have constituted the major thrust of efforts in prevention.[4,6,10,14,15] Further efforts in this approach may yet have benefits, especially awareness campaigns targeted at the high-risk groups, such as parents of preschool children, Māori and Pacific Islanders, South Auckland parents and lower socioeconomic groups. However, education alone has major limitations: Education requires significant resources and sustained efforts to be effective, and the benefits are often short-term. And even with the best parental supervision and driver care, driveway accidents can still occur, as demonstrated by a few of the cases in our study.

Strategies in the area of vehicular modifications have largely focused on improving the rearward visibility of vehicles. The Motor Accidents Authority (MAA) of New South Wales in Australia has conducted extensive research into the effectiveness of various visual aids and technologies, such as specialized mirrors, proximity sensors and cameras. The MAA reported that any significant improvement to rearward visibility would require the combination of a rear-mounted video camera and short-range proximity sensor.[15] Such a combination system is yet to be developed commercially and requires further refinement. Even with currently available technologies, the greatest limitation is the accessibility and affordability in the current markets, particularly for lower socioeconomic groups.

We believe that a more definitive and feasible solution in addressing driveway run-over injuries lies in physical measures and modifications that improve the safety of the driveway environment. The driveways on which run-over injuries occur are characteristically shared, extend through the property and function as a child play area. These factors maximise exposure of children to vehicles.

The absence of physical separation between driveways and children's living areas is associated with a threefold increase in the risk of driveway injuries.[9] Physical separation can be achieved through various means, including fencing off the driveway, creating a physically separate outdoor play area and, for future developments, changing the design or configuration of driveways.

Fencing is perhaps the most direct and basic form of physical separation and has been frequently recommended.[1,6,7,9,10] Advantages include the relatively low cost and flexibility of design, particularly for existing homes and already developed properties where the options for change are more restricted. However fencing is not always practical and, in some instances, may be ineffective.

We believe that it is important to promote the concept of physical separation in general: "Kids and cars don't mix". This concept allows the flexibility to decide the most preferable means for each property to achieve physical separation.

Who is responsible for ensuring safe driveway environment? Parents, caregivers, landlords, developers and council planners could all contribute. Driveway safety

should be incorporated into the planning and design of future residential developments. Placing the garage close to the front of a property for example could limit the driveway's accessibility to children, decrease the driveway's usefulness as a play area, and maximise use of the land area for living purposes rather than for vehicles.

The present study is limited by its retrospective nature, although it is based on two prospectively collected trauma registries and a Coroner's registry. It is an observational study of driveway injuries and the residences at which they occurred but with no control group. It cannot be confidently concluded from the presented data that driveway layout is independently associated with risk of injury.

Further research should include a matched control group for comparison. Investigation into the design aspects of driveways will be beneficial, particularly questions addressing the ideal way to secure existing driveways and the ideal layout for off-road parking for new residences.

Competing interests: None known.

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Opportunistic immunisation of paediatric inpatients at Rotorua Hospital: audit and discussion

Rowena Gilbert, Katharine Wrigley

Abstract

Aim To audit current practice around opportunistic immunisation in a New Zealand hospital and make recommendations for improvement.

Methods We reviewed inpatient notes for 369 patients aged 3–23 months admitted over a 6-month period in 2007. Data was obtained regarding children's immunisation status, documentation of this and action taken in response to the under-immunised child. Literature review and discussion with local clinicians were used to identify recommendations for future practice.

Results 84% of patients had their immunisation status documented on admission; only 60% of these were up-to-date with immunisations. Official immunisation records were rarely available. In 79% of patients who were behind with immunisation, no follow-up action was recorded, and only 4% of under-immunised children received catch-up immunisation on the unit.

Conclusions Current practice around opportunistic immunisation is poor. A number of measures could be expected to improve this; these include establishing routine systems for obtaining immunisation records, a visual reminder system for immunisation and training more staff in immunisation.

New Zealand's low immunisation coverage has caused concern among health professionals and planners.[1] Nationally, only 76% of children are up to date with immunisations, with even lower rates among Māori and Pacific children, and low socioeconomic groups.[2] Lakes DHB, served by Rotorua Hospital, has the lowest immunisation rate in the country; 63% of two year olds in the area are up-to-date.[3]

Missed opportunities are a major factor in under-immunisation, and opportunistic immunisation is key to improving coverage.[4-6] Hospital admission provides a valuable opportunity to review children's immunisation status and provide catch-up immunisation.[7,8] Documentation of immunisation status and opportunistic immunisation of hospital inpatients were adopted as Clinical Indicators by Rotorua Children's Unit in 2007, with the aim of benchmarking performance and driving improvements in practice.

This audit looks at the immunisation status of paediatric admissions to Rotorua Hospital over a 6-month period. Three issues are addressed; immunisation status and factors affecting this, documentation of immunisation, and action taken in response to the under-immunised child. We then discuss potential barriers to catch-up immunisation within our service, and make recommendations for service improvement.

Methods

In-patient notes were sought for all children aged 3 to 23 months who were admitted to the hospital under paediatric care between 1 May 2007 and 31 October 2007. Demographic information was recorded, as well as immunisation status from the paediatric clerking. For some children, official Ministry of Health immunization records had been obtained and filed in the notes during admission. These were used to confirm the accuracy of information documented in the admission clerking.

It is possible that some parents brought their Well Child (Tamariki Ora) Health Book to hospital during admission. While this may have been an additional source for determining a child's immunisation status we were unable to determine this from the inpatient notes, and felt that contacting parents to obtain this data retrospectively was beyond the scope of this audit**.**

Where children had not received all of their age-appropriate immunisations, the notes were reviewed for any explanation given for this, and to identify whether any action had been taken, for example advice to see GP for immunisation, discussion about immunisation or catch up immunisation on the ward.

The notes were reviewed by four members of the paediatric team; two SHOs, a senior nurse and an experienced care assistant.

Audit questions

- National Health Index number (NHI); this is a unique health identification code given to each child at birth in New Zealand.
- Date of birth
- Age (at admission)
- Sex
- Ethnicity
- Month of admission
- Immunisation status from clerking (up to date, behind, or not documented)
- Immunisation status from Ministry of Health data (if included in notes)
- Reasons for non immunisation (if documented).
- Action taken (catch-up done on ward, catch-up offered but declined, referred to GP for catch-up, discussed immunisation)
- NZDep2001 deprivation score of child's address
- Number of previous admissions (excluding Special Care Baby Unit admissions)

Audit standards

- All children presenting to paediatric care should have immunisation status documented
- Where appropriate, catch-up immunisation should be offered

Results

388 children aged 3 months to 2 years were admitted under paediatric care between 1st May and 31st October 2007. Of these, 369 were included in our audit. Reasons for exclusion were the unavailability of notes, children not clerked by paediatrics (boarder children accompanying siblings; children admitted for routine investigations) or children too old for the study (24 months or older on admission).

Demographic information—From the audit sample of 369 patients ;

- The majority of patients were Māori (66%)
- A majority (58%) of the admissions were male
- 61% of patients lived in areas with a deprivation score of 9 or 10, thus indicating low socioeconomic status.

Immunisation status—Immunisation rates among children admitted by Rotorua Hospital's Paediatric Department were low, though at a level similar to community immunisation rates within the region.[3] Only 60% of children who had immunisation status documented were up to date.

Māori children were less likely to be immunised, but, in contrast with community statistics,[3] immunisation status was not significantly affected by socioeconomic status.

Documentation—Documentation of immunisation status was missed in 16% of admission clerkings. Furthermore, Ministry of Health data was only available for 43 patients, although this improved in October when the ward began to routinely obtain faxed reports from the Ministry of Health. Twelve (28%) of the Ministry records contradicted parental reporting of immunisation status.

Reasons for not immunising—Of 119 children who were behind with immunisation, reasons were recorded in 43 (36%). The most common reason for missing immunisations was illness at the time a vaccination was due; this was cited in 21 cases. We were unable to determine the type of illness preventing immunisation. Parental choice or concern about vaccination safety (11 children) and time constraints (6) were the other main reasons.

Catch-up immunisation would have been inappropriate in five cases; two children were palliative care patients and three had contraindications to vaccines.

Action on immunisation—In 90 patients, 79% of those in whom catch-up vaccination was indicated, no action was documented. Only 4 children were given catch up immunisations on the ward. A discussion on immunisation was recorded in 15 cases, and 5 were referred to their GP.

No-one who was offered the opportunity for catch-up immunisations declined.

40 of the under-immunised children had at least one previous admission to the children's ward, suggesting previous missed opportunities to vaccinate.

Discussion

This audit confirms a low rate of immunisation in children admitted to Rotorua Hospital, and demonstrates a high level of missed opportunity in relation to catch-up immunisation to the ward. While we believe this is the first audit of opportunistic immunisation in New Zealand, it is likely that similar problems exist in other district health boards. We hope that this audit and discussion will help other district health boards to reflect on and improve their practice.

16% of children presenting to the children's unit did not have their immunisation status documented on admission, despite this being a key question in paediatric history taking. Furthermore, verification of immunisation status was rarely possible, since Ministry of Health data was only available for 43 patients. Parental recall of immunisation status is often inaccurate,[4] and official health records are essential if catch-up immunisation is to take place.[7-9]

It is encouraging that the availability of this data improved towards the end of the audit period, when the paediatric ward clerk began routinely obtaining and filing Ministry of Health Records.

Perhaps most concerning was the lack of action when children were found to be behind with immunisation. Despite catch-up immunisation being recommended by many bodies, and being adopted as a clinical indicator for the children's unit, only 4% of under-immunised children received immunisations in hospital.

Availability of staff trained in immunisation was a major barrier to catch-up immunisation. While the Children's Unit is trying to address this, it is still common for there to be no immunisation trained nurse available on the day of discharge.

Lack of a pre-ordered vaccine supply was another potential obstacle to ward-based immunisation. While vaccines were always available from hospital pharmacy, they needed a doctor's prescription before they could be obtained on the ward, and could not be ordered in advance.

However, since only 19% of patients have any action or discussion documented, it seems likely that the patient's immunisation status is often over-looked. Immunisation status is not routinely referred to during discharge planning, and in our experience vital information often remains unread in a patient's charts.

Some of the barriers to catch-up immunisation may relate to a lack of knowledge and education among health professionals. In his study of opportunistic immunisation of hospitalised children in Leeds (UK), Conway noted a lack of interest in immunisation among health professionals.[8] There may be a need for increased education among junior doctors and nurses about the importance of immunisation.

It is also possible that junior doctors do not feel confident in discussing immunisation with parents. Indeed, a survey of New Zealand GP's demonstrated significant knowledge gaps in relation to immunisation,[1] while research in Rotorua found that a significant proportion of health professionals lack confidence around immunisation safety.[10] It is likely that hospital healthcare providers have similar educational needs, which must be addressed if practice is to improve.

Interestingly, the most common reason for incomplete immunisation was illness at the time the immunisations were due; only 11 parents cited 'choice' or 'concern' as an explanation. Furthermore, none of the families who were offered catch-up immunisation refused. This correlates well with New Zealand data suggesting that only 5-6% of families choose not to immunise their children.[11]

As doctors, we may overestimate parental concern about immunisation; a survey of New Zealand GPs found that parental concern was believed to be the most significant barrier to improving immunisation rates.[12] An appreciation of parental willingness to immunise should encourage health professionals to respond more confidently to missed immunisations, with less fear of causing conflict with parents.

A number of steps have now been taken on the paediatric unit to try to improve practice, beginning with the prioritisation of immunisation as a paediatric clinical indicator and the decision to audit this practice. Most importantly, the ward has now established routine systems for establishing children's immunisation status from the Ministry of Health. It has also increased the availability of vaccine information for

parents and professional, begun training more nurses in immunisation, created systems for vaccine ordering and cold chain storage, and made arrangements for continuous monitoring of practice.

Recommendations

Systems for immunisation of hospitalised children have been developed by Conway[8] in Leeds, UK, and by Bell and colleagues[7] in Philadelphia, USA. Both authors highlight key aspects of a ward-based immunisation programme;

- A routine system for obtaining accurate immunisation data
- A routine system for providing catch-up immunisation, including visual reminders of a child's immunisation status and a plan to immunize on day of discharge
- Educating, motivating and supporting staff
- Monitoring and evaluating progress.

Discussion with Rotorua paediatricians has identified two ongoing barriers to catch-up immunisation. These relate to systems for immunisation and staff training.

The unit lacks a routine system for providing catch-up immunisation; to establish this will require a commitment from all staff to provide immunisation on day of discharge, education and encouragement from senior ward medical and nursing staff, and a system to help alert staff to the under-immunised child. As a visual reminder, we would recommend a coloured stamp or laminate to highlight the child's status in the front of the in-patient record and drug chart.

Secondly, unavailability of staff trained in immunisation is a major barrier to catch-up immunisation. We recommend that the children's unit broadens programmes to train nurses in immunisation, and considers including junior doctors in such programmes. As an interim measure, the ward now displays a list of immunisation trained nurses at the nurses station.

Leadership and coordination is an essential aspect of improving immunisation practice.[7,8,13] We recommend the nomination of a person with responsibility for immunisation, whose role would include education, support and monitoring of progress. The district health board may want to consider the introduction of an Immunisation Coordinator to help develop and maintain a strong programme.

Ongoing evaluation and feedback to staff about the successes and limitations of an in-patient immunisation programme is vital.[12] The Children's Unit has already made arrangements to repeat this audit and bench-mark our performance against other District Health Boards in New Zealand; it is hoped that analysis of this data will demonstrate a change in practice and promote continuous improvement.

Competing interests: None known.

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Preventing winter falls: a randomised controlled trial of a novel intervention

Lianne Parkin, Sheila M Williams, Patricia Priest

Abstract

Aim To investigate the hypothesis that wearing socks over shoes improves traction on icy footpaths.

Methods Randomised controlled trial involving 30 pedestrians (median age 21 years, range 18–70) travelling in a downhill direction on icy public footpaths at two sites in Dunedin, New Zealand. Intervention: different coloured socks applied over normal footwear or usual practice (unadulterated footwear). Primary outcome: difference in mean self-reported slipperiness on a 5-point scale. Secondary outcomes: falls, observer-rated slipperiness, observer-rated confidence, time to descend study slope.

Results Two-thirds of participants (65%) had previously fallen on ice. Wearing socks over normal footwear was associated with a statistically significant improvement in traction; the difference in mean self-reported slipperiness scores between the control (n=15) and intervention (n=14) groups was 1.3 (95%CI: 0.4–2.3). Agreement between self-rated and observer-rated slipperiness was high (r=0.70). A higher proportion of the intervention group (71% vs 53%) appeared confident. One member of the control group fell. There was no evidence of risk compensation in the intervention group (difference in mean descent times 1.9 seconds, 95%CI: -6.1–10.0). The only adverse events were short periods of indignity for some members of the intervention group.

Conclusion Wearing socks over shoes appears to be an effective and inexpensive method to reduce the likelihood of slipping on icy footpaths.

There are anecdotal reports that pedestrians who wear socks over top of their footwear are less likely to slip and fall in icy conditions. Advocates of this practice include our local council (in Dunedin) which advises residents who prefer to walk (rather than drive) in icy conditions to "put a pair of old socks over your shoes to increase grip".[1]

Methods to enhance footwear traction have particular relevance for our population. While the university, hospital, and business areas of Dunedin are located on relatively flat land, most residential areas are clustered on the surrounding hills. In winter, damp weather followed by freezing conditions can transform a quick journey to work into a lengthy and perilous expedition.[2]

Searches of Medline and the Cochrane Library (using the terms "ice", "falls", "prevention", and "socks") failed to locate any evaluations of unorthodox sock wearing. To remedy this surprising gap in falls prevention research, we decided to undertake a randomised controlled trial to investigate the hypothesis that wearing socks over shoes improves traction on icy footpaths.

Methods

Participants and settings—We initially considered recruiting volunteers to walk down a short suburban street (Baldwin Street) which, according to the Guinness Book of Records, is the steepest street in the world. However this proved impractical for two reasons. First, requiring volunteers to traverse a 1 in 2.86 gradient in icy conditions seemed ethically and legally unwise. Second, in order to travel downhill in this cul-de-sac, the researchers and volunteers would need to scale the incline. This was not an attractive prospect.

We therefore decided to adopt a pragmatic approach and intercept passing pedestrians at two other sites (Figure 1). These particular sites were chosen because many university employees, students, and members of the public used these routes each morning. Moreover, painful experience meant that all of us were acquainted with their slippery nature in icy conditions.

Figure 1. Study sites

To be eligible for inclusion in the trial, passing pedestrians simply needed to be travelling in a downhill direction. It was decided *a priori* that persons already wearing socks over their shoes would not be eligible.

At both sites, the researchers were divided into two groups: recruiters and outcome assessors. These groups were stationed at the uphill and downhill ends, respectively, of the study slopes. Recruiters asked pedestrians whether they were willing to take part in a study to assess the anti-slip performance of different types of footwear and different types of socks worn over the top of footwear.

Participants gave verbal consent and completed a questionnaire which collected demographic data, as well as information about experience with icy conditions, previous falls on ice, injuries, familiarity with the route, and type of footwear (also photographed). Once this information had been recorded, recruiters opened a sealed envelope to ascertain the group to which the participant was allocated.

Intervention—Participants in the intervention group were provided with a pair of socks to put on over their footwear (Figure 2). The acrylic-blend work socks (size 11–14) were purchased in bulk from a budget department store using independent research funds.

Individuals in the intervention (socks) and control (no socks) groups were directed to walk downhill as normally as possible (given the conditions). In light of the observed behaviour of pedestrians (often young men) at these sites on previous mornings, participants were asked to refrain from deliberately skidding or sliding.

Figure 2. Correctly fitted socks

Outcomes—On reaching the outcome assessors, participants were asked to complete an assessment form. Self-rated slipperiness (the primary outcome) was measured using a validated slipperiness scale.[3] Participants were asked to indicate on the 5-point scale how slippery they found their descent: "not slippery", "somewhat slippery", "slippery", "very slippery", or "extremely slippery". Previous research has shown a strong, statistically significant correlation between subjective reports of slipperiness and objective measures of friction (r=0.90).[4] Participants were also asked to report any falls and to make any other comments they wished.

To validate self-reported slipperiness, outcome assessors independently recorded (using the 5-point scale) how slippery participants appeared to have found the footpath. Assessors were also asked to document any falls and to comment on the demeanour of the participants during their descent (for example, "walked confidently", "clung to fences or parked cars", "crawled"). Finally, to detect any risk compensation in the intervention group, the assessors used stop-watches (standard issue obtained from one electronics shop) to time the descent of each participant. Landmarks such as water valve covers and traffic signs were used as starting and stopping points.

Sample size—Sample size calculations were undertaken using PS software.[5] To detect a difference of 1.5 in mean self-rated slipperiness, with a 1:1 ratio of intervention to control participants, using an alpha of 0.05, 90% power, and a within group standard deviation of 1.1,[3] we calculated that 12 people in each arm of the trial would be required.

Randomisation—Microsoft Excel software was used to generate the random allocation sequence which was stratified by site. Sheets of paper noting the allocation status (socks / no socks) were placed in numbered opaque envelopes which were then sealed. Recruiters were instructed to use these envelopes in numerical sequence after they had administered the baseline questionnaire.

Blinding—It was not possible to blind the participants and outcome assessors to treatment allocation. However, certain measures were employed to conceal the exact nature of the study hypothesis, and hence minimise biased assessment of outcome.

First, to avoid any implication that socks were superior, all recruiters and outcome assessors were instructed to wear unmodified footwear. Second, participants and assessors were simply told that we were interested in assessing the performance of different types of footwear and different types of socks worn over the top. Third, participants' footwear was photographed for later reference and this might have encouraged participants and assessors to think that the characteristics of footwear were important. Fourth, because we had heard anecdotal accounts about the supremacy of certain types of socks, we deliberately allocated socks of three different colours to confuse any avid sock supporters about what, exactly, was being tested. To avoid any disclosure of the true state of affairs (that the socks were of identical composition), the labels were removed by the principal investigator. This action was also

necessary because the socks were labelled "alpha ♂™" and we did not wish to encourage any rash behaviour in the intervention group.

Statistical methods—Observer comments about the demeanour of participants were summarised into three categories: "confident", "cautious, but did not hold onto supports" (fences, railings, or parked cars), and "held onto supports". The data were analysed according to intention to treat. The groups were compared using a t-test for the continuous or ordinal variables and a Fisher's exact test for the categorical variables. Because men were known to be more intrepid than women, the sample size was increased to allow adjustment for sex.

Ethical approval—Ethical approval was granted by the University of Otago Ethics Committee at departmental level.

Results

Participants—The trial was conducted on 15 August 2008. A total of 30 pedestrians underwent randomisation (Figure 3). One young woman after agreeing to participate, and appearing to understand the instructions, inexplicably turned to walk back uphill and disappeared. The most common reason given for not participating in the trial was "running late for lectures".

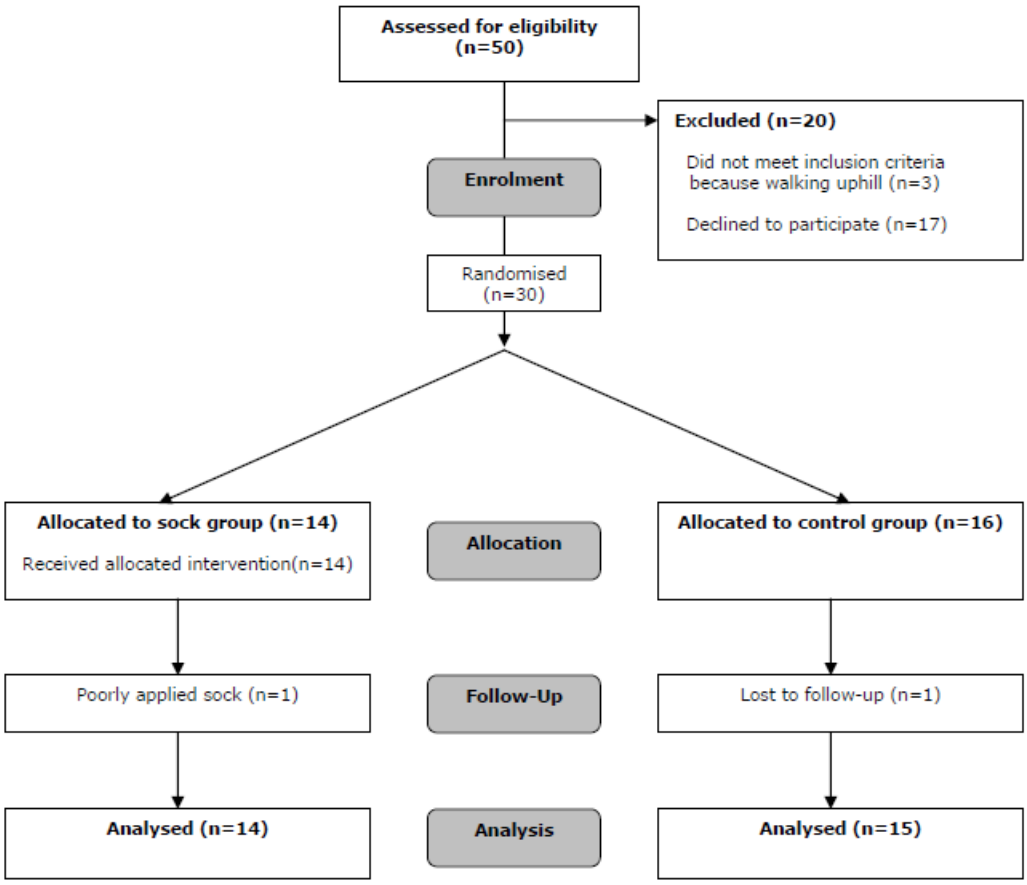
No-one was already wearing socks over their shoes. Only one participant did not fully comply with the study protocol: a segment of redundant sock at the toes (resulting from improper application) created a hazard. In accordance with intention to treat principles, her data were analysed as randomised.

The baseline characteristics of the participants are shown in Table 1. High proportions of both groups had previously fallen on ice. All participants were wearing sensible footwear.

Table 1. Baseline characteristics of study participants

Variables	Intervention group (n=14)	Control group (n=15)
Women (no [%])	7 (50)	5 (33)
Median age (range)	22.0 (19 – 58)	21.0 (18 – 70)
First winter in icy conditions (no [%])	—	1 (7)
Previous falls on ice (no [%])	8 (57)	11 (73)
≥ 1 fall this winter (no [%])	4 (29)	7 (50)
Injury from fall this winter (no [%])	1 (7)	—
Time been walking this route (no [%]): <6 months 6–12 months >12 months	 3 (21) 9 (64) 2 (14)	 2 (13) 9 (60) 4 (26)

Figure 3. Flow of participants through the trial



Outcomes—Wearing socks over footwear significantly improved traction (Table 2). The mean self-reported slipperiness scores in the intervention and control groups were 1.6 (SD 1.14) and 2.9 (SD 1.32) respectively (difference in means 1.3, 95%CI: 0.4–2.3). This difference increased to 1.4 (95%CI: 0.4–2.3) after adjusting for sex. There was a high level of agreement between self-rated and observer-rated slipperiness (r=0.70).

A higher proportion of the intervention group (71%, 10/14) than the control group (53%, 8/15) appeared confident while descending the study slopes, although the difference was not statistically significant (p=0.45). There was no evidence of risk compensation in the intervention group (difference in mean descent times 1.9 seconds, 95%CI: -6.1–10.0).

Table 2. Pre-specified primary and secondary outcomes

Outcomes	Intervention group (n=14)	Control group (n=15)	Difference in means (95% CI)
Primary outcome (mean [SD])			
Self-rated slipperiness	1.6 (1.14)	2.9 (1.32)	1.3 (0.4 – 2.3)
Secondary outcomes (mean [SD])			
Observer-rated slipperiness	1.6 (0.66)	2.3* (1.07)	0.64 (0 – 1.3)
Seconds to descend slope	37.7 (9.36)	39.6 (11.57)	1.9 (-6.1 –10.0)

*Observer-rated slipperiness score was missing for one control.

Two members of the control group and one in the intervention group (who tripped on improperly applied socks) slipped, but only one fell (a control). Although participants in the intervention group were told that they could keep their socks, many (who appeared to have image issues) opted to return them to the outcome assessors — including one young man who promptly fell on leaving the assessment area. Falls were also observed, incidentally, in non-sock-wearing pedestrians negotiating intersecting streets. No obvious injuries were sustained in the vicinity of the study sites.

Feedback from the intervention group about the use of socks was informative: "socks are key!!", "that was sweet as", "recommend socks for hungover people", "socks helped with slipperiness but wouldn't wear them to uni[versity]!"

Adverse events—The only adverse events were short periods of embarrassment for the image-conscious in the intervention group.

Discussion

Wearing socks over footwear significantly reduced the self-reported slipperiness of icy footpaths and a higher proportion of sock-wearers displayed confidence in descending the study slopes. The only falls occurred in people who were not wearing (external) socks.

The trial had other unanticipated benefits. For example, a retired couple who lived beside one of the study sites provided a compelling oral history covering several decades of ice-related mishaps on their street.

It was not possible to blind participants or outcome assessors. However, some obfuscation of the exact hypothesis reduced the potential for biased outcome assessment. Moreover, it was reassuring to learn that many of the participants had previously been unaware of this novel use of socks. Apart from sex, no adjustment was made for imbalances in the baseline characteristics of the groups as these were not specified before beginning the study. It is possible that the control group, having a larger proportion of participants who had previously fallen on ice, were more inclined to report slipperiness and to be less confident. However, the difference in proportions was related to the sex imbalance between the two groups and the fact that men in the control group were more likely to have fallen than the women. We did not enquire about the circumstances of previous falls, but if the excess among the men resulted from deliberate attempts to slide this would make it less likely that our results are an artefact of a higher level of trepidation within the control group.

The research presented several unique challenges. Unfortunately, freezing conditions, unless accompanied by a certain degree of moisture, do not guarantee a slippery footpath. Thus we could not set a specific date for data collection. Although our Head of Department's suggestion to furtively spray the study slopes with water had some practical merit, we were obliged to reject his idea and wait for suitable conditions. Inevitably, when they did occur, it was difficult to reach the study sites.

It has been suggested that new arrivals to cold climates should be warned about the dangers of falling on ice and, moreover, should be given special training on how to walk in such conditions.[6] As part of this preventive approach, perhaps municipal authorities in colder regions of the country could consider issuing a large pair of socks (in local colours) to each new resident.

Research questions for the future include "does wool perform better than synthetic?" and "which socks perform best in a cost-effectiveness analysis?" Other suggestions for future investigations are of a practical nature: provide a thick rug for participants to sit on while putting on socks, supply socks of varying sizes, and pack a thermos flask.

Conclusion

Despite some residual scientific uncertainty, because of the high frequency of ice-related falls in our population, the cheap and simple nature of the socks-over-shoes intervention, and the absence of physical harm (if correctly fitted), we feel inspired to join an eminent professor, herself a long-time proponent of socks, in adopting this practice this winter.

Competing interests: None known. In particular, none of the authors has financial links with sock manufacturers and none of us own sheep.

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Infant and perinatal outcomes of triplet pregnancy in Auckland: better than expected?

Malcolm Battin, Michelle Wise, Anne DeZoete, Peter Stone

Abstract

Aim There were two aims to the study: (1) to provide local outcome data that would be useful in counselling prospective parents of triplets; and (2) to address the deficit in accurate contemporary data on neurodevelopmental outcome and neonatal morbidity for those infants weighing less than 1500 g at birth.

Methods We reviewed the outcome of triplet pregnancies born at National Women's Hospital / Auckland City Hospital (Auckland, New Zealand) for 1995–2005 inclusive. For this study triplet pregnancy was defined as a pregnancy beyond 20 weeks leading to registration of at least one birth.

Results For the study period, 55 triplet pregnancies were identified. Forty-five percent of the pregnancies were reported as spontaneously conceived and 60% had no major complications other than premature delivery. One pregnancy spontaneously aborted; three fetuses from one pregnancy were stillborn, and four infants died in delivery suite. The median gestational age at birth was 32 (23–37) weeks and birth weight 1620 (530-2780) g. The median (range) Apgar score, for liveborns, was 8 (2–10) and 10 (4–10) for 1 and 5 minutes respectively.

There were five neonatal deaths. Fifty-three infants, <1500g at birth, underwent formal developmental assessment. Three had cerebral palsy (2 hemiplegia and 1 spastic diplegia); one had marked motor delay and one hearing impairment requiring aids. The median Bayley II MDI was 95 (71–105) and PDI 94 (65–110). Outcomes were categorised in surviving triplets <1500 g as normal in 66%, mild abnormality in 17%, moderate abnormality in 15% and severely abnormal in only 2%.

Conclusion Although triplets represent a significant burden on the regional NICUs the outcome, including those <1500 g at birth, compares favourably with that reported.

The triplet birth rate has generally increased worldwide since the 1970s.[1,2] Two important factors associated with this are the tendency towards increased maternal age, which may be associated with higher rates of spontaneous multiple births,[3] and the rising use of medical assistance to become pregnant.[4–7] Locally, there has certainly been a significant increase over time in the proportion of multiple pregnancies conceived following fertility treatments.[8]

A triplet pregnancy has significant implications for the mother, the infant, the family,[9] and society as a whole.[10] Triplet pregnancies are reported to have high rates of complications,[11–13] the most common of which is preterm delivery.[12,13] Indeed, the recent literature on triplet pregnancies reports delivery to occur at a mean gestation of approximately 32–34 weeks.[4–6,12,13]

Other important pregnancy complications that occur more frequently are preeclampsia,[13,14] excessive postnatal haemorrhage[11,13] and growth restriction, which is associated with an increased rate of perinatal mortality.[15] In addition there is a two-fold increase in risk of maternal mortality over singleton pregnancies.

Postnatally, there are reports of an increased rate of neonatal morbidity including respiratory distress syndrome (RDS),[5,12] intraventricular haemorrhage (IVH)[5,12] and retinopathy of prematurity (ROP).[5,16] Lastly triplet pregnancy carries an increased risk of cerebral palsy (CP).[17] In twins the highest risks for CP are in monochorionic twins, especially in association with discordant growth or fetal demise of a co-twin.[18] Most triplet pregnancies are polyzygotic and polychorionic / polyamniotic but some contain a monochorionic pair.

The combination of the growing number of triplet pregnancies and the potential for problems make it important to review the available data on perinatal and neonatal outcomes. Although there have been reports of neonatal outcome in recent cohorts of triplets published,[16,19-21] a recent review highlighted the need for quality neurodevelopmental outcome data.[18] Particularly, there is a lack of data on neurodevelopmental follow up of triplets born with a birth weight below 1500 grams, i.e. those who may be expected to have the highest mortality and morbidity.

Accordingly, we have reviewed the neonatal, maternal and perinatal outcomes of triplet pregnancies born at NWH in Auckland during the period 1995 to 2005 inclusive. There were two broad aims. Firstly, to provide local outcome data that would be useful in counselling prospective parents of triplets. Hence a basic analysis of gestation, birth weight and survival data are presented for all triplet pregnancies during this period. Secondly, to address the deficit in accurate contemporary data on neurodevelopmental outcome and neonatal morbidity for those infants weighing less than 1500 g at birth.

Methods

All women who had given birth to triplets, at National Women's Hospital (subsequently National Women's Health, Auckland City Hospital), Auckland, New Zealand during the years 1995–2005, were identified from the Healthware database. A triplet pregnancy for the purpose of this study was defined as a pregnancy beyond 20 weeks that lead to registration of at least one birth. The mothers' and babies' paper and electronic medical records were searched for clinical and demographic details including pregnancy and neonatal histories.

Pregnancy details included maternal age at conception, delivery method, gestational age at delivery, conception details, maternal complications, and antenatal steroid use. Method of conception was defined as spontaneous or with fertility treatments. Details of any fertility treatment were recorded including ovulation induction (OI) with Clomiphene Citrate or Gonadotrophins, Assisted Reproductive Technologies (ART) such as *in vitro* fertilisation (IVF) with embryo transfer or other IVF techniques such as intracytoplasmic sperm injection (ICSI) and gamete intra-fallopian transfer (GIFT).

Neonatal data included details of resuscitation, sex, birth weight, neonatal morbidity, neonatal follow up and outcome. All identified infants were cross referenced with the neonatal database to confirm data. Major neonatal morbidity included chronic lung disease (CLD), confirmed necrotising enterocolitis (NEC), retinopathy of prematurity (ROP) stage 3 or 4, intraventricular haemorrhage (IVH) grade 3 or 4, periventricular leucomalacia, porencephalic cyst, or hydrocephalus. CLD was defined as the need for respiratory support (oxygen, CPAP, or ventilation) at 36 weeks of corrected postmenstrual age.

Infants with a birth weight below 1500 g are enrolled in a follow-up programme when they graduate from the NICU, including physical examination and formal developmental assessment using the

Bayley scales of infant development[22] at 18 months of age. In addition to Mental Developmental Index (MDI) and Psychomotor Developmental Index (PDI), outcome category is formally allocated on a scale of 1-4, according to published criteria,[23] where 4 is normal and 1 severely abnormal.

The outcome for infants with a birth weight above 1500 g is generally good thus their follow up arrangements will vary and includes: neonatologist clinic, at a tertiary centre; local paediatric follow; GP; and Bayley assessment is only performed if requested. Infants undergo routine formal hearing assessments and ophthalmological assessments as indicated from gestation and clinical course.

Data are presented as mean and standard deviation if normal or median (range) if not normally distributed. Incidences were compared by Chi squared or Fisher's exact test as appropriate. Pregnancy and delivery data is presented as a percent of total triplet pregnancies whilst neonatal data is presented as a percent of the number of babies (either total number or number of neonatal admissions). For the calculations based on the number of babies (such as birth weight, neonatal morbidity, and perinatal mortality) any fetus born before 20 weeks gestation was excluded.

Results

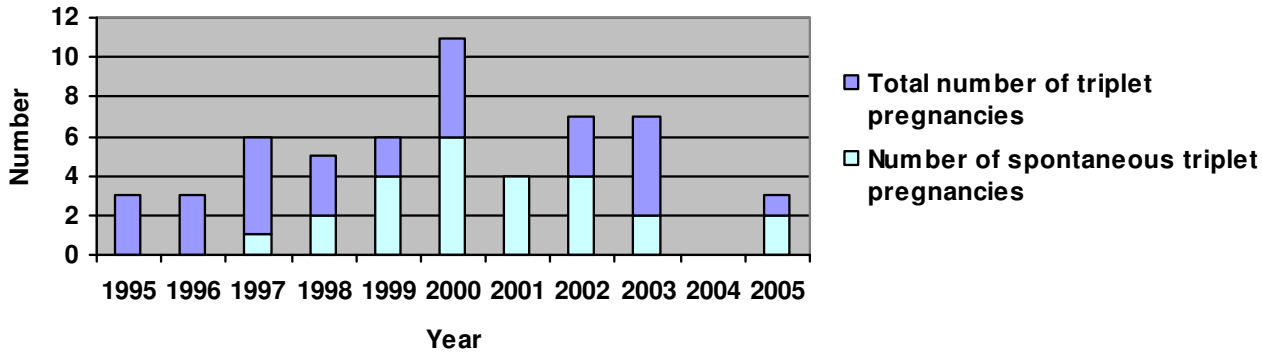
For the study period, 1995 to 2005 inclusive, 55 triplet pregnancies were identified and the charts reviewed. The mean age of the women was 32 years (Table 1). Twenty-five pregnancies (45.4%) were known to be spontaneously conceived. Thirty-three women (60%) had no major complications other than multiple pregnancy. All but one set of triplets delivered in the same way. Eight women (14%) delivered vaginally, and of these, 3 were less than 24 weeks. The number of infants delivered each year varied from 6 to 33 with a peak in 2000 (Figure 1).

Table 1. Maternal, pregnancy and birth characteristics

Variables	Number of women (N= 55)	%
Median maternal age at delivery (range)	32 (19–39)	
Method of conception		
Unknown	7	13
Spontaneous	25	45
Ovulation Induction	11	20
IUI (Intrauterine insemination)	1	2
IVF	11	20
Number of embryos transferred = 2	3	
Number of embryos transferred = 3	4	
Number of embryos transferred unknown	4	
Pregnancy-related maternal complications		
Gestational hypertension ± proteinuria	8	14
APH	5	9
PPH (> 1000 mL)	5	9
Other (GDM, increased LFTs)	4	7
Nil	33	60
Mode of delivery		
Vaginal birth	8	14
Emergency LSCS during labour*	19	34
Emergency LSCS without labour	11	20
Elective LSCS	17	31

* Includes the set of triplets where Triplet A delivered vaginally and Triplets B and C by CS; APH=antepartum haemorrhage, PPH=Post partum haemorrhage (>1000 mL), GDM=gestational diabetes mellitus, LFTs=liver function tests, LSCS=lower segment caesarean section.

Figure 1. Distribution of triplet pregnancies by year and showing proportion that were spontaneously conceived.



*Conception data unavailable for 7 triplet pregnancies

Of the 165 fetuses, 10 died prior to admission to the neonatal unit. These included three infants from one pregnancy who were liveborn at 22 weeks gestation but died in the delivery suite; three were stillborn, one at 27 and two at 29 weeks; and one 23 week infant who weighed 475 grams was not resuscitated and died in delivery suite. In addition, there were three fetuses from one pregnancy that spontaneously aborted prior to 22 weeks gestation.

Although two delivered at 19 weeks plus 6 days the third was delivered at 20 plus 5 days so the pregnancy was included in the current report. There was also one set of triplets born at 37 weeks gestation who did not require admission to the neonatal unit. The overall sex distribution was even with 84 (51%) males and 81(49%) females.

Of the infants actively resuscitated and/or admitted to NICU (n=152), the median gestational age at birth was 32 (range 23–-35) weeks and birth weight 1620 g (530–2780) g respectively. Two infants were born prior to 24 weeks gestation, 17 infants between 24 and 27 weeks plus 6 days, 49 infants between 28 weeks and 31 weeks plus 6 days and 84 infants between 32 weeks and 35 weeks 6 days. At birth 19 (12.5 %) infants required intubation for resuscitation and the median (range) Apgar score, for the liveborn infants, was 8 (2–10) and 10 (4–10) for 1 and 5 minutes respectively.

There were five neonatal deaths (3.3%), including the one 23-week infant who died in delivery suite, with each of these occurring in infants born at 25 weeks gestation or less. Thus the overall number (i.e. including stillbirths, spontaneous abortions and pre viable live born infants) of perinatal deaths was 14/165, which equated to a crude perinatal mortality rate for triplet pregnancies of 83/1000 and a neonatal mortality rate of 33/1000 births respectively.

Neonatal course and morbidity—In 35 infants the main respiratory diagnosis was respiratory distress syndrome (RDS); of these, 28 infants received surfactant. There were also 11 cases of transient tachypnoea and one case of pulmonary hypertension. The median (range) duration of ventilation was 0 days (0–70) and median duration of CPAP was 2 (0–317) days.

Respiratory morbidity included six infants who developed air leak, five with chronic lung disease and one who required home oxygen. Other neonatal morbidities included one case of proven necrotising enterocolitis and serious cerebral ultrasound abnormalities in nine infants that included various combinations of grade 4 intraventricular haemorrhage (five infants), ventriculomegaly / hydrocephalus (six infants) and cyst formation (five infants).

Congenital anomalies were present in six infants (4%) and included one case each of polycystic dysplastic kidney, arachnoid cyst, two vessel cord, massive facial haemangioma, tracheal oesophageal atresia and hydrops.

Outcome data—Infants below 1500 g are routinely followed in clinic and undergo developmental review including Bayley assessment. Fifty-three infants weighed less than 1500 g at birth, with a mean gestation of 29 (23–35) weeks and birth weight 1040 (530–1480) g. In this group, 39 infants had received a complete antenatal steroid course, 10 an incomplete course and in only four cases no antenatal steroids had been received. Six infants died, including one at 7 months unrelated to neonatal period; three developed cerebral palsy, two cases of hemiplegia and one spastic diplegia; one infant had marked motor delay and one infant hearing impairment requiring aids.

Bayley scores were performed in 30 infants with a median MDI 95 (71–105) and 94 (65–110). Outcomes were categorised for all surviving infants below 1500 g as normal (4) in 31/47 (66%) of survivors, mild abnormality in 8/47 (17%), moderate abnormality in 7/47 (15%) and severely abnormal in only 1/47 (2%) infants. The one infant born prior to 24 weeks gestation (23 + 6) who survived the period and had a good neurodevelopmental outcome on follow-up.

Of the 64 infants above 1500 g some limited follow up information is available. Twenty-four were normal when last reviewed at a median of 14 (range 3–24) months and two had died from conditions presumed not to be related to the neonatal course (SIDS and aspiration secondary to epilepsy associated with an arachnoid cyst). The median birth weight of this group was 1795 g and median gestation was 33.5 weeks, which would normally be expected to be associated with a reassuring outcome.

Discussion

In this paper we report the outcome, including mortality and neonatal morbidity, for an 11 year cohort of 165 triplets born at a single large perinatal centre in New Zealand. The overall fetal losses for pregnancies that reached 20 weeks gestation were low with only 9 fetuses resulting in stillbirth, spontaneous abortion or pre-viable delivery. Furthermore, there were only five neonatal deaths, all of which occurred before one week of age.

Consistent with our expectation, mortality was focused in those pregnancies that delivered at the very premature end of the spectrum, indeed 1/3 cases in infants born before 24 weeks gestation died. In general the crude perinatal mortality rate of 83/1000 and a neonatal mortality rate of 33/1000 for triplet births compares favourably to reported rates of 41-121/1000[5,12,13,16,23,24] and 51–59[5,6] respectively.

Even though neonatal mortality was quite low for a group of premature infants there was morbidity. Approximately 6% had cerebral ultrasound abnormality and 3% developing chronic lung disease but below 1% of infants required home oxygen or

developed proven necrotising enterocolitis. These morbidities with potential long-term consequences were also largely focused in those pregnancies below 28 weeks gestation. Congenital anomalies occurred sporadically with a rate that was consistent with that reported from other studies.[21,26]

Review of the neurodevelopmental outcome for triplet infants <1500g revealed over 80 % of the survivors, categorised as normal or only mildly abnormal (66%+ 17%) and only 1/47 (2%) infant categorised as severely abnormal. These results were comparable with those reported from a cohort of triplets from Israel;[27] however, that study reported outcome of a slightly more mature group of triplets with a mean BW of 1660 g and gestation of 32 weeks.

In the New Zealand data the scores encompass a broad range and the values of 65 and 71 for minimum MDI and PDI respectively represent a significant degree of impairment. Also three of these infants developed cerebral palsy with two cases of hemiplegia and one spastic diplegia plus one infant had marked motor delay and one infant with hearing impairment requiring aids.

There are very limited data available on neurodevelopmental follow up of triplets with a birth weight below 1500 g but the one report from Zagreb described the outcome to be normal in 15 infants, CP in seven and minimal abnormality on neurological testing in seven infants.[19] Although it should be noted that in the centre reporting this data there was not a specific follow up program for infants born at this weight and findings were from neurological assessments by a neurologist so there may be some referral and / or ascertainment bias in that data.

Although the data described in the current study are from a single high risk centre so represent a fairly homogeneous pattern of management there are some limitations. Specifically, there are quite small numbers that mean it is not possible to perform meaningful comparisons within the cohort such as the outcomes of triplet pregnancies conceived spontaneously versus those conceived using assisted techniques.

The other potential limitation is the lack of complete follow up data on those infants who were not enrolled in the follow up program. Nevertheless a minimum data set of gestation, birth weight, neonatal survival and neonatal morbidity were established. Furthermore, if the clinician following the child considers development to be abnormal then formal assessment can be performed on request.

The role of fertility treatment in triplet pregnancies is well recognised.[8] Locally there have been strong moves to decrease the number of multiple births secondary to assisted fertility.[28] During the study period the number of triplet pregnancies fluctuated from none to 11 per year and there is the suggestion that numbers are declining since the peak in 2000. This experience is consistent with that of others with recent UK data on triplet and higher order births demonstrating that the rate has decreased by one-quarter since 1998.[29] NZ has already taken steps to reduce the number of multiple births following ART by implementing policy limiting the number of embryos transferred.

It is of interest to explore the relative contribution of multiple pregnancy and prematurity to any adverse outcome for the infant. Some authors have compared data obtained from triplets to singletons of same gestation and report survival and major short term morbidity to be very similar once controlled for appropriate variables.[4,16,21]

Although neonatal stay is reported to be generally longer for triplets than twins[4,30] and in one study [16] there was still an increased rate of mild IVH and severe ROP associated with triplet pregnancy. A logical extension to this is to examine the role of selective fetal reduction on subsequent neurodevelopmental outcome. Although it is well described in the literature,[31–35] the published results in terms of neurodevelopmental outcome are somewhat contradictory and this procedure was not performed on any of the triplet pregnancies in the current cohort.

The Cochrane Review[36] concludes there is no strong evidence about the effects of reducing the number of fetuses in women pregnant with triplets or higher order multiples. A subsequent systematic review[37] suggests that embryo reduction reduces the rate of preterm delivery, with a number needed to treat 7 (95%CI: 5–9) but there is an increased rate of miscarriage, with a number needed to treat of 26 (95%CI: 14–193).

Although this suggests embryo reduction may have a role in reducing prematurity, there is still a lack of data on the effect, if any, on subsequent long term neurodevelopmental outcome. One retrospective study has examined cerebral palsy (CP) rates in a large cohort of trichorionic triplets, where the decision to have ER or not was determined by parent choice.[38]

The mean gestation at birth was 35.6 weeks versus 33.8 weeks and CP rate was 13.8 versus 18 per 1000 live births respectively for those managed with reduction to twins or expectant management. The authors suggested that there was a significant difference in gestation at birth but the rates of cerebral palsy were similar and concluded there was a need for further data.[38]

In summary, this study provides local data on the outcome of New Zealand triplets. This will be useful not only for counselling prospective parents of triplets but also in planning services and potentially as a baseline for monitoring impact of ongoing developments in the care of triplet pregnancies. In addition, the detailed neurodevelopmental follow up data may be used to counsel the parents of preterm triplet infants admitted to the neonatal unit.

Competing interests: None known.

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Pacific Islands Families: Child and Parental Physical Activity and Body Size—design and methodology

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Abstract

Aim To objectively assess physical activity (PA) and body size in 6-year-old children and their mothers participating in the Pacific Islands Families (PIF) cohort study, and to identify factors potentially related to PA and body size in Pacific children.

Methods The PIF cohort was drawn from live births at Middlemore Hospital (South Auckland, New Zealand) in 2000. Information has been collected at birth, 6 weeks, 12 and 24 months, and 4 and 6 years postpartum. At 6 years, the Child and Parental Physical Activity and Body Size (PIF:PAC) study was simultaneously conducted and measures of child and mother PA (8-day accelerometry), body size (waist circumference, body mass index), and PA supports and barriers (questionnaire) taken.

Results 254 mothers and their children took part in the PIF:PAC study. Usable accelerometer data were gathered for 173 mothers and 199 children over an average of 3–4 days. High levels of overweight and obesity were found in boys, girls, and mothers (62%, 58%, and 97% overweight or obese, respectively).

Conclusion Strategies for obesity reduction in Pacific populations are urgently required. Combined, the PIF and PIF:PAC studies will provide vital information for understanding and targeting the obesity epidemic in Pacific children.

New Zealand's Pacific population continues to be one of the fastest growing and significant ethnic groups in New Zealand,[1] with approximately 6.9% residents identifying as being of Pacific descent.[2] Yet, Pacific peoples residing in New Zealand also continue to be socially disadvantaged relative to other New Zealanders.[3]

Findings from the National Children's Nutrition Survey and 2006/07 New Zealand Health Survey (NZHS) showed that approximately 55-60% of Pacific children are overweight or obese; substantially higher than other New Zealand children.[4,5]

These statistics have immediate negative implications for child health including increased risk of exhibiting type 2 diabetes, risk factors for cardiovascular disease, experiencing obstructive sleep apnoea, orthopaedic complications, a reduced quality of life, and negative psychosocial effects stemming from discrimination and preoccupation with weight.[6–8] Further, obesity in childhood is associated with significant long-term developmental consequences, including an increased risk of exhibiting overweight/obesity and associated morbidities in later life.[9]

Obesity is predominantly the result of an "energy gap", the excess of energy intake over energy expenditure.[10] These energy gaps can be relatively small (e.g. ~20–30 kcal/day), and therefore could be easily reduced by small increases in physical activity (PA).

Participation in regular PA is fundamental to obesity prevention and treatment in children.[11] PA also confers other important benefits in children, including improved bone health[12] and cognitive function,[13] a decreased risk of developing type 2 diabetes,[14,15] and a reduced risk of exhibiting cardiovascular disease risk factors.[16]

Conversely, physical inactivity (often quantified using television or screen time) is associated with a multitude of both short-term and long-term negative health outcomes.[17-19] Consequently, PA promotion for obesity prevention in Pacific children is a public health priority in New Zealand. The *Healthy Eating – Healthy Action* strategy highlighted children and young people, as well as Pacific peoples, as two groups that will achieve the greatest benefits from participating in more PA, and the strategy calls for research to address physical in/activity and obesity in Pacific peoples.[20]

Nationwide assessment of children's PA levels to date has been conducted using self-report, or parental proxy-report measures only, both of which are inherently biased.[21] Notwithstanding this, it appears that Pacific children may actually be more physically active than their European and Māori counterparts, but at increased risk of developing obesity and other lifestyle related diseases due to increased participation in sedentary pursuits such as television watching.[4]

Culturally appropriate, effective, and integrated programmes are urgently required at national and community levels to combat the rising problem of obesity, and to promote healthy lifestyles and well-being for Pacific children and families. Accurate quantification of even small changes in PA and sedentary behaviour is fundamental to understanding associates of PA and health gain, and informing effective programme development.

The Pacific Islands Families (PIF) study offers a unique opportunity to meet this research need. The PIF study follows a cohort of Pacific infants born at Middlemore Hospital, South Auckland, between 15 March and 17 December 2000.

General aims of the PIF study are to:

- Identify and characterise those individuals and families experiencing both positive and negative health outcomes,
- Understand the mechanisms and processes shaping the pathways to those outcomes, and
- Make empirically based strategic and tactical recommendations to improve the wellbeing of Pacific children and families and thereby benefit New Zealand society as a whole.

In-depth information on parent and child health and social, demographic, cultural, and lifestyle factors has been collected from mothers, fathers, and children when the children were 6 weeks, 12 and 24 months, and 4 and 6 years.[22,23]

At the 6-year PIF measurement phase (2006), an additional study (Pacific Islands Families: Child and Parental Physical Activity and Body Size [PIF:PAC]) was conducted, using accelerometry to gather a precise and objective measurement of children's PA and to identify supports for and barriers to children's activity. The

current paper provides a detailed description of the PIF:PAC study design, methodology, and study population.

Methods

Design—The PIF:PAC was a separate nested sub-study, designed to investigate PA levels, sedentary behaviours, and associates of activity behaviours in children and mothers participating in the PIF study's 6-year measurement wave. Existing PIF protocols for home visits and data collection, entry, accuracy, storage, and security were adhered to.[23] Additional protocols and measures specific to the PIF:PAC are described below.

Aims—Specific study aims were to:

- Determine the demographic, health, social, and environmental factors associated with various dimensions of PA, objectively determined by accelerometry (e.g. an examination of differences in accumulated PA associated with body size, ethnic group, socioeconomic status, and/or maternal education level);
- Investigate maternal PA levels and perceived barriers to and facilitators of PA participation, and the relationship these variables have with child PA levels;
- Identify the levels and associations of objectively measured physical inactivity in the sample.(e.g., the relationship between physical inactivity and increased television viewing, family size, maternal education level, and/or ethnic group); and
- Assess the relationship between maternal overweight/obesity, child overweight/obesity, and physical activity levels.

Participant recruitment and enrolment—A comprehensive description of the PIF recruitment process has been published elsewhere.[23] The full PIF cohort comprises 1398 children and their families. High retention has been achieved to date, with 910 children and 1066 mothers participating in the 4-years measurement phase. The full cohort were revisited in 2006 when the children had their sixth birthdays, with the exception of those who had withdrawn from the study over the past 6 years, and those not currently living in New Zealand.

The nature of this longitudinal study allows for those who have not participated in some earlier assessments, to still be eligible for subsequent assessments. The PIF:PAC study ran concurrently with measurement of the substantive PIF variables at 6 years. Due to funding constraints, the first 660 eligible PIF participants only were also invited to participate in the PIF:PAC component of the study at the first home visit (see Figure 1).

Participation in the PIF:PAC study was not required for ongoing involvement with the longitudinal PIF study. Mothers willing to participate provided informed consent, and assent was given by participating children. Mothers consenting to participate in the PIF:PAC study were visited at their home on a separate occasion (home visit 2).

At this second home visit, maternal body size was measured and accelerometers provided to participating mothers and children, and written and verbal instructions on their use given. Families were visited approximately 8 days later to collect the accelerometers and pedometers and gather compliance information and participant feedback.

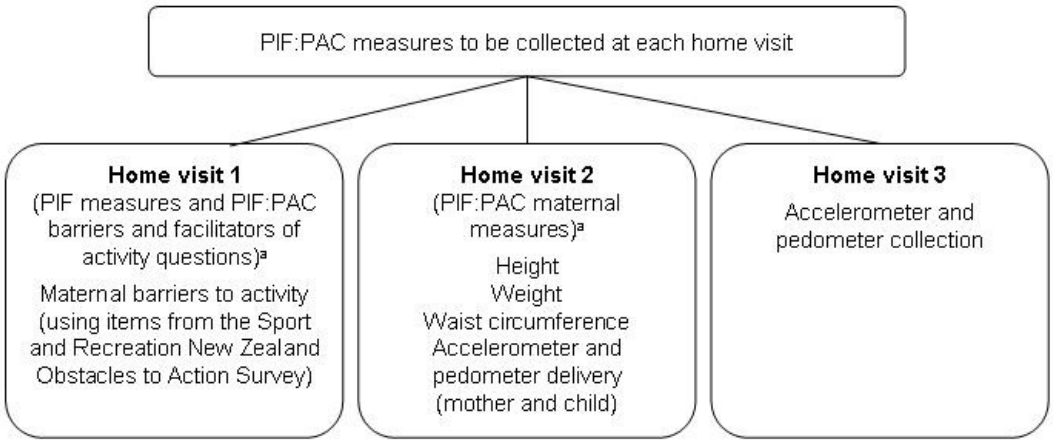
Measures—Figure 1 outlines the measurements specific to the PIF:PAC study that were taken at the 6-year data collection point; detailed descriptions are also provided below.

Child and maternal physical activity—Children and their mothers were visited at their homes by a trained PIF researcher and asked to wear an Actical accelerometer (Mini Mitter, Bend, OR) on a purpose-made elastic waistband for 8 consecutive days (including water activities).

Participants were asked to wear the elastic waistband with the accelerometer sitting above the right hip;[24] appropriate placement was demonstrated to the participants and written instructions for accelerometer use were also provided. Accelerometers were set to collect data in 60-second epochs. The Actical accelerometer is lightweight, water resistant, and contains a piezoelectric sensor that detects movement and acceleration over all planes of movement. This monitor has been validated using indirect calorimetry in both children and adults,[24] and is the only accelerometer that measures omni-directional movement, making it most suitable for use with children.[25]

A measurement period of at least 7 days is recommended to gather a reliable estimate of usual activity, and also enables the comparison of activity during week days and weekend days.[26] Accelerometers were collected by the same researcher approximately 8 days after the initial home visit; information on accelerometer problems and participant compliance was recorded at this time.

Figure 1. Measurement battery for the PIF:PAC study



aChild measures of height, weight, waist circumference, and body fatness were taken during the school data collection visits for the PIF study at six years

Maternal barriers and facilitators of physical activity—Questions to the mothers about barriers and facilitators of PA participation were included within the standard parent interview protocol within the substantive PIF Study. Items from the Obstacles to Action survey[27] were used, to allow comparisons with nationally representative data. This survey was implemented in a nationwide study to identify at-risk groups for insufficient activity, and specific motivators and barriers for physical activity and inactivity for differing groups using a comprehensive range of questions related to attitudes and opinions, individual health, health behaviours, and demographics. Thirty-six items from the physical activity section of this survey (copied verbatim from sections 6 and 8) were utilised in the PIF:PAC study. The interviewer read the survey questions to the parents and recorded their responses.

Maternal body size—Mothers' height was measured to the nearest 0.1 cm using a stadiometer, and weight was assessed using Seca scales to the nearest 0.1kg with the parent in light clothing. Body mass index was calculated as weight (kg) / height (m)^2. Ethnic-specific cut-offs for overweight (26 kg/m^2) and obesity (32 kg/m^2) were used to determine weight status.[28] Waist circumference was measured at the mid axillary line (halfway between the top of the hipbone and the lower rib) to the nearest 0.1 cm and thresholds for high trunk fat mass applied.[29]

Two serial measurements were made for each body size measurement, and the average calculated. If the difference between two readings exceeded 0.5 cm, 0.5 kg, or 1 cm for height, weight, or waist circumference, respectively, a third recording was taken, and the average of the two closest readings taken. These measurements were taken to complement the anthropometric measures (height, weight, waist circumference, body fatness) that were taken of the children during the child assessment at their school as part of the PIF study.

For the children, gender-specific thresholds for high trunk fat mass developed with New Zealand children aged 5.9 years using waist circumference values were applied.[30] International gender-specific thresholds for 6-year-old children were used to define overweight and obesity.[31]

Standard PIF study measures: The following information has been obtained at the first 4 measurement points (6 weeks, 12 and 24 months, 4 years) through interviews and direct child assessments:

- Sociodemographic and cultural factors (e.g. parental demographics, household composition, transport, discriminatory behaviour);

- Child development (childhood activities and experiences, discipline and nurturing, and cognitive, motor, psychosocial and language development);
- Parent and child health issues (child health, parent health, immunisation, nutrition, child anthropometric measures); and
- Family and household dynamics (sharing and support, finance, education, employment).

These structured interviews were repeated with mothers and fathers of the children, and the children themselves at the 6-year measurement phase. Additional data were collected at this time regarding child body size, nutritional practices, and physical activity (basic step-based information and questionnaire), as below:

- Child's body size (height and weight, subscapular and triceps skinfolds, waist and mid upper arm circumference, body fatness by bioimpedance analysis);
- Nutritional practices (eating patterns, food frequency, dietary recall, food beliefs/values); and
- Child and maternal physical activity (self report and proxy report, pedometer steps).

Data accuracy and security—Standard PIF study protocols include a variety of systems to ensure data accuracy and consistency, including: manual coding of each interview (to identify potentially spurious data at the time of data entry), accompanying interviewers to gauge rapport and conduct, participant coding to ensure no individual can be identified from the data, and post interview random phone checks with participants (to confirm specific interview details). All data collected are treated as sensitive information.

Participants own their data and have the right to withdraw this information from the study at any time. Additional checks were completed to determine accelerometer data quality and accuracy for the PIF:PAC study. This involved manual scanning of activity graphs for each participant and identifying corrupt (e.g. constant accelerometer count values for extended periods, scrambled data, and so on) or empty (i.e. no data due to unit not being worn) files and potentially erroneous data (e.g. 0 activity counts for >30 minutes, activity counts exceeding 12,000/60-second epoch, activity counts for >16 hour time periods).

In cases where files were corrupt or empty, these data were excluded from further analyses. Where data were questionable, information was confirmed using the participant compliance information.

Statistical analyses—For the purposes of the current paper, descriptive statistics (frequencies and percentages) of basic sociodemographic variables measured were calculated for participants of the PIF:PAC study and compared with those for the full PIF cohort using the PIF study baseline data (6 weeks).

Ethics—Ethical approval for the PIF and related studies has been obtained from the Auckland Branch of the National Ethics Committee, the Royal New Zealand Plunket Society and the South Auckland Health Clinical Board. Conduct of the study complied with the ethical standards for human experimentation as established by the Helsinki Declaration.

Results

From the original PIF cohort at 6 weeks (N=1376), 1001 mothers participated in the 6-year PIF measurement phase (32% attrition from those eligible at baseline; see Figure 2). Due to funding constraints, the first 660 of these only were also invited to participate in the PIF:PAC study. Of those invited, 254 (38%) consented for themselves and their child to participate in the PIF:PAC study, and child assent was gathered for all of these children.

Figure 2. Recruitment characteristics of the PIF:PAC study and PIF study at each measurement phase

Table 1 contains descriptive statistics for basic baseline (6-weeks postpartum) demographic factors of the full PIF cohort and those participating in the PIF:PAC study. The characteristics of participants in the PIF:PAC study were broadly similar to the characteristics measured in the overall cohort. Of those consenting to participate in the PIF:PAC study, usable accelerometer data were gathered for 173 (68%) mothers and 193 (76%) children.

Table 1. Frequencies (%) of demographic factors for maternal participants enrolled in the PIF (N=1376) and PIF:PAC (N=254) studies using baseline PIF data (6 weeks)

Variable	PIF study		PIF:PAC study	
	n	(%)	n	(%)
Age (years)[a]				
<20	111	(8)	21	(8)
20–24	354	(26)	62	(25)
25–29	366	(27)	64	(25)
30–34	324	(24)	52	(21)
35–39	176	(13)	41	(16)
≥40	44	(3)	13	(5)
Marital status				
Married/de facto	1107	(80)	203	(80)
Single	269	(20)	51	(20)
Highest educational qualification				
No formal qualification	535	(39)	94	(37)
Secondary	464	(34)	91	(36)
Post-secondary	377	(27)	69	(27)
Ethnicity				
Samoan	650	(47)	125	(49)
Tongan	289	(21)	60	(24)
Cook Island Māori	232	(17)	37	(15)
Niuean	59	(4)	11	(4)
Other Pacific[b]	47	(3)	7	(3)
Non-Pacific[c]	99	(7)	14	(6)
Household income (NZD)				
≤$20,000	457	(33)	94	(37)
$20,001–$40,000	710	(52)	127	(50)
>$40,000	161	(12)	27	(11)
Unknown	48	(3)	6	(2)

Note: 248 mothers in the PIF:PAC study had singletons and 6 had twins – where twins were measured, only the first born twin was included; [a]1 observation invalid; [b]includes mothers identifying equally with two or more Pacific groups; [c]includes non-Pacific mothers who were eligible through the Pacific ethnicity of the father.

Considerable data were lost due to participant non-compliance, researchers not being able to contact the mothers for the second home visit, and accelerometer hardware failure. Descriptive statistics of the accelerometer data collected and missing data are provided in Table 2.

Table 2. Descriptive information for accelerometer data collected in children and their mothers participating in the PIF:PAC study at 6 years (N=254 mothers, 254 children)

Usable accelerometer data collected	n	(%)
Clusters		
Mother and child	156	(61)
Child only	37	(15)
Mother only	17	(7)
Individuals		
Total children	193	(76)
Total mothers	173	(68)
Reasons for accelerometer data loss (mother and child, n=142)		
Unable to schedule appointment	26	(5)
Accelerometer unit lost	4	(1)
Accelerometer hardware failure (data corrupt, battery failure, no data saved)	39	(8)
Participant non-compliance (did not wear accelerometer at all)	60	(12)
Unexplained/other	13	(3)
Descriptive information of raw accelerometer data	mean	(min, max)
Number of days of data		
Child	5.2	(1, 10)
Mother	4.4	(1, 10)
Time worn per day (minutes)		
Child	765	(111, 1184)
Mother	844	(150, 1293)

Height and weight measurements were taken for 238 (94%) participating mothers and 248 (98%) children. Using gender-specific and ethnic-specific body mass index values to classify weight status, 97% of mothers, 58% of girls, and 61% of boys were considered overweight or obese (see Table 3). Waist circumference was measured in 230 mothers and 227 children; of these, a high trunk fat mass was found in 97% of mothers, 53% of girls, and 60% of boys. Barriers to and facilitators of physical activity were also assessed in 254 (100%) mothers participating in the PIF:PAC study (data not reported here).

Table 3. Body size measurements of children and their mothers participating in the PIF:PAC study at 6 years (N=254)

Variables	PIF:PAC study	
	n	(%)
Girls		
BMI status, kg/m^2 (n=120)		
Normal weight/underweight (BMI<17.34)	56	(42)
Overweight (17.34≤BMI≤19.64)	42	(32)
Obese (19.65≤BMI)	35	(26)
Waist circumference status, cm (n=118)		
Low/normal trunk fat mass (<56.4)	56	(47)
High trunk fat mass (≥56.4)	62	(53)
Boys		
BMI status, kg/m^2 (n=109)		
Normal weight/underweight (BMI<17.55)	44	(38)
Overweight (17.55≤BMI≤19.77)	36	(31)
Obese (19.78≤BMI)	35	(30)
Waist circumference status, cm (n=109)		
Low/normal trunk fat mass (<57.0)	44	(40)
High trunk fat mass (≥57.0)	65	(60)
Mothers		
BMI status, kg/m^2 (n=238)		
Normal weight/underweight (BMI<26)	8	(3)
Overweight (26≤BMI<32)	29	(12)
Obese (32≤BMI)	201	(84)
Waist circumference status, cm (n=230)		
Low/normal trunk fat mass (<80)	8	(3)
High trunk fat mass (≥80)	222	(97)

BMI=body mass index status using ethnic-specific thresholds for adults,[28] and international thresholds for children.[31]

Discussion

Internationally, the PIF:PAC is one of the first large-scale epidemiological studies to use accelerometry for objective PA measurement in children and their mother. With the developed world currently suffering from an obesity epidemic, results from this study will provide much sough after evidence in the relationship between familial PA. Furthermore, the combination of PA and longitudinal data from the PIF on both mothers and children will allow important and timely investigations into PA, obesity, and factors contributing to the health and wellbeing of Pacific peoples; a population carrying an abnormally high overweight/obesity load.

Concordant with nationally representative data, a high prevalence of overweight and obesity was observed in Pacific children and their mothers participating in the PIF:PAC study. Body size measures revealed relatively similar results, with 61 or 60% of boys, 58 or 53% of girls, and 96 or 97% of mothers categorised as having high body mass index or waist circumference, respectively.

Overweight and obesity prevalence in our sample was approximately 10% higher than that found for boys and adult females in the NZHS,[5] and identical to that found for girls. The exceedingly high body size measured in the mothers is of concern,

particularly considering that if ethnic-specific thresholds had been applied in the NZHS, it is likely an even greater difference between obesity prevalence in our mothers and the nationally representative sample would have been found.

By using accelerometers in the PIF:PAC study, we have been able to gather a substantial amount of complex and precise information about the PA patterns, intensities, inactivity levels, and duration and timing of in/activity in Pacific children and their mothers that will be explored and described for the first time. Feasibility of using accelerometers with a sub-sample of the PIF cohort was demonstrated; participants were largely compliant, providing detailed PA information over an average of 3–4 days for an average of 13–14 hours.

Application of apposite longitudinal modelling techniques of the activity data will allow us to investigate PA patterning of individuals based on a large amount of data (e.g. 1 day of wear with 10 hours data using 60 second epochs is equal to 600 data points). The method of accelerometer data treatment as well as the longitudinal nature of the PIF study data will also enable the use of powerful repeated measure multivariable regression methods to explore relationships between physical activity, body size, and the associates and determinants of each in great detail.

Demographic information measured in our sample was largely similar to that found in the representative sample participating in the PIF study cohort at 6 weeks; as such findings resulting from this study will be broadly generalisable to the wider Pacific population.

While undoubtedly a strength of the study, the use of accelerometers for research purposes can also prove problematic. Activities such as swimming and cycling are not well captured by hip-mounted accelerometers.[32] Though most participants were compliant, 12% did not wear the accelerometers at all during the measurement phase, and others only wore the units sporadically (resulting in a range of number of days worn and hours worn per day).

Given only 38% of the eligible families participated, it is also possible that the additional burden associated with wearing an accelerometer may have discouraged involvement in the study. The substantial data collected necessitates manual cleaning and processing that is time consuming, and there is no agreed best-practice approach for data reduction and interpretation. Although researchers within our team have devised a robust accelerometer data treatment protocol using generalised estimating equation methods (not presented here), this method currently requires statistical support and considerable resources to complete.

Culturally appropriate, effective, and integrated programmes are urgently required at national and community levels to combat the rising problem of obesity, and to promote healthy lifestyles and well-being for Pacific children and their families. The PIF:PAC study affords the opportunity to better understand the effects of an active (or inactive) childhood.

Findings from the PIF:PAC study, in combination with the substantive PIF study findings, will provide ethnic-specific information on relationships between PA participation and health outcomes in Pacific children. This valuable and timely information can assist stakeholders in their promotion of Pacific health and wellbeing in New Zealand.

The information may be used to inform school and community programmes, create the opportunity to conduct and evaluate randomised prevention trials, and improve the delivery of service and professional practice as it pertains to Pacific family life both locally, and throughout New Zealand.

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Sudden unexpected infant death and bedsharing: referrals to the Wellington Coroner 1997–2006

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Abstract

Aims To describe the factors associated with sudden unexpected infant deaths, for which there was no clear medical diagnosis, referred to the Wellington-based coronial paediatric pathology service over the decade from 1997 to 2006.

Methods The postmortem report, Police 47 file, Coroner's findings and deceased infant's medical records were used to create a profile for each sudden and unexpected infant death.

Results There were 64 deaths in the period: 54 of these occurred during sleep and did not have a clear medical diagnosis. Māori and Pacific infants and infants from low decile areas were over-represented in the group. The majority (88.7%) of infants were < 6 months of age at death. Overall, 50% of infants had been placed to sleep in a non-recommended sleep position and 38% usually slept in a non-recommended location. Bedsharing was associated with 53.7% of deaths. There was a significant association between bedsharing and being found dead on a Sunday morning (p=0.04).

Conclusion Sudden unexpected death in infancy is associated with unsafe sleep environments and sleep positions. Every effort should be made to ensure that information about safe infant sleep practices reaches the caregivers of those particularly at risk.

Sudden infant death syndrome (SIDS) is defined as "The sudden death of an infant under 1 year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene and review of the clinical history".[1]

Over recent decades SIDS rates have fallen in New Zealand and internationally.[2–6] For many infants who die suddenly and unexpectedly and do not fulfil diagnostic criteria for SIDS, a final diagnosis may not be possible because of failure to undertake a complete examination of the death scene and lack of documentation of the full clinical history. This has lead to the more general term Sudden Unexpected Death in Infancy (SUDI) being used to describe this group of infants and to the final cause of death increasingly being labelled as undetermined.[7]

Attention has increasingly focused on the infant sleeping environment. Asphyxia, overlaying, and strangulation have been noted as causes of SUDI due to unsafe sleeping environments.[8–10] Reviews of coronial SUDI death investigations have been reported internationally but not previously in the New Zealand context.[11–13] This study aimed to review cases of SUDI, referred by the Coroner to the Wellington Hospital Mortuary for autopsy from 1997 to 2006, to describe their demographic characteristics and assess the sleep situation at time of death.

Methods

Cases were sourced from the Wellington Hospital Mortuary records. Infants who died suddenly and unexpectedly who were more than 28 days of age and less than 1 year old were included. Documents used to source information about the cases were; the autopsy report, the Police 47 form (P47), and the Coroner's Inquest findings.

Details for hospital-based records lacking a copy of the Coroner's findings or an autopsy report were accessed through the Ministry of Justice Archives. The predetermined hierarchy of evidence was the Coroner's Inquest, followed by the autopsy report with the least weight placed on the P47. Some files contained copies of the complete Police file and a clinical history taken by a paediatrician. This information was given more weight than the P47.

The verdict from the Coroner's findings as to cause of death was also recorded. All subjects were included in the initial database and cases were subsequently excluded if a specific cause of death was determined at autopsy. Information gathered for the remaining infants included the following; the position the infant was found in, the position the infant was placed to sleep, the sleep surface the infant was found on, the usual sleep surface, whether the infant shared a room, details of bedsharing, and whether the infant was placed on a soft surface (defined as either a pillow, sheepskin or duvet).

Hospital records were reviewed where possible. Data collected included: age, sex, gestation, birth weight, and ethnicity. Socioeconomic status was assessed using the home address as reported on the P47 form. Addresses were geo-coded by Statistics New Zealand into New Zealand Deprivation Index 2001 mesh-blocks and then converted to 2001 decile scores.[14]

Data were entered in an excel spreadsheet and pivot tables used to facilitate analysis. Data for sex, birth weight, ethnicity and gestation were compared with regional data from the Ministry of Health Report on Maternity for 2002 and Chi-squared analysis was used to compare variables where comparable data were available.[15]

Binary logistic regression was applied to determine whether any of the variables increased the risk of bedsharing. Incomplete data prevented a correlation between decile and bedsharing being calculated. A p value < 0.5 was considered significant. Ethical approval for the study was granted by the Central Regional Ethics Committee. Approval for the study was given by the Wellington Coroner.

Results

Case selection—There were 99 Coroner's case records that met inclusion criteria. The most complete information was available for infants referred to the Wellington Coroner so only these were included in the study. Other cases had been referred to Dr Zuccollo for forensic postmortem from Coroner's outside of the Wellington region. Final causes of death are listed in Table 1.

There were 64 postneonatal deaths between 1997 and 2006. Some cases were labelled as SUDI as a final diagnosis. To ensure all possible SUDI deaths were included in the analysis the following classifications were also included in the SUDI group: accidental asphyxia, SIDS and undetermined with possible and probable classifications of these diagnostic labels also included. There were 54 (84.4%) SUDI cases, and 10 (15.6%) non-SUDI cases.

Table 1. Final cause of death for cases referred to the Wellington Coroner 1997–2006

Final cause of death	No of cases
Determined causes of deaths	
Inflicted injury – child abuse	1
Infection	4
Congenital anomaly	3
Acquired cardiac disease	1
Acute gastrointestinal	1
All SUDI deaths	
SUDI	20
SIDS	14
Possible / probable accidental asphyxia	4
Possible / probable SIDS	3
Undetermined	5
Accidental asphyxia	8
Total	**64**

SUDI infants—The demographic details of the SUDI infants are listed in Table 2. Two sets of twins were found dead together. For SUDI infants, 75.0% (95%CI: 61.1–85.2) were full term compared with 92.6% (95%CI: 91.8–93.2) from the local population as reported in the 2002 National Maternity Report (Chi squared 20.91, p<0.0001).[15]

The median birth weight was 2880g compared with the national mean birth weight of 3400g documented in the 2002 National Maternity Report. Māori (Chi squared 40.1, p<0.001) and Pacific (Chi squared 6.5, p=0.01) infants were over-represented in the sample compared with ethnicity reported for Wellington infants in the 2002 Maternity Report. New Zealand European infants were under-represented (chi square 30.3, p<0.001)

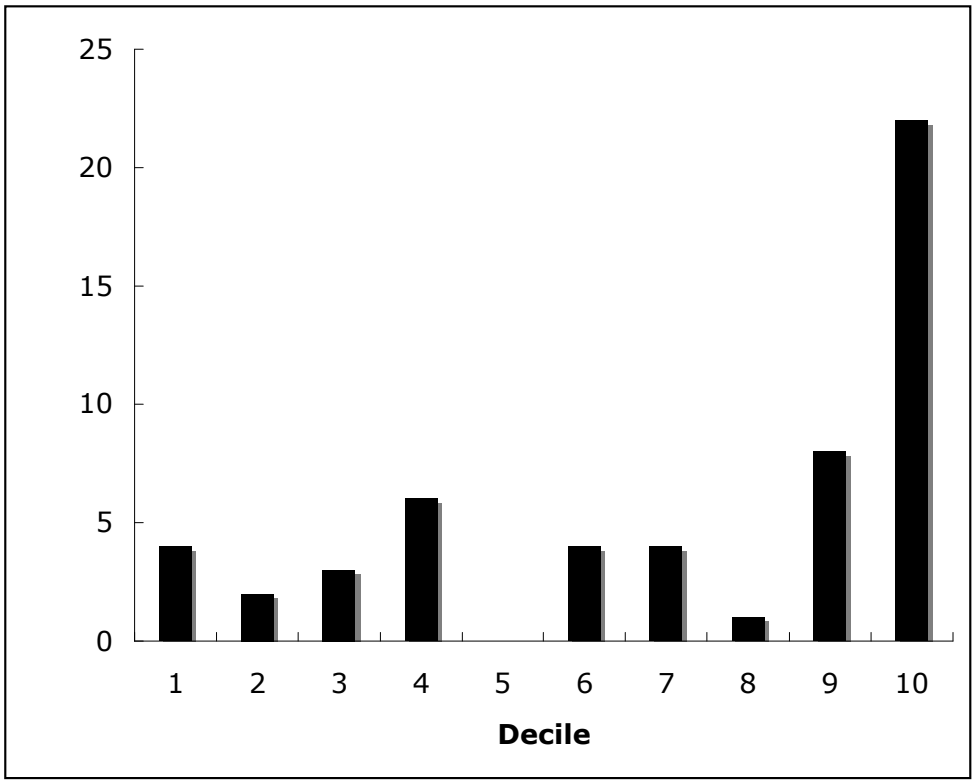
Mothers of SUDI infants—Maternal age was known for 49 cases. The median maternal age was 24 years (range 17–40 years). Body mass index (BMI) values were only available for 18 mothers so could not be reported on. NZ Deprivation Index decile ratings are illustrated for mother and infant pairs in Figure 1. For 30 (55.5%) infants, the decile rating was 9 or 10 whereas only 6 (11.1%) infants were in decile 1 or 2.

Timing of deaths—The number of deaths varied from one to nine per year with no trend to an increase or decrease in deaths over the time period. There was a slight majority (59.3%) of deaths in winter and autumn. Deaths occurred on the weekend (Friday, Saturday, Sunday) in 46.2% of cases. Sunday was the commonest day for death to occur (18.5% cases). The majority of infants (57.4%) were found dead between 0601 and 1200h. There were 11 (20.4%) infants found between 0001–0600h, 9 (16.7%) infants between 1201–1800h, and 3 (5.6%) infants between 1801–2400 hours.

Table 2. Demographic variables for 54 SUDI cases referred to the Wellington Coroner 1997-2006 and for some variables for infants born in the Hutt Valley and Capital and Coast DHBs in 2002

Demographic variable	No of cases (%) or Median (range)	HVDHB and CCDHB 2002 Maternity report
Male sex	30/54 (55.6%)	
Age at death (days)	95 (30–358)	
Age <3 months	25/54 (47.2%)	
Age 3–5 months	22/54 (41.5%)	
Age >5 months	7/54 (13.2%)	
Gestation at birth		
≥ 37 weeks	36/48 (75%)	4867/5258 (92.6%)
32-36 weeks	8/48 (16.6%)	347/5258 (6.6%)
28-31 weeks	4/48 (8.3%)	44/5258 (0.8%)
Birthweight (gms)	2880 (1128–4380)	
Birthweight ≤ 2500g	14/48 (29%)	348/5402 (6.4%)
Ethnicity		
NZ European	15/54 (27.8%)	3406/5324 (64.0%)
Māori	25/54 (46.3%)	801/5324(15.0%)
Pacific	12/54 (22.2%)	596/5324 (11.2%)
Other	2/54 (3.7%)	519/5324 (9.8%)
Maternal age (years)	24 (17–40)	

Figure 1. NZ Deprivation index 2001 classification based on maternal address for SUDI infants referred to the Wellington Coroner 1997–2006



Sleep environment at death—Overall, 50% of infants for whom the information was known were placed to sleep in a non-recommended sleep position and 38% usually slept in a non-recommended location. Table 3 lists the position the infants were placed for the last sleep, the position found and the usual sleep position.

Table 3. Usual sleep position, position placed at last sleep and position found, for SUDI deaths referred to the Wellington Coroner 1997–-2006

Position	Usual position	Position placed	Position found
Prone	6 (11.1%)	7 (13%)	14 (25.9%)
Supine	15 (27.8%)	24 (44.4%)	23 (42.6%)
Side	3 (5.6%)	17 (31.5%)	11 (20.4%)
Side/supine	1 (1.9%)	0	0
Entrapped	0	0	3 (5.6%)
Unknown	29 (53.7%)	6 (11.1%)	3 (5.6%)

Table 4 lists the usual location for sleep and location found. Although only 12 of the cases usually slept in a double bed, 24 cases were found dead in a double bed. There were 29 (53.7%) babies bedsharing at the time of death. For one infant no information was available about bedsharing. Of the infants in the bedsharing group 16 (55%) were <3 months of age compared with 9 (37.5%) of the non-bedsharing infants. Of those placed supine, 17 were found supine and 13 of those were bedsharing.

Table 4. Normal sleep location and location found for SUDI deaths referred to the Wellington Coroner 1997–2006

Sleep location	Normal location	Location found
Cot	23 (42.6%)	19 (35.2%)
Double Bed	12 (22.2%)	24 (44.4%)
Couch	3 (5.6%)	4 (7.4%)
Basinette	2 (3.7%)	0
Own Mattress	1 (1.9%)	1 (1.9%)
Single Bed	1 (1.9%)	4 (7.4%
Car seat	0	1 (1.9%)
Unknown	12 (22.2%)	1 (1.9%)

Of the 17 infants placed on the side, 8 remained on the side but 6 of these were bedsharing. Four infants moved from side to prone, four infants moved from side to supine (three were bedsharing) and one infant was found entrapped. Two of the bedsharing infants were twins sharing a cot. Of the others, 23 (79.3%) were sharing a double bed, two (6.9%) a couch and two (6.9%) a single bed. For 12 of the infants bedsharing there was one other person in the bed, for another 12 there were two other persons in the bed, for four there were three others and for one there were four others.

Of the 10 infants found dead on a Sunday, 9 (90%) were bedsharing. The time found was between midnight Saturday and lunchtime on Sunday for eight of these infants.

Breast-feeding was the main reason for 14 of the infants sharing a bed during the last sleep (48.3%). Of those 14 infants, 13 (92.8%) of their mothers fell asleep before the infant was removed from the breast. Insufficient information was available to comment on specific bedding characteristics.

Risk factors for death in a bedsharing situation—Infants found dead on Sunday were more likely to be bedsharing than infants who died on other week days (OR 15.0, 95%CI: 1.2–185.2, p=0.04). Diagnosis at postmortem, age, sex, time of day, ethnicity, position put down, weekend death or death in the second half of the study were not significant risk factors for death in a bedsharing situation.

Change in diagnoses—There were 27 deaths in the first half of the decade and 27 in the second. Bedsharing was a factor in 12 (44.4%) of the deaths in the first 5 years and in 17 (63%) of the deaths in the second. This difference was not significant (Chi squared 1.51, p=0.22).

For 44 (80.5%) Wellington SUDI cases the Coroner had released a verdict as to cause of death. Of these verdicts 36 (81.8%) were in agreement with the pathologist's findings at postmortem. Of the eight cases that were changed, seven received the verdict "Undetermined" by the Coroner. A Coroner's verdict of SIDS or possible SIDS was given for 12 (44.4%) cases in the first half of the decade but for no cases in the second half of the decade.

The most common final Coroner's verdict in the second half of the decade was SUDI. Information presented at inquest lead to a confirmed diagnosis in only one of these cases which was to confirm a case of presumed accidental asphyxia.

Accidental asphyxia—To identify the reasons for accidental asphyxia as a cause for SUDI, all cases of suspected or presumed accidental asphyxia, as determined after autopsy, were grouped together. This resulted in 12 cases of accidental asphyxia when possible and probable cases were included (Table 5).

Table 5. Suspected mechanism for SUDI deaths concluded to be due to presumed or possible accidental asphyxia

Suspected mechanism	No cases
Breast smothering infant	2
Cot accident	2
Entrapment	2
Adult overlying infant	1
Pillow	2
Unknown	2
Plastic mattress cover	1
Total	**12**

Discussion

This study provides a profile of factors associated with post-neonatal SUDI deaths referred to the Wellington-based coronial paediatric pathology service. In this cohort of infants, 88.7% were less than 6 months old and 24.9% were preterm.

Māori and Pacific infants were over-represented in the cohort and just over half the infants were from a decile 9 or 10 area. Half had been placed to sleep in a non-recommended sleep position and just over half were found dead in a bedsharing situation. For 38% the usual place of sleep was a non-recommended sleep location.

There was a strong association between being found dead on a Sunday morning and bedsharing at the time of death. While the rate of SIDS has decreased, worldwide, deaths listed as accidental asphyxia or undetermined have increased.[16] This trend is reflected in the current study, which showed a significant decrease in the proportion of SIDS cases and an increase in cases labelled SUDI between the first and second five-year periods.

The prevalence of bedsharing among the SUDI cases in this study at 53.7% is comparable to an international prevalence of between 35-50% in cohorts based on similar criteria.[3 17 18] In this study 90% of infants who were bedsharing for the purpose of breast-feeding were not removed from the breast before the mother fell asleep. There was a significant association between bedsharing and being found dead on Sunday morning.

Increased risk of death at weekends and in particular on Sunday, was found in the New Zealand Cot Death Study and in the United Kingdom the weekend effect was more marked in younger infants.[19 20] It was not possible to determine from the current data why this might be so. Mothers in a bedsharing situation appear to usually respond well to an infant's needs during the night.[21]

It is possible that the weekend, and in particular Saturday night, might be a time when parents are more likely to socialise and the combination of staying up later than usual and perhaps consumption of alcohol, even in small amounts, may be enough to affect a mother's ability to respond to her infant's needs while co-sleeping. The increased tiredness may also mean that an infant-mother pair is more likely to fall asleep together after a feed.

Māori and Pacific infants were over-represented in this group of SUDI deaths. For Caucasian infants only 23.5% of infants were in a double bed at the time of death but the corresponding proportion for Māori and Pacific infants was 50% and 66.7% respectively. Of the infants found dead in a double bed, 66.7% lived in a decile 9 or 10 area. Deprivation is a recognised association with sudden infant death in other countries also.[22]

We were unable to get accurate data on levels of maternal smoking. This is recognised as being the main associated risk for infants in a bedsharing situation.[23,24] More recent case-control studies have shown that infants of mothers who do not smoke are also at increased risk when bedsharing in the first 3 months of life.[18,24,25] Half the bedsharing infants in this study were <3 months of age.

The rate of bedsharing in this cohort (53.7%) compares with a rate of 31.7% reported previously in 1993 from the New Zealand Cot Death study case data and 11.7% from the New Zealand Cot Death study controls.[23] The policy conclusions drawn from these data published in 1995 suggested that stopping bedsharing for all infants would have a minimal effect on the rate of sudden infant death.[26] However this analysis did not take into account age at death or maternal weight which have both been shown since to contribute to risk.[17]

It is concerning so many infants were placed to sleep in a non-recommended sleep position or location. Recent reviews of infant care practices in New Zealand indicate that prone placement of infants for sleep is now rare. [27, 28] Of the 17 infants placed to sleep on their side, only 8 were found dead on their side. Of the other 9, 1 was found entrapped, 4 were found prone, and 4 supine. This is not a recommended sleep position because of this recognised instability.

The demographic profile of the cases in this study suggests that some Māori and Pacific parents and parents from more deprived groups of the community may be less likely to either be aware of or adhere to guidelines for safe sleep practice for infants.

This study had three significant limiting factors. Firstly a lack of information in case files and medical records meant that known associations such as maternal smoking, gravida, parity and maternal weight could not be analysed. Secondly the absence of controls meant that relative risks for each risk factor could not be calculated. Thirdly, the change in use of diagnostic categories over time had to be accounted for. This was addressed by combining all unexplained deaths together and including those determined originally as SIDS and accidental asphyxia in with the SUDI deaths.

A major strength of the study is that all the cases were autopsied by one perinatal pathologist. Also the cases derived from the Wellington Coroner's jurisdiction contained all cases referred to the Coroner in the region for the ten year time period and consequently form a complete dataset for the Wellington population.

The overall rate of sudden infant death has not varied between 1997 to 2006 but there has been a significant shift in diagnostic categories from SIDS to SUDI. This trend probably reflects that more information is available to the pathologist to enable cause of death to be determined. An increasing number of deaths appear to be occurring while bedsharing.

Māori and infants from lower socioeconomic deciles appear to be at greater risk from sudden unexpected death in infancy in the Wellington region. Educational messages about safe sleeping practice need to be particularly targeted towards these groups if further improvements are to be seen in decreasing unexpected death in this age group.

Competing interests: None known.

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Acute infective conjunctivitis: evidence review and management advice for New Zealand practitioners

Genevieve F Oliver, Graham A Wilson, Richard J Everts

Abstract

In this review we present and discuss recent data and provide recommendations for New Zealand practitioners regarding the diagnosis and management of acute infective conjunctivitis. In particular, we discuss clinical predictors of bacterial versus viral conjunctivitis, a potential role for routine conjunctival culture, the benefits of topical antibiotic therapy for bacterial infections, delayed treatment algorithms, choice of topical antibiotic and the restriction of selected patients from work, school or early childhood care.

Most eye disease is managed solely by general practitioners (GPs), accounting for about 1.5% of their workload in the United Kingdom (UK).[1] Although only a small proportion of eye disease seen in general practice is potentially sight-threatening, one study of GPs revealed that 68% of 8279 respondents had 'some uncertainties about eyes' and 10% admitted that 'eyes scare me stiff'.[2]

Conjunctivitis is the most frequent cause of a red eye.[2] One in eight schoolchildren has an episode of acute infective conjunctivitis every year,[3] and on average GPs see a case every week.[1,2] Despite their familiarity with this condition, there is a wide variety of approaches by GPs to the management of acute infective conjunctivitis.

We searched for relevant English-language literature using MEDLINE and bibliographies and identified a number of studies on acute infective conjunctivitis published in the last decade. In this review we examine those data and provide practical management advice for clinicians who manage adults and children with acute bacterial and viral conjunctivitis in New Zealand.

Diagnosis

The hallmark symptoms and signs of acute infective conjunctivitis are grittiness, redness and discharge with minimal or no visual disturbance. The infection is usually bilateral. Allergic conjunctivitis is typically itchy and often seasonal or reactive and accompanied by other atopic features. It is important to consider more serious eye diseases if there is unilateral red eye, severe pain, photophobia, a drop in visual acuity or recent ocular surgery or trauma.

Few well-designed studies have examined clinical predictors of bacterial versus viral conjunctivitis, despite the importance of this distinction for treatment. Rietveld et al studied 184 adults aged 18 years or older with acute conjunctivitis and found bilateral gluing of the eyelids and absence of previous conjunctivitis to correlate significantly on multivariate analysis with bacterial conjunctivitis.[4] Patel et al studied 111 children aged 1 month to 18 years with conjunctivitis and found gluey or sticky eyelids or eyelashes in the morning and purulent or mucoid discharge to independently predict

bacterial conjunctivitis.[5] The most common bacterial causes in adults and children are *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.[3,6,7]

Swabbing the conjunctivae

No study has prospectively evaluated the utility of conjunctival culture as part of a logical algorithm in the routine management of infective conjunctivitis. Unpublished New Zealand data reveals a high correlation between preliminary (24-hour) culture results and final culture results of conjunctival swabs (> 90% positive and negative predictive value).[8] Culture results available the day after clinical evaluation could therefore be combined with clinical features to guide treatment decisions.

Certain clinical situations warrant conjunctival culture. These include infections not responding to treatment, neonatal conjunctivitis (test for *Neisseria gonorrhoea* and *Chlamydia trachomatis*), infections in contact-lens wearers, (consider *Pseudomonas aeruginosa*, *Acanthamoeba* spp. and opportunistic fungi), conjunctivitis in the setting of an outbreak (discuss testing with Public Health or Infection Control advisors) and conjunctivitis in adults who are sexually active and have other symptoms of sexually-transmitted infection or profuse purulent discharge (test for *N. gonorrhoea* and *C. trachomatis*).

Untreated, infants with ophthalmia neonatorum may develop severe ocular sequelae.[9] Serology, culture, and DNA amplification tests for adenovirus are available in New Zealand but their use is restricted to outbreak or exceptional individual situations.

Benefits of treatment

Before June 2005, more than 2 million prescriptions for ocular antibiotics were issued every year in primary care in England.[3] Given that approximately half of all conjunctivitis infections are viral and that the vast majority of bacterial conjunctivitis infections resolve spontaneously without sequelae, were these prescriptions indicated?

A meta-analysis of antibiotics versus placebo for acute bacterial conjunctivitis was published in a Cochrane review in 2006.[10] Five randomised trials including a total of 1034 participants were analysed. Clinical recovery with antibiotics was faster, especially in the first 2 to 5 days after presentation (relative risk of clinical cure 1.24; 6 patients needed treatment in order to achieve one more clinical cure than with placebo).

Six to ten days after presentation the benefit of antibiotics was less (relative risk of clinical cure 1.11; number needed to treat = 13). The benefit of topical antibiotics versus placebo was greater on microbiological cure than on clinical cure. At 2 to 5 days after presentation the relative risk of microbiological cure was 1.77; at 6 to 10 days the relative risk was 1.56.

The trial of highest methodological quality included in the Cochrane Review was a randomised, double-blind trial involving 326 children (age 6 months to 12 years) in the UK general practice setting.[3] Children were treated with chloramphenicol drops or placebo. About half a day was gained in time to resolution in those treated with antibiotic.

An additional randomised, controlled trial in 2006 (published after the Cochrane Review) assessed different management strategies for acute infective conjunctivitis.[11] Thirty general practices in southern England recruited a total of 307 adults and children over a 4-year period. Patients were randomised into three treatment groups: immediate chloramphenicol drops (every 2 hours for 2 days, then 4 times daily), delayed antibiotics (prescription to be collected at patient's discretion after 3 days) or no antibiotics. Each group was also randomised to receive an information leaflet or not as well as an eye swab or not.

Antibiotics were actually used by 99% of the immediate-antibiotic group, 53% of the delayed-antibiotic group and 30% of controls. Severity of symptoms 1 to 3 days after presentation was similar among the three treatment groups. However, duration of moderate symptoms was shorter in the immediate and delayed-antibiotic groups compared with controls (3.3 and 3.9 vs. 4.8 days, respectively). By day 8 there was no significant difference between the groups. Satisfaction with the amount of information on eye infections was greater in those who received an information leaflet and more patients also felt that the doctor dealt with their concerns well. Obtaining an eye swab increased patients' concerns about conjunctivitis.

These trials show that antibiotic treatment reduces duration of clinical illness by ½ to 1½ days. One would expect that patients would appreciate a day or so less discomfort, especially if the conjunctivitis is visually unattractive or leads to restrictions at work, school or early childhood care. Moreover, the substantial benefit of antibiotics on microbiological cure may lead to reduced transmission of pathogenic bacteria. In 2003, however, a qualitative study of patients' perceptions of acute conjunctivitis was performed in the UK,[12] which revealed that most patients who presented for treatment did so because they were unaware of its self-limiting nature.

When informed that conjunctivitis is self-limiting, most people chose to wait a few days to see if it improved, even if this resulted in a longer duration of symptoms. Patients welcomed a delayed prescription strategy as a way of potentially avoiding antibiotics and repeat visits to the doctor.

Choice of antibiotic

Randomised controlled trials of bacterial conjunctivitis reveal little or no significant difference between various antibiotics in terms of clinical efficacy.[13] Chloramphenicol is the treatment of choice in New Zealand, Australia and the United Kingdom for uncomplicated conjunctivitis in adults and children.[14–16] It has broad-spectrum activity but does not treat chlamydia or *Pseudomonas* infections.

Resistance to chloramphenicol is rare despite millions of courses having been used for decades: of 281 bacterial isolates from eye swabs submitted to Christchurch Medlab South over a 6-month period in 2008 only 3 (1%) were resistant to chloramphenicol.[7] Chloramphenicol has few side-effects.[3] A large international case-controlled study of patients with aplastic anaemia found no evidence of an association with recent topical chloramphenicol use.[17]

Fusidic acid is as effective as chloramphenicol[3] but is about four to seven times the cost and is only partly subsidised in New Zealand.[18] There are reports of emerging resistance to fusidic acid:[14] in New Zealand, for example, 14.4% of more than 11,000

Staphylococcus aureus isolates tested in 2006 were resistant to fusidic acid.[19] Moreover, one study showed that fusidic acid gel caused a burning feeling on instillation in 14% of patients.[19]

It is vital that topical antibiotics that may promote resistance to important oral agents are not used unnecessarily. Resistance develops rapidly and easily amongst *Pseudomonas aeruginosa* and other gram-negative rods to fluoroquinolones (ciprofloxacin, ofloxacin) so these should not be used outside of exceptional circumstances, such as proven pseudomonas infections.

Restriction from child-care, school, or work

The need for patients to be excluded from work, school or early childhood care is controversial and recommendations vary widely between countries, authors and institutions.[20-22] The New Zealand Ministry of Education has no guideline for children returning to school and the New Zealand Ministry of Health refers to local guidelines set by the Medical Officers of Health.

There are arguments for and against the need to restrict patients with conjunctivitis. Some reason that conjunctivitis is generally harmless and that the societal cost of restrictions is high, especially when you take into account the need for parents of children with conjunctivitis to either take leave themselves or make arrangements for childcare.

On the other hand, conjunctivitis can be uncomfortable and unsightly and both bacteria (e.g. *Streptococcus pneumoniae*)[20] and viruses (especially adenovirus)[21] can cause outbreaks in certain circumstances. An adenovirus type 8 outbreak in the Dunedin Hospital Eye Clinic in 2004 cost the District Health Board approximately $25,000 to manage and affected 15 patients and one staff member.[23]

There are few data available to guide recommendations on restriction of patients with conjunctivitis. Bacteria have frequently been isolated for a week or more after enrolment into conjunctivitis treatment trials; the isolation rate is less in groups randomised to topical antibiotics.[9] Viral excretion may persist for weeks after infection[24] and even asymptomatic or minimally symptomatic persons may contribute to transmission of organisms.[25]

The quantity of organisms and infectivity of the patient, however, decrease with time and correlate with symptoms. One mechanism for this is that as symptoms resolve the patient will less often touch his or her eye; transmission of most cases of conjunctivitis is by contaminated hand-to-hand contact. On the other hand, asymptomatic or minimally symptomatic persons may also contribute to transmission of organisms.[25]

We recommend clinicians individualise advice to patients with conjunctivitis regarding return to work, school or early childhood care based on the duration of illness, resolution of symptoms, use of topical antibiotics (only applies to proven bacterial infections), apparent infectivity of the strain (is it an outbreak?) and the patient's circumstances. For example, is the patient able to comply with good hand hygiene? Is the patient in contact with immunosuppressed persons?

Key management points

- Consider more serious eye disease if there is a unilateral red eye, decline in visual acuity, severe pain, photophobia or recent ocular surgery or trauma
- Gluing of the eyelids on waking and purulent or mucoid discharge are associated with bacterial conjunctivitis
- Preliminary conjunctival culture results (available the day after clinical evaluation) could be combined with clinical features to guide treatment decisions
- Take a conjunctival swab if the patient is not responding to therapy, a neonate, a contact-lens wearer or part of an outbreak. Also take conjunctival swabs in patients who are sexually active and there is diffuse purulent conjunctival discharge or symptoms of sexually-transmitted infection elsewhere
- Antibiotic treatment of bacterial conjunctivitis reduces duration of clinical illness by ½ to 1½ days and hastens microbiological cure
- Antibiotic treatment of bacterial conjunctivitis may be especially beneficial for patients with distressing symptoms, in outbreak situations or if the patient's infection prevents them from attending work, school or early childhood care. Once told that conjunctivitis is self-limiting, however, many patients choose to wait a few days to see if their symptoms improve without treatment
- Chloramphenicol is the recommended topical antibiotic for bacterial conjunctivitis in New Zealand as resistance among eye isolates is rare in New Zealand and it is cheap and well-tolerated
- Individualise advice to patients with conjunctivitis regarding isolation from work, school or early childhood care

Conclusion

Key management points are summarised above. Variable approaches to management of infectious conjunctivitis to date probably reflects the difficulty in clinically distinguishing bacterial from viral infections, modest benefits of antibiotic treatment and individual patient preferences regarding treatment of what is usually a benign short-lived illness. Published reports in the last decade have provided the first reliable data on clinical features of bacterial versus viral conjunctivitis, further defined the benefits of various antibiotic therapies for bacterial infections and examined the issues of patient choice and the use of delayed treatment algorithms for topical antibiotics.

Several topics require further investigation, for example, the cost-effectiveness of antibiotic treatment of bacterial conjunctivitis is unknown. There are no data available on the effectiveness of treatment with saline, ocular decongestants, povidone iodine or warm compresses. A prospective study of the use of preliminary culture results from conjunctival swab samples to guide use of topical antibiotics is underway in New Zealand.

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A case of beta lactam-induced visual hallucination

Victor Kong, Lutz Beckert, Charles Awunor-Renner

We present a case of a 58-year-old man who experienced marked visual hallucination as a result of the use of ertapenem.

Case report

Mr F is a 58-year-old man who was admitted with episodes of marked nocturnal visual hallucination, following his recent discharge from the orthopaedic service some 2 weeks previously for management of a recurrent hip wound infection following multiple operations for a femoral fracture a year ago.

Multiple resistant organisms were cultured from the wound and he was commenced on a course of ertapenem and discharged. Post discharge, he experienced marked nocturnal visual hallucinations on a daily basis. On multiple occasions, the presence of his close friends was perceived as real and he engaged in sensible conversation, only to notice their actual absence after a brief period of time.

Others episodes included seeing text messages on his switched-off cell phone, and pouring tea into an absent cup, again, noted by the patient shortly afterwards. These were also well noted by family members and were initially thought to be generalised "confusions", to the degree that the patient was constantly unsure if he was hallucinating or not. He was not delusional, remained conscious throughout and recalled these episodes in vivid detail as real events, which caused significant distress to him and the family.

These symptoms were most marked some 4 hours post dosage of ertapenem (once daily intravenously administered by the district nurse), improved the following day and recurred with repeated dosage at approximately the same time each day. He had no other specific complaints and no psychiatric history. Relevant medical histories include coeliac disease, osteoporosis and chronic liver disease. His only other medications were nadalol and alendronate.

On examination he was alert, orientated with no altered sensorium. No focal neurology was noted and there was no evidence suggestive of hepatic encephalopathy. A subsequent CT head scan was also unremarkable.

He was managed on the medical ward and continued to experience daily episodes of visual hallucination obvious to ward staff. Haloperidol was commenced with no symptomatic improvement despite repeated dosage. No other causes were found the following week, when psychiatric consultation was initially contemplated. Ertapenem was eventually suspected and was withheld for 2 days, when improvement was noticed by the patient. It was reintroduced at a lower dosage, but almost identical symptoms recurred shortly thereafter.

Following consultation with the clinical microbiologist, it was eventually discontinued and changed to amikacin. Marked improvement was noted and

eventually the rapid complete resolution of symptoms. The patient had no further episodes since and was subsequently discharged.

Discussion

Ertapenem is a potent, broad spectrum beta lactam antibiotic of a sub class known as carbapenem and is commonly used for mixed aerobic and anaerobic polymicrobial infections.[1] Hallucination is a rare adverse event, but generalised altered mental status has been documented that ranges between 3.3 to 5.1%.[2] A case of tactile hallucination has been report in the United States.[3] However, the case presented here is the only case of nocturnal visual hallucination related to ertapenem reported to the New Zealand Centre for Adverse Reactions Monitoring to date.

Mr F experienced marked symptoms on a daily basis shortly after commencing ertapenem, which occurred at specific time of the day that appeared to coincide with symtomatology. The subsequent reintroduction resulting in recurrence of almost identical symptoms, and a complete resolution shortly after its termination, are highly suggestive of their association.[4]

Ertapenem related visual hallucination is a rare but important adverse effect and is a frightening and difficult experience for the patient and family. It can be difficult to recognise and may easily be mistaken as being of non-organic origin. Consequently, a systematic review of patients' medications, with consideration for appropriate adjustment, is of crucial importance.

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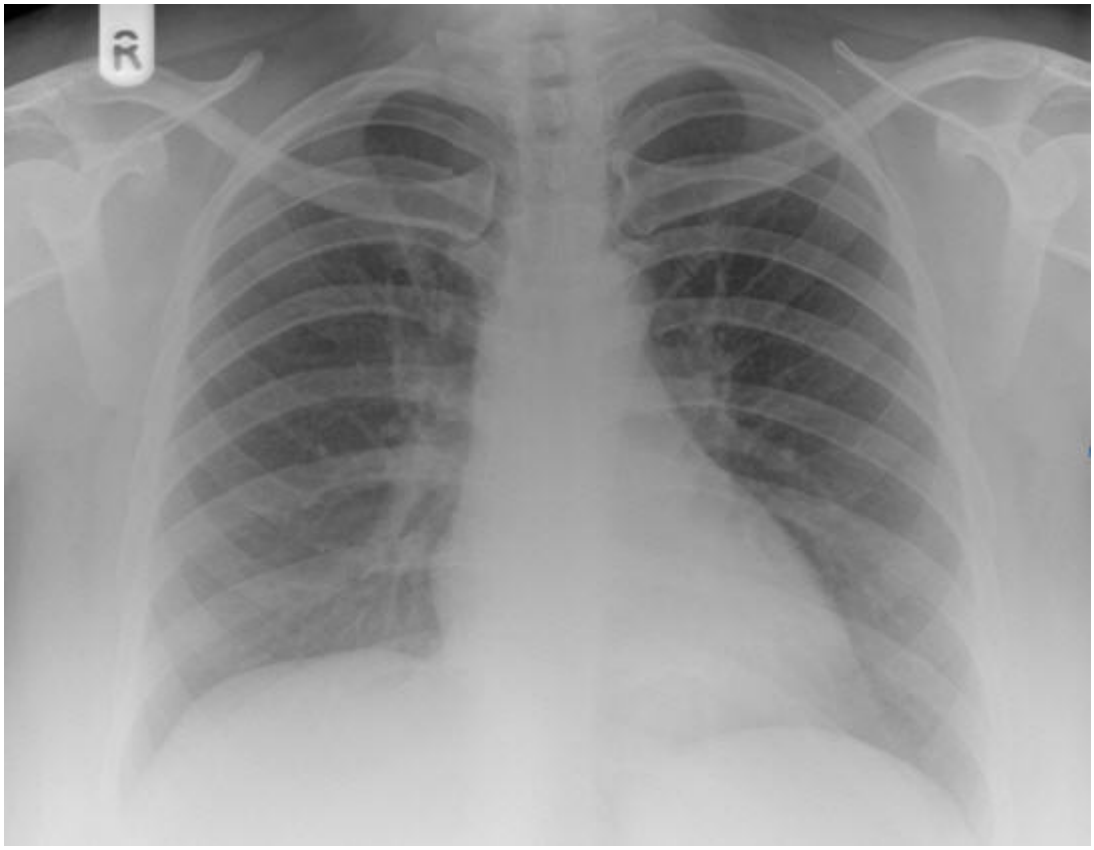
All that wheezes is not asthma

Shoaib Faruqi, Jack A Kastelik, Michael E Cowen, Simon P Hart

A 35-year-old woman presented with persistent productive cough and occasional haemoptysis for 6 months. A trial of treatment for asthma and several courses of antibiotics were unhelpful.

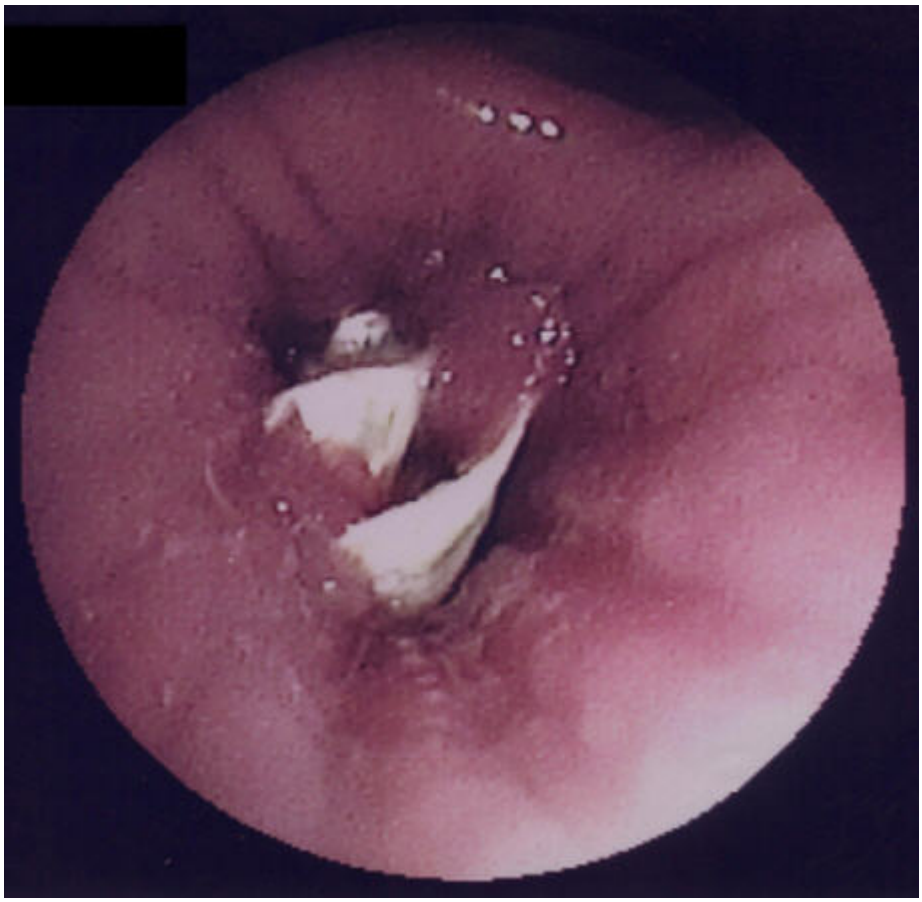
On examination of the chest, a localised wheeze was heard on the right side. An obtained chest radiograph was normal (Figure 1).

Figure 1. Chest radiograph which is normal



The unusual history and a localised wheeze on the right side prompted a flexible bronchoscopic examination which revealed the culprit plastic foreign body in a segmental bronchus of the right lower lobe with overlying granulation tissue (Figure 2).

Figure 2. A plastic "foreign body" is seen in a basal segment of the right lower lobe on flexible bronchoscopy



The foreign body was removed following a rigid bronchoscopy, leading to amelioration of her symptoms. There was no history to suggest foreign body aspiration.

Foreign body aspiration, though more common in children, can present in any age group. The typical presentation is as an acute emergency, however occasionally an insidious presentation may be noted. In adults, foreign body aspiration usually occurs due to failure of airway protective mechanisms and less frequently accidentally.

As in our case, small foreign bodies may lodge in segmental bronchi mimicking other lung conditions such as bronchial asthma. A high degree of clinical suspicion is needed to make the diagnosis, which if missed can lead to serious consequences.[1,2]

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Carbon monoxide poisoning on a motor launch: part 2

Published in NZMJ 1909;7(30):42–45 and written by Dr W J Barclay, Thames.

Continued from part 1 at http://www.nzmj.com/journal/122-1297/3667

Upon further enquiry it was found that it is not unusual for the men attending to these engines in the cabins of launches to experience toxic symptoms of a lesser degree, e.g., headache and dizziness. Thus the engineer of this same launch stated that, on the same night as the fatality occurred, he himself "felt queer," but was able to continue at work till the boat arrived home. He was able to help with the corpse, and rode off on a bicycle for assistance, but on returning he partially collapsed. I found him sitting in the wet grass against a fence, feeling faint and with a feeble pulse. He had to be helped indoors, but recovered with rest and stimulation.

This collapse, some time after coming into the fresh air, is like what is experienced in C.O. poisoning, and I think the engineer of this launch undoubtedly suffered from this in a minor degree.

The difference in degree of poisoning is probably explained by the fact that the visitor was sleeping in the very fore part of the cabin, in a recess extending under the deck and without any opening for ventilation, whilst the engineer was sitting at the back of the cabin receiving the benefit from an open port-hole fixed halfway forward in the cabin. Thus the visitor lay in comparatively stagnant air ; the engineer sat in the best ventilated part of the cabin.

Carbon monoxide is a particularly dangerous gas. When mixed with air it has no warning smell, and is easily breathed ; hence its action is insidious. And it is also very deadly.

THE NEW ZEALAND MEDICAL JOURNAL
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Feminisation of the medical workforce

We have all noted this in recent years but what about some facts? A recent detailed analysis by the Royal College of Physicians shows that 40% of all doctors in Britain are women. Among general practitioners (GPs), 42% are female. By 2013, says the College, a majority of GPs will be women, and by 2017 there will also be a majority of women doctors in hospitals. It is also noted that women account for 60% of all medical students in Britain, a figure mirrored in New Zealand—your scribe finds his territorial figure to be 59%.

Clearly there are great benefits arising from more women in medicine. However, and a very important however, there will be a profound problem arising unless training numbers are increased to allow for the biological events inevitable in the feminine workforce.

The Guardian Weekly, 12/6/09, p14.

Intensive insulin therapy for the critically ill

Hyperglycemia is associated with adverse outcomes, including increased mortality, in acutely ill patients. A number of randomised trials have tested the hypothesis that intensive insulin therapy might reduce in-hospital mortality. One, in particular, demonstrates that intensive insulin therapy, targeting a blood glucose concentration of 4.4–6.1 mmol/L, significantly reduced in-hospital mortality.

This trial involved patients in a surgical Intensive Care Unit (ICU). The researchers in this abstracted paper speculate on whether this conclusion has wider merit. Their meta-analysis included 26 trials which involved 13,567 patients. The overall interpretation of their meta-analysis was that intensive insulin therapy significantly increased the risk of hypoglycemia and conferred no overall mortality benefit among critically ill patients. However, it is interesting to note that benefit was noted in the 5 surgical ICU reports where the Odds Ratio (OR) for death was 0.63 (cf OR 0.93 in all 26 trials).

CMAJ 2009;180(8):821–7.

Heart failure therapy guided by N-terminal brain natriuretic peptide (BNP)?

The proposition that BNP levels might enable clinicians to manage heart failure more effectively was first raised by New Zealand researchers in 2000. The paper reported on in this abstract is the fifth randomised trial evaluating the issue of BNP versus symptoms in the management of heart failure. 499 Swiss patients aged 60 years or older with systolic heart failure (ejection fraction ≤ 45%) were randomised to symptom or BNP-guided therapy.

Overall, clinical outcome or quality of life was similar in each arm, but age group sub-analysis showed that BNP guided treatment improved outcome in patients aged 60-75 years but not in the 75 years or older group. A reviewer of the paper notes information from the 5 trials is that the strategy of using N-terminal BNP-guided therapy appears safe in patients younger than 75 years (i.e. no excess of hypotension, renal failure, or hyperkalemia) and some data suggest a modest reduction in mortality for some patients.

JAMA 2009;301:383–92 & 432–4.

Cervical cancer smear tests for women after age 50 years?

Some believe that women with a history of negative smear tests can cease such testing when they reach 50 years of age. Is this sound advice? This report from the Netherlands is based on their national data register. The data presented compares the incidence of cervical cancer in women who have had three previous consecutive negative smears and were either aged 30–44 years or 45–54 years of age. The cohorts were large, 218,847 and 445,382 respectively, and the follow-up was 10 years.

Cancer incidence was 41/100,000 in the younger group and 36/100,000 in the older women (p=0.48). So even after several negative smear results, age is not a good discriminative factor for early cessation of screening.

BMJ 2009;338:1058–61.

Type 2 diabetes and coronary artery disease

The authors of this paper note that the optimal treatment for patients with both type 2 diabetes mellitus and stable ischemic heart disease has not been established. This multi-centre trial attempts to solve this problem. 2368 patients with both type 2 diabetes and heart disease were randomly assigned to undergo either prompt revascularisation with intensive medical therapy or intensive medical therapy alone and to undergo either insulin or oral hypoglycaemic drug treatment.

Randomisation was stratified according to the choice of percutaneous coronary intervention (PCI) or coronary-artery bypass grafting (CABG) as the more appropriate intervention. At 5 year follow-up there was no significant difference in the rates of death and major cardiovascular events between patients undergoing prompt revascularisation and those undergoing medical therapy, or between those taking insulin or those being treated with oral hypoglycaemic drugs.

N Engl J Med 2009;360:2503–15.

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Use of placebos by New Zealand doctors

In 1982, the use of placebos in New Zealand general practice was investigated and it was found that "almost all GPs surveyed would deliberately use a placebo under certain circumstances".[1] Given the implicit deception, it has been suggested that placebo use could harm the doctor-patient relationship.[2,3] However, a recent New Zealand survey suggested that "patients seem to consider placebo use appropriate", at least "when it is for the benefit of the patient, at the patient's request or there seems to be no available alternative treatment".[4]

When a recent request to the Medical Council of New Zealand about placebo use revealed that no guidelines currently exist (personal communication), we decided to again survey New Zealand doctors regarding their use and beliefs about placebos.

Methods—A non-probability sample of New Zealand registered medical practitioners was recruited via an online medical research review website (n=15), by direct email (n=25), and by conventional post (n=117) from a register of all general practitioners located in Western Bay of Plenty and the lower North Island.

Questions were asked about: frequency of placebo use; type of placebo use; information provided to patient; belief about placebo effectiveness; and, reason for using placebo. Response options were closed format, although each question had the option to provide further information. Two questions from the 1982 survey were included to enable comparisons over time.

Results—Respondents were 62 (39.5%) female and 95 (60.5%) male registered medical practitioners with a mean age of 51 years. When asked to state their speciality, 137 (87.3%) stated GP, 10 (6.4%) medicine, and 10 (6.4%) 'other'.

Seventy-eight (49.7%) of respondents reported that they had administered or prescribed a placebo, defined as treatments where there has been no demonstrated clinical efficacy, in the previous year, and 45 (28.7%) reported they had never administered or prescribed a placebo (see Table 1).

Table 1. Frequency of prescribing or administering placebo

Frequency	Number	%
More than 10 times in the last month	2	1.3
More than 10 times in the last year	22	14.0
1–10 times in last year	54	34.4
Not at all in the last year	33	21.0
Never	45	28.7
Missing	1	0.6
Total	**157**	**100.0**

The most commonly used form of placebo was antibiotics for viral or other non-bacterial diagnoses (108), followed by vitamins (61), herbal supplements (19), sub-therapeutic dose of medication (14), saline infusions or saline intramuscular injections (3), and sugar or artificial sweetener pills (3). There were 25 'other' responses (e.g. Bach's flower rescue remedy).

The most common information given to patients about the placebo was that 'it is a substance that may help and will not hurt' (53). Other responses were that 'it is medication which will improve their symptoms' (16), 'it is medicine with no specific effect' (5), 'it is a placebo' (2), 'nothing' (12), and 'other reasons (21).

Six (3.8%) respondents reported that placebos have no therapeutic effects whatsoever and 10 (6.4%) believed effects occur rarely, whereas 91 (58%) of participants believed they occur sometimes and 46 (29.3%) believed effects occur often.

The most common reasons for administering or prescribing placebo were after unjustified demands for medication, for non-specific complaints, and after all clinically indicated treatment possibilities were exhausted. Alternative responses for administering or prescribing placebos are reported in Table 2.

Table 2. Reasons for administering or prescribing a placebo

Situations where placebo prescribed	Frequency	%
After "unjustified" demand for medication	53	33.8
For non-specific complaints	39	24.8
After all clinically indicated treatment possibilities were exhausted	37	23.6
To calm patient	26	16.6
To get patient to stop complaining	19	12.1
As a diagnostic tool (i.e. to distinguish between psychogenic and organic causes of symptoms)	14	8.9
Other	14	8.9
To control pain	7	4.5
To buy time before next regular dosage of medication	5	3.2

Table 3 summarises the questions that were repeated from the 1982 survey.

Table 3. Questions from the 1982 survey

	Answer	1982 (%)	2009 (%)
Would you consider administering a bandage or dressing to a painful area (especially for a child) to relieve pain and anxiety, even though this action will have little known effect on the injury?	Definitely not	5.4	3.8
	As a last resort	10.8	23.6
	On rare occasions	45.9	9.6
	Fairly frequently	16.2	22.9
	Definitely appropriate	21.6	34.4

	Answer	1982 (%)	2009 (%)
You suspect a patient of being a malingerer, would you consider the use of a placebo to determine if their pain is organic or not?	Definitely not	35.1	15.9
	As a last resort	18.9	3.8
	On rare occasions	27.0	54.8
	Fairly frequently	5.4	2.5
	Definitely appropriate	13.5	17.8

Discussion—Around three-quarters of New Zealand doctors who completed the survey reported having administered or prescribed a placebo, around half of respondents had done so in the previous year and 1 in 7 had done so more than 10 times in the previous year. Comparison with the 1982 survey suggests that use of placebos has if anything increased over time. These findings are similar to those from a recently published survey of 12,000 USA doctors which found that around half prescribed placebo treatments on a regular basis.[5]

Our findings suggest placebos are used to placate patients for whom active interventions are either not available or have been exhausted. Given that placebos clearly do have effects, we consider such use to be consistent with medical ethics so long as the doctor considers their use to be in the best interests of the patient.

However, we are concerned that 'antibiotics for viral or other non-bacterial diagnoses' was the most commonly prescribed form of placebo, as this leads to an increased risk of antibiotic resistance in the community and also risks side effects for the individual. The use of antibiotics as placebos suggests that guidelines from the Medical Council regarding the use of placebos would be useful.

Our survey findings are limited by the sampling methods used. However, we believe that these findings are likely to be broadly representative of placebo use in New Zealand and warrant further research, debate, and official guidance for doctors.

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Response to letter from the NZ Council of Homeopaths

Gwyneth Evans, on behalf of the NZ Council of Homeopaths, has put a positive spin[1] on our homeopathy survey findings.[2] Our survey investigated whether patients presenting to their GP believed that homeopathy worked, understood how it worked, and whether it contained any active ingredients, not whether homeopathy was effective.

To answer her specific points, firstly, beliefs about effectiveness and measurable outcomes are not the same thing; that is, a belief that homeopathy is effective is not proof that homeopathy is effective. We do note, however, that positive beliefs may predict placebo effects.

Second, our brief survey was not funded. We were concerned that people are wasting their time and money on homeopathy and wanted to understand why it was popular. The survey showed that almost every user was unaware that there were no active ingredients present in homeopathy products.

Third, we see no need to further add to the body of scientific knowledge into the healing powers of homeopathic remedies as it is clear-cut: homeopathic preparations have been diluted beyond the level where a single molecule of the original substance is likely to remain and therefore any homeopathy can only work by simple placebo effect. This is why it has never been shown to have effects greater than placebo in a well-conducted clinical study that can be replicated.

Homeopathy is like the Emperor's new clothes—there is nothing there. To claim that homeopathic products contain energy from active ingredients that *were* present, but that this energy cannot be detected, is little different to witchcraft. By way of example, there is a Berlin Wall homeopathy product that had dust from the wall in it before it was diluted away, used for asthma, headaches, insomnia and other conditions.[3]

A recent survey showed that around 1 in 8 New Zealand GPs refer patients to homeopaths.[4] We urge these doctors to stop referring patients to a form of treatment that has no scientific evidence or plausibility, as referrals give homeopathy credibility it does not deserve. If doctors want to prescribe or recommend natural treatments, there are many that are supported by good evidence.[5]

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New software for modelling impacts of regional nuclear war: relevance to New Zealand

Political and social instability in various parts of the world make the risk of a regional nuclear conflict a real concern. As United States (US) President Barack Obama stated recently: "In a strange turn of history, the threat of global nuclear war has gone down, but the risk of a nuclear attack has gone up".[1] Nine countries now have nuclear weapons and around 40 more have the capability to build them within a matter of months according to International Atomic Energy Agency (IAEA) Director General Mohamed ElBaradei.[2]

Previous New Zealand work explored the impacts of nuclear war on this country,[3,4] but this focused on "full-scale" wars between the US and the then Soviet Union. Contemporary research has updated and extended earlier studies to explore the effects of a regional nuclear conflict, such as a war between India and Pakistan.[5–7]

New modelling and software animation shows how dust from even a "limited" nuclear war (i.e. one involving around 100 Hiroshima-sized nuclear bombs, representing less than 0.03% of the total explosive power of the world's current nuclear arsenals), could spread to the atmosphere above New Zealand only 11 days after the attacks (http://www.nucleardarkness.org/index2.php?p=warconsequences&menu=fivemilliontonsofsmoke).[8] The modelling suggests that this dust would reduce the surface air temperature in New Zealand by two degrees Celsius in years one to two and reduce the length of the growing season in parts of the country.[6] These changes could directly harm New Zealand agriculture, however this would probably be minor compared to the indirect impact arising from the social, environmental and economic devastation a nuclear conflict would cause in countries that New Zealand trades with.

Tens of millions of people would be likely to die immediately in and around the cities attacked in such a regional nuclear war. The rapid spread of atmospheric dust around the world from the fires in attacked cities would bring about: severe frosts, shortened growing seasons, reduced rainfall, monsoon failure and a substantial increase in ultraviolet radiation.[7,9,10] The severe damage to global food production brought about by such climatic changes would have enormous health consequences among the world's most vulnerable populations. It has been estimated that a billion people worldwide would starve to death in the resulting famines.[9] Given the historical correlation between famine and disease, infectious disease epidemics are another possible result of such a war.[9]

While New Zealand has a good track record in terms of rejecting nuclear weaponry,[11,12] far more needs to be done to prevent such potential wars and to promote nuclear disarmament internationally. The time is ripe for New Zealand health workers, disarmament advocates, officials and politicians to greatly intensify their efforts in the nuclear disarmament field.

Individuals can join a range of disarmament non-governmental organisations or engage with their political representatives to encourage the New Zealand Government to:

- Show stronger leadership, along with a grouping of other like-minded, progressive, small and medium sized countries, in pushing for a Nuclear Weapons Convention[13] (or at least for alternative models towards nuclear weapons abolition).
- Extend the excellent work done at the United Nations by New Zealand in calling for all nuclear weapons to be taken off high alert.
- Improve its own funding support for disarmament advocacy and research (the current estimated funding for disarmament in New Zealand is less than 1% of the defence budget).

The traditional argument against such actions is that they might negatively impact on New Zealand's chances of securing a free trade deal with the US. With such a deal already under negotiation and a current US President strongly in favour of seeking "the peace and security of a world without nuclear weapons",[1] there has never been a more opportune time for New Zealand to take the lead in pushing the nuclear disarmament agenda forward.

Competing interests: All of the authors have worked for non-profit, non-governmental organisations promoting nuclear disarmament and two (NW and AW) are members of the non-profit organisation: International Physicians for the Prevention of Nuclear War (NZ Branch).

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John Morrison Bird

MBChB, FRNZCGP (20 March 1931–21 March 2009)

Dr John Bird's career as a general practitioner spanned 47 years, most of which was spent as a sole practitioner in the Christchurch suburb of Aranui.

He was born in Greymouth. His father, Dr William Anderson Bird, practiced on the West Coast for over 40 years.

John was the second of four sons, three of whom went on to become General Practitioners.

He attended Grey Main School until he came to St Andrews College as a border where he excelled at science and mathematics.

On leaving school, he joined his brother at Otago Medical School where he graduated MBChB in 1954. He moved to Christchurch to become a House Officer in 1955 where he met Alison Hughes.

They were married in 1957, the same year he entered general practice in Runanga.

He spent 2 years in Runanga, where he was introduced to the challenges of practicing in a small isolated community. The stories he told of that time included one of his first patients being a mine pony that had lacerated its scalp. John perched on top of a fence to stitch the "patient" while several burly miners held the pony in place.

In 1959, he took over Dr Bert Brant's practice in Aranui where he practiced until 1991. He was a sole practitioner throughout this period, with the surgery attached to the house. This meant that the family was very much part of the practice and home life revolved around surgery hours, house calls, and providing obstetric care. While a 'sole practice' in name, it was really a partnership between John and his wife Alison, who supported him in every way.

Soon after they married, Alison knitted John 'the blue jersey' that was to accompany him throughout his years in practice. It was pulled over his pyjamas late at night on his way out to yet another house call. That blue jersey was the first thing that many of his patients saw in this world.

For many years, he shared his on call responsibilities with Dr Colin Reece (every second night and every second weekend) before a wider roster developed in the eastern suburbs. John often spoke of the importance of house calls to general practice—he was always acutely aware of the role of the general practitioner in the community.

He was equally committed to providing on-the-job experience for medical students thinking of a career in general practice. John would go out of his way to make this a

valuable experience and I know that his efforts were appreciated by the students. We have decided that the donations of friends and family and a portion of the estate will go to a prize for Otago Medical School students specializing in general practice.

He was never too busy to make time for anyone in genuine need and was never truly off duty. Our holidays were punctuated with John being called to stitch wounds, treat sunstroke, and reset dislocations. For those who could not make ends meet, the subject of fees was never raised—his philosophy was that the health outcome was more important than personal gain and many benefited from his generosity over the years.

He became a Member of the Royal College of General Practitioners in 1975 and took real pride in being accepted as a Fellow in 1988. John retired from full time practice in 1991, but still took on locum work until 2004. This allowed him to remain actively involved in general practice which was his passion.

John retired from practice in 2004, the same year that Alison died. He made three trips to China to visit his son Nathan, continued his love of gardening, and rediscovered his joy of painting. He was devoted to his grandchildren and was active right up to his death. He had accompanied his granddaughter to Dunedin to show her his old university “haunts” only 1 month before he died.

John epitomized the dedication and compassion so necessary for general practice. His quiet and unassuming manner belied the contribution he made to the medical community at large and the support he gave to so many patients and families through difficult times. His love and commitment to medicine as a vocation was only matched by his love and pride in his family—we will remember him as a gentle man and a true gentleman.

John died peacefully in Christchurch after a short illness.He is predeceased by Alison and is survived by his three children Michael, Jenny, and Nathan and their families as well as his three brothers Bill, Barry, and Chris and their families.

Michael Bird, John’s eldest son, wrote this obituary with help from Jenny and Nathan.

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David Cargill Heaton

July 1943–May 2009

David's quiet humanitarianism inspired many of those who worked with him. He was one of the leaders in Haematology in New Zealand in the 1980s and 1990s, and his death due to cancer at only 65 years has saddened many.

David was born in Queensland, Australia in 1943, the son of a Methodist Minister. He attended medical school in Brisbane, and in 1972 he became a haematology trainee in the Prince of Wales/Prince Henry Hospital in Sydney.

He was subsequently offered a consultant position in Christchurch, a city he had visited as a young elective student.

Although Lyn, his wife, had never been to New Zealand, she took it on trust that Christchurch would be place that they would enjoy living for many years. David contributed to Haematology and General Medicine in Christchurch for the next 24 years (1977–2001).

He was one of the founding members of the New Zealand Association of Haematology, holding the positions of Secretary and Treasurer, and then President (1988–1990). He was an examiner of the Royal Australasian College of Pathologists, as well as Chief Examiner for the Technologists Board (NZIMLT).

In his early days in Christchurch, he had particular involvement with the transfusion service. During this time, noting the falsely high platelet count given by the laboratory machine on a young man with aplastic anaemia, he made the original observation that red cells of patients who were Kidd negative lacked the urea transport system. This finding was subsequently confirmed by the Mayo Clinic in 2003.

Although in his modesty he didn't necessarily seek such positions, David's innate sense of fairness and integrity made him a natural leader. In 1987, David returned from a meeting in Australia to find that the Chairman of Pathology Services had died unexpectedly and that David in his absence had been nominated to take over the leadership of Pathology Services in Christchurch. Having had this position thrust upon him, he took it very seriously and obtained a DHSM from Massey University. Although he relinquished that position during the "health reforms" in the 1990s, he remained Medical Director of the Haematology Laboratory until 1999.

One of the things the Christchurch hospital community will remember David for most is his role in the creation of the "Haemostasis Service". During the era of HIV infections in haemophiliacs he had become increasingly involved with haemophilia at a local and national level. From 1993 to 1998 he chaired both the Haemostasis

Committee of the NZHS and the Medical Advisory Committee of the New Zealand Haemophilia Society, out of which came the National Treatment Guidelines. In the early 1990s he used his abilities in drawing people together to create hospital-wide guidelines on treatment of thrombosis and to set up the much valued outpatient Haemostasis Service.

He moved to Liverpool, Sydney in 2001 for family reasons and worked there until unexpected ill health forced him to retire in 2007.

David's prime concern as a doctor was to treat patients as humanely and effectively as possible. For this reason, his patients loved him and his colleagues held him in very high regard.

He was also always a very dedicated family man. He will be greatly missed by his wife Lyn and their three children.

Dr Ruth Spearing (Consultant Haematologist at Christchurch Hospital) wrote this obituary with assistance from David's family.

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The Elderly: legal and ethical issues in healthcare policy

Martin Lyon Levine (editor). Published by Ashgate Publishing Ltd, 2009.
ISBN 9780754620440. Contains 590 pages. Price £117.00 (online)

This book is part of a series called *The International Library of Medicine, Ethics and Law*.

The editor of the series as a whole says its aim is to provide access to basic materials in the area from a number of disciplines, partly on the basis that any one library is unlikely to have access to all the periodicals and books from which the material is drawn.

The elderly are the focus of this volume, edited by a scholar with academic appointments in a number of schools within the University of Southern California, namely law, gerontology, and medicine.

The text contains a series of reprints, all from journals, focussing on legal, ethical, and clinical aspects of the care of older adults, and spanning the years 1982 to 2004.

The reprints are loosely organised into four parts: Healthcare in an aging society, Decision-making for the older patient, Are the needs of the elderly met?, and Distributive justice. The journals are legal periodicals and the clinical and bioethical literature. There is a largely United States focus but journals from the United Kingdom, Hong Kong, and Australasia also feature.

Although there is an introduction setting the scene for the topic the papers are not accompanied by a commentary. It is not clear how the papers were identified or selected for inclusion, and the material is not indexed apart from the grouping of the papers in the contents by sub-topics within each major subject heading. There is considerable variation in the depth of coverage of various topics by the papers selected. For example one reprint is a short commentary on an original piece of research concerning the Oregon State Death with Dignity Act, rather than a reprint of the original research paper. The material is also inevitably out of date in some respects. A paper discussing international trends refers to New Zealand's 10 health boards. If the material concerning other countries is similarly out of date its value may be reduced.

The reprints are taken directly from the journals and resized to fit the book with an uncomfortable reduction in the font size for some reprints, making it difficult for those of us with presbyopia to read the material comfortably. There is also variation in the clarity of reproduction.

The book would be of most use to academics, clinicians, and legal practitioners wishing to get a flavour of the issues around older adults, the law and ethics, rather than an in depth understanding or detailed review of these areas.

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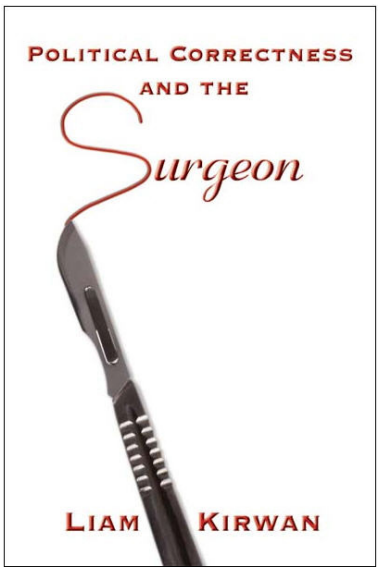
Political Correctness and the Surgeon

Liam Kirwan. Published by AuthorHouse (UK), 2008. ISBN 9781434346223 (paperback). Contains 300 pages. Price £7.30 + shipping

Liam Kirwan was a professor of surgery from Cork, Ireland who has gone into print.



His book draws on many years of hospital practice. I believe it should be required educational reading for those embarking on a career in secondary healthcare, and recommended as entertainment for those in that area of practice who are approaching retirement. It will also reassure those in the latter group that they are not alone and that the managerial madness they have witnessed is an experience they share with colleagues in some other overseas healthcare systems.

In essence, Kirwan's message is that the spirit of managerialism has not been exorcised. It still haunts and perverts hospital and related systems elsewhere in the developed world. Furthermore, it uses political correctness as an important tool to retain its pervasive power over unwitting clinicians.

His message is conveyed as a long and extensive monologue from himself to a mysterious senior management figure called Patricia (*Hospital Correctitude Commissar*).

In this monologue, the areas of managerial madness are described and explored in detail. All the individuals, offices, processes, and procedures are given descriptively comical names (*The Maladroit Fellow* is a surgeon who prefers *Pseudowork* i.e. attending management meetings. *The Wizards of the Black Hole* preside over the smoke-and-mirrors of contemporary healthcare accounting. *The Time Police* from *Fortress Brussels* exercise totalitarian powers over *allowed* hours of work).

Indeed, the reader is left in no doubt that, in the latter part of his career, the good professor found himself in an absurd Alice in Wonderland environment where the inmates had taken charge of the asylum.

The prose is richly Celtic, and some of the sentences are longer than Judge Jeffreys', but the whole work is extremely entertaining for its droll language and dark insightfulness. It would make good bedtime reading and an agreeable present for any hospital colleague with a sense of humour.

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