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This Issue in the Journal

Bacterial contamination of platelet concentrates produced in New Zealand

Michelle Dickson, Dorothy Dinesh

Platelet concentrates are blood products used to prevent or treat bleeding and are frequently transfused in patients with leukaemia. The concentrates are stored at a warmer temperature of 22 degrees Celsius and therefore have a higher chance of bacterial growth. Bacteria in blood products can cause severe transfusion reactions and can even be fatal. Our paper summarises the strategies in place in New Zealand to monitor and prevent platelet bacterial contamination. It also provides data on contamination rates and compares this to rates reported in other countries.

A tale of two cities: paradoxical intensity of traffic calming around Auckland schools

Timothy Hopgood, Teuila Percival, Joanna Stewart, Shanthi Ameratunga

The school journey is a common context for child pedestrian injuries in New Zealand. The populations at higher risk are known and these are preventable injuries which traffic calming interventions have demonstrated effectiveness in reducing these rates. This study compared the distribution of traffic-calming modifications around schools in areas of high and low socioeconomic deprivation in Auckland and Manukau Cities. This study found socioeconomically least-deprived schools had more traffic calming interventions than the most deprived schools, and Auckland schools had more interventions than Manukau schools. Traffic calming measures were observed more commonly in less deprived areas where the risks of child pedestrian injuries are generally lower.

The San Francisco Syncope Rule performs well in a regional rural emergency department in New Zealand

Andrew Munro, Rosie Whittaker

As a group, people who faint have a low but consistently measurable rate of short term threat to life (related to heart form or function, hidden bleeding, clotting or brain event). Making a clinical judgement about this small risk can be difficult but may be assisted by the use of a scoring system (also referred to as decision, instrument, tool or support). It is important that the tool is robust enough to 'catch' those all people with a life threat whilst not being so blunt as to falsely identify people who have no such threat. This study although small supports a number of similar studies in predicting risk with reasonable accuracy. This summary assists the media and other lay readers in understanding your paper and identifying any significant or important points/findings.

The high volume debate in a low volume country: centralisation of oesophageal resection in New Zealand

Edwin Beenen, Welson Jao, Grant Coulter, Ross Roberts

In contemporary medical research for complex surgical procedures, like the resection of the oesophagus for cancer, there is a focus on high volume work load as it is assumed that this will decrease perioperative mortality and improve long term outcome. Most of this research is based on large databases and does not allow for further investigation on why exactly this advantage exists. Furthermore in a large country with a small population like New Zealand and thus a very low population density and therefore a low workload of operable oesophageal cancer it is very debatable if high volume centres could or should exist.

Being a low volume centre according to world standards (although no strict consensus has been reached about volume size) we have reviewed our results of oesophageal resections and found that our results with a perioperative mortality of 1.6% and a 5-year survival rate of 39.7% are very decent results and comparable to large centres worldwide. We therefore argue that a good standard of care for the resection of the oesophagus can be obtained by small volume centres. Also because of the small population size and the expected low incidence of oesophageal cancer within New Zealand we question the need and the feasibility of high volume centres. Rather than focussing on just volume size, the six cancer centres in New Zealand should improve and keep their practises up-to-date by collaboration, exchange and monitoring of results and working methods.

Reduction mammoplasty and resource allocation—are patients being treated fairly? An examination of the current New Zealand situation, and looking towards the future

Eloise E Dickie, Jeremy W Simcock

In New Zealand, there is inequitable access to surgery for patients who would be treated by breast reduction, with substantial variation across geographical location and time. A Ministry of Health Plastic Surgery Prioritisation Tool is in development, which may address this discrepancy. There is much evidence that exists illustrating quality-of-life gains for reduction mammoplasty are equivalent to other surgical procedures, which are more readily available, such as orthopaedic joint surgery. The challenge is to improve equity of access across all surgical conditions.

Murine typhus and leptospirosis presenting with undifferentiated symptoms of an acute febrile illness to Waikato Hospital, New Zealand, 2009–2010

James Irwin, Deon Tredoux, Graham Mills

Patients presenting to hospital with a febrile illness are often discharged without a clear diagnosis. This study aimed to identify what proportion of these patients presenting to Waikato Hospital have leptospirosis or murine typhus (an infection carried by rat fleas). Fifty-seven patients were studied. Nine were diagnosed with leptospirosis, five with murine typhus, three with Epstein-Barr virus (EBV), two with cytomegalovirus (CMV), five with bacterial sepsis and six with other diagnoses. A low blood platelet count was associated with murine typhus infection, and a low lymphocyte (white blood cell) count and rural occupation with leptospirosis. There was a trend towards rural residence being associated with murine typhus infection. These two infections were the most common cause of undiagnosed fever severe enough to warrant referral to Waikato Hospital. A similar profile of infection may be present in other rural regions of New Zealand.

Pay attention [to the road] or pay the price

Alistair Woodward, Jamie Hosking, Shanthi Ameratunga

If you caught a bus recently in Auckland, New Zealand you are likely to have seen a poster headed *Pay attention, or pay the price*. It shows a pedestrian simultaneously texting and stepping off the curb into murderous traffic.

Many safety campaigns of this kind have been run in the past: a quick search on Google identifies a number that have used exactly the same slogan. The message, which is popular because it is intuitively obvious, is that road users should drive, ride or walk carefully to avoid injury.

There are three problems with this approach to road safety. The underlying logical model is circular. Not paying attention, or not being careful, is defined by the consequences. And the consequence (injury) is attributed to lack of attention or due care. Second, there is no evidence that interventions of this kind work.

Publicity and awareness raising campaigns are certainly important as part of a comprehensive programme (e.g. drink driving advertisements in conjunction with legislation and a high level of enforcement). But on its own, urging road users to be careful is pouring money into a black hole. Humans do not have the necessary psychological resources to “pay attention” all the time to all possible threats.

Even if the spirit was willing, our brains don’t work that way. It has been shown many times, in many different settings, that we see what we expect to see. For example, in an environment in which cyclists and pedestrians are uncommon, the brain is tuned to recognize cars. Failing to see a cyclist is not necessarily due to lack of care; there may be a physiological explanation.

However the most important objection to relying on “be careful” messages is that there are other, well-demonstrated, highly cost-effective routes to improved road safety. One of us worked in injury research in South Australia at a time when road-side power poles typically consisted of two steel beams held together by a generous filling of concrete.

The research team studied injuries that occurred when cars collided with these poles, and took its findings to the Highways Department. Might it be a good idea if another, less harmful design was adopted? This suggestion caused a good deal of amusement, because, as one of the senior engineers put it, “I’ve never seen a bloody Stobie pole jump out into the middle of the road and cause an accident”.

Fortunately, this one dimensional view of road safety did not hold sway. The Stobie pole (named after the man who invented it) is not extinct,¹ but energy absorbing alternatives are now standard items and have contributed to the dramatic reduction in serious crash injuries in Australia and elsewhere.²

Another incarnation of “pay attention or pay the price” is legislation that specifically penalizes one class of road user for crashes that cause injury to other, more vulnerable, road users. Most frequently this would apply to drivers of cars and trucks

who are responsible for a crash that injures a pedestrian or cyclist, although it might conceivably apply elsewhere (e.g. a cyclist/pedestrian collision).

The idea for such a law in New Zealand has been given some impetus by recent, widely publicized car versus cyclist crashes. It makes sense, some might say, to penalize the drivers of cars and trucks more severely if they are responsible for injuries to cyclists, because the interaction is so one-sided. (How often is a driver seriously injured by a cyclist?)

Shifting liability onto drivers, and raising the stakes if a crash does occur, would be big steps towards improving behaviour on the roads and instilling a European-style safety culture.

Weiss and Ward have taken a close look at these, and other arguments for a vulnerable road user protection law in New Zealand.³ They point to other jurisdictions, typically in the United States, where such laws apply.

In some European countries the onus falls on drivers to pay for the costs of any crash involving cyclists and pedestrians, but as Weiss and Ward point out, provisions of this kind have little relevance in New Zealand. There have apparently been no evaluations of the effectiveness of vulnerable road user protection laws. But there are good reasons to suspect that legislation would not act as a significant deterrent.

In this context, carelessness is difficult to define as it is, strictly speaking, apparent only after the event. We note also there is short step between ‘carelessness’ and ‘culpability’ and a focus of this kind on individual road users misses opportunities to correct hazardous aspects of the broader transport system.⁴

Avoiding crashes (paying attention) is not entirely under people’s control, in some circumstances. Furthermore, the presumption that ‘to err is human’ underpins modern approaches to safety in other domains, from preventing airplane crashes to reducing the harm caused by anaesthetic errors.

Transportation systems designed to be more tolerant of human error have equivalent potential for road safety. Strategies that address two broad principles are considered particularly important in preventing injuries to vulnerable road users: separating pedestrians and cyclists from motor vehicles, and managing vehicle speeds to reflect safety features of roads.⁵

There are many opportunities in New Zealand to take a more robust approach to speed management in order to protect pedestrians and cyclists. When a network of 20 mph (30 km/h) zones was introduced in London, road traffic injuries were reduced by 40%.⁶ All road users benefitted, but the greatest reduction applied in children aged less than 12 years.

In New Zealand, we could also be more proactive advocating for vehicle designs that increase the safety of not only vehicle occupants but also vulnerable road users who are more likely to be severely injured in collisions (e.g. “pedestrian-friendly” cars).

We agree with Weiss and Ward that it is not sensible to introduce a new law that penalizes drivers who strike cyclists or pedestrians. The existing legislation, if applied consistently, is sufficient to deal with careless, negligent and dangerous behaviours on the road. And more importantly, the big gains in road safety and public health more

broadly will not come from pinning blame on individual road users, either cyclists and pedestrians or vehicle drivers.

A narrow, fault-based approach “is the product of transport policies that put vehicles, highways and speed before people and road safety. The same ‘vehicle first’ approach makes current approaches to transport policy a threat to international efforts to tackle global environmental problems, including air pollution and climate change.”⁵

Competing interests: Nil

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Blood safety

Sarah Mant, Mark P Smith

Safety in our hospitals is a cornerstone expectation of the New Zealand health service. Given that more than 40,000 patients of all ages receive blood component therapy in New Zealand each year, transfusion safety is of paramount importance as a key quality indicator.

Review of transfusion morbidity over past decades identifies not only a range of transmissible infection issues (HIV, hepatitis, parvovirus, CMV, *Yersinia*), but also tardy organisational and political response to transmitted infection where scientific understanding of the infectious agent was lacking. This was certainly the case when acquired immunodeficiency spread to patient groups not considered at risk, notably people with haemophilia in the 1980s. As a result, the sophistication of blood transfusion services internationally matured substantially in terms of surveillance and risk management strategies.

In contrast to the HIV experience, the proactive systems response to the threat posed to the blood industry by new variant CJD in the 1990s was rapid and effective at identifying and eliminating risk.

In New Zealand, the Health Amendment Act 1998 led to establishment of the New Zealand Blood Service (NZBS). It was designed to meet New Zealand's transfusion needs, providing blood cellular (red cells, platelets, stem cells) and non-cellular (plasma and fractionated protein) components, and including collection, cell separation, storage and distribution functions.

The NZBS is responsible for safety governance at all stages of the transfusion process, from donor vein to recipient vein.¹ Since its inception, NZBS business has evolved in response to changing consumer needs. For example, as a result of the introduction of recombinant proteins there is now less reliance on plasma-derived clotting concentrates.

Another challenge has been meeting the sometimes unpredictable acute demand for blood component therapy across New Zealand's geographically diverse regions. Our political leaders have rightly reaffirmed the importance of the NZBS blood self-sufficiency programme.²

In its recent performance audit, the Auditor-General described the NZBS as a high-performing organisation, working effectively and efficiently to meet its performance targets.³ So what are our quality indicators and how well are we performing on transfusion matters?

The NZBS maintains accreditation with external certification bodies, notably MEDSAFE (Ministry of Health) and International Accreditation New Zealand (IANZ). IANZ assesses medical testing laboratories in relation to international quality and competency standards.

Compliance with Good Manufacturing Practice regulations encompasses systematic adherence to manufacturing processes and routine screening of products of blood processing for bacterial contamination and other transfusion-transmissible infections.

Strict donor selection criteria contributes significantly to the safety of blood products, as does universal leucodepletion. Viral infectious agents can reside within white cells; leucodepletion of all cellular blood components mitigates this risk. Like many modern health systems,⁴ the NZBS has introduced a haemovigilance programme designed to detect clinical safety signals following transfusion.⁵ This national incident management system reports and manages events that affect both patients and donors.⁶ All incidents are routinely reviewed at clinical and quality review meetings.

In this issue of the *NZMJ* Dickson et al⁷ present the results of a joint programme of bacterial screening and haemovigilance reports related to safety of platelet transfusion between 2003 and 2011. They report the rate of confirmed bacterial contamination of a platelet unit sampled on day 2 after manufacture was 0.04%—a rate that compares well to international benchmarking.

It is important to understand and quantify risk associated with transfusion. This knowledge informs patient consent to transfusion. It is an enduring reminder that transfusion of biological material will always be a measured balance between clinical need and an organisation's ability to meet that need, while adhering to a "safety first" principle.

Competing interests: Nil.

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Bacterial contamination of platelet concentrates produced in New Zealand

Michelle Dickson, Dorothy Dinesh

Abstract

Aims To identify the rate of bacterial contamination of platelet concentrates in New Zealand and compare with other countries who use the BacT/ALERT screening system. To report on septic transfusion reactions associated with platelet transfusion in New Zealand.

Methods Six mL of platelet concentrate is inoculated into a BacT/ALERT BPA (aerobic culture) bottle on Day 2 post-collection. Bottles that are flagged as positive are sent to the microbiology laboratory, with the associated unit, for confirmatory testing. Platelet units that have expired are sampled again. Results from the four blood processing sites in New Zealand were reviewed.

Results 59,461 (65%) platelet components were sampled on Day 2 and 15,560 (17%) were re-sampled post-expiry, between December 2003 and September 2011. The rate of confirmed bacterial contamination was 0.04% for Day 2 sampling and 0.04% for post-expiry sampling. The rate in the published literature ranges from 0.01-0.74% and is lower (0.01–0.18%) when diversion of the initial flow of blood is utilised. There were five bacterial transfusion transmitted infections associated with platelet transfusion reported during the study period.

Conclusions: BacT/ALERT screening reduces the transfusion of bacterially contaminated platelet concentrates. Day 2 sampling does not identify all contaminated units.

Bacterial contamination of blood products can lead to severe transfusion reactions and death. The warmer storage temperature of 22°C for platelet concentrates, compared to other blood components, facilitates the growth of bacteria.

The New Zealand Blood Service (NZBS) has implemented a number of measures to prevent and reduce the risk of transfusion-transmitted bacterial infections (TTBIs). These are summarised in Table 1. Reduction of risk commences at the donor interview and follows steps along the transfusion chain to prevent bacteria entering the closed processing system. The six NZBS blood centres are audited by Medsafe annually and must comply with the Code of Good Manufacturing Practice (GMP).

Variation in the methods for detecting bacterial contamination and the day of sampling exists between countries. The timing of sampling for bacterial culture, the volume of the initial inoculum and species of bacteria are factors that impact on the rate of bacterial growth and the sensitivity of the screening system.

Table 1. Measures to reduce the risk of bacterial contamination and transfusion-transmitted bacterial infections

Procedure	Details of the procedure and the mechanism of risk reduction
Donor Session Record (DSR)	<ul style="list-style-type: none"> – Donor completes health questionnaire prior to interview, identifies infectious risks – Infective symptoms – Recent visit to doctor, dentist or hospital – Recent use of antibiotics/medicines – Gastrointestinal symptoms – Skin conditions (eczema, acne, psoriasis)
Health interview	<ul style="list-style-type: none"> – Registered nurse reviews questionnaire and checks donor, deferred if risk of bacteraemia – General appearance check – Venepuncture site check – Review DSR
Skin disinfection	<ul style="list-style-type: none"> – Ensure adequate cleansing of venepuncture site – Chlorhexidine 2% followed by a 70% isopropyl alcohol swab, stroke or circular method, ≥ 6 cm \times 6 cm area – Monitored 3 monthly per site, at least annually per staff member, using commercial RODAC agar plates
Diversion pouch	<ul style="list-style-type: none"> – Prevents small plug of skin entering the unit – First 30–40 mL aliquot of blood is diverted into a pouch, used for testing (implemented 2003)
Post-donation information	<ul style="list-style-type: none"> – National procedure ensures prompt withdrawal of blood components and prevention of transfusion – Special notice card given to all donors, includes the donation number and a free phone number to use within the next 48 hours – Donors are advised to call if they develop infection, diarrhoea or illness; recall information not mentioned in the interview or feel that their blood should not be used for transfusion
Closed system processing	<ul style="list-style-type: none"> – System does not breach integrity of the sterile blood pack assembly – Single use, closed tubing – Use of sterile connecting device for connecting 2 closed systems – Leucodepletion filter incorporated into closed system (2001)
Bacterial contamination screening	<ul style="list-style-type: none"> – Microorganisms produce CO₂ which causes a sensor to change colour and flags as positive – BacT/ALERT Microbial Detection System – Sampling of platelet concentrate on Day 2 and Day 8 – 6 mL used to inoculate the aerobic culture bottle – Platelets are released into stock while culture continues over the shelf life
Appropriate storage and transport conditions	<ul style="list-style-type: none"> – Warming of components above specification may promote bacterial replication – Use of validated transport systems – Maintain temperature specifications – Protect contents of containers and contain any leakage
Visual check	<ul style="list-style-type: none"> – Infected units may have visible clots, altered colour and loss of swirling – Integrity of bag – Turbidity/abnormal colour – Clumping of the contents – Swirling
National Haemovigilance Programme	<ul style="list-style-type: none"> – Surveillance of septic transfusion reactions and sterility testing – Voluntary reporting of transfusion related events, includes specific category for transfusion-transmitted infections – Commenced in New Zealand in 2005

In New Zealand over 13,000 units of platelet concentrates are transfused annually. These include platelets collected by apheresis (usually 2 units per procedure) and pools of four buffy coats from donors with identical ABO Rh D group. All units are leucocyte reduced by filtration. Table 2 summarises the specifications for platelet concentrates.

Table 2. New Zealand Blood Service specifications for platelet concentrates

Volume	Pool: 200–350 mL Apheresis: 180–400 mL
Leucocyte count	$<5 \times 10^6$ / unit
Platelet count	$>2.4 \times 10^{11}$ / unit
pH at expiry:	6.4–7.4 (Day 6)
Storage	22 ± 2 °C, with continuous gentle agitation
Expiry	5-day shelf life (same if irradiated)
Whole blood donation (buffy coat for platelet pool)	Donation time must not exceed 12 minutes*

*Prolonged collection time may be associated with increased risk of contamination by skin bacteria

NZBS commenced bacterial testing of platelet concentrates using the BacT/ALERT system in 2003. The scheme was progressively rolled out such that by the end of 2007 all six sites in New Zealand that produce platelets were participating. All sites endeavour to sample as many platelet concentrates as possible.

During 2010 NZBS tested approximately 84% of all apheresis platelet donations and 81% of platelet pools. The results of bacterial screening are not currently used as pre-release criteria when platelets are issued, i.e. platelets may be transfused prior to sampling and whilst BacT/ALERT results are pending, if there is a clinical demand.

The National Haemovigilance Programme was established by NZBS in 2005. Reporting to the scheme is voluntary. The annual reports include a summary of transfusion transmitted infections and are accessible via the website (www.nzblood.co.nz). Transfusion reaction investigations associated with platelet concentrates routinely involve sending the platelet bags for microbiological testing (if the bags are returned to the laboratory).

We report the first 5+ years experience of our national surveillance system using the BacT/ALERT screening of platelet concentrates, as well as TTBIs reported through the National Haemovigilance system.

Methods

Platelet concentrates from apheresis donations (Haemonetics MCS+ Cell Separator) and buffy coat pools are sampled on Day 2 (Day 0 = day of collection) using a sterile connected pouch (MacoPharma sampling bag, France) to maintain a closed system.

Approximately 12 mL of platelet concentrate is transferred to the pouch. 6 mL is used to inoculate a BacT/ALERT BPA (Biomérieux, Durham, North Carolina) bottle which contains culture media that supports the growth of aerobic microorganisms.

The system utilises a colorimetric sensor and reflected light to monitor the presence and production of carbon dioxide (CO₂) that is dissolved in the culture medium. If microorganisms are present in the test sample, CO₂ is produced as microorganisms metabolise the substrates in the culture medium and this results in a colour change (to yellow) of the gas-permeable sensor installed in the bottom of each culture bottle. The remaining 6 mL is retained for follow up Gram stain and culture in the event that a positive BacT/ALERT result is obtained.

Inoculated bottles are loaded into the BacT/ALERT instrument and remain there until flagged as positive or until the end of Day 7 if negative. Bottles that are flagged as positive are sent to the local hospital accredited microbiology laboratory for Gram stain, culture and identification. Platelet and red cell components from the same unit are traced and recalled for testing.

Where components have been transfused, clinical follow up by a medical officer is required. The retained sample pouch is stored at 22 °C and sent for testing when the platelet component is not available.

BacT/ALERT BPA bottles flagged as positive by the BacT/ALERT 3D Signature system that are negative on the Gram stain and culture for the platelet component (or platelet sample pouch if component not available) are recorded as **false positive**. BacT/ALERT BPA bottles flagged as positive by the BacT/ALERT 3D Signature system and are positive on the Gram stain and/or culture for the platelet component (or platelet sample pouch if component not available) are recorded as **true positive**.

Platelet concentrates that were sampled on Day 2 and reach expiry are held in a platelet incubator until Day 7 and sampled again on Day 8. The Day 8 samples are incubated for 24 hours and follow the same procedure if they are flagged as positive. BacT/ALERT testing is performed at the four blood processing sites in New Zealand. A summary report is prepared by each site every month and forwarded to the relevant technical, medical and quality staff. Data from all four blood processing sites from October 2003 to September 2011 was collated and reviewed.

Information regarding cases of reported TTBI associated with the transfusion of platelet concentrates was obtained from the National Haemovigilance Programme.

An OVID Medline literature review was undertaken, using the search words platelets and bacterial contamination, to identify publications in the English language from 1996 onwards, which coincides with the introduction of the Serious Hazards of Transfusion (SHOT) haemovigilance scheme in the United Kingdom. Published data from other countries utilising the BacT/ALERT system for screening platelet concentrates, was reviewed.

Results

A total of 91,262 platelet components were produced by six centres in New Zealand between December 2003 and September 2011. Pooled platelets comprised 57% and 43% were apheresis collections.

25,009 (64%) apheresis platelet units were sampled on Day 2 and 7,845 (20%) were sampled again post-expiry, on Day 7 or Day 8. 34,452 (66%) platelet pools were sampled on Day 2 and 7,715 (15%) were sampled post-expiry, on Day 7 or 8.

Overall the sampling rate was 65% for Day 2 and 17% for post-expiry units. There were a total of 130 BacT/ALERT positive results, 102 were from Day 2 samples (0.17%) and 28 were sampled post-expiry (0.18%). 28 (21.5%) of the BacT/ALERT positives were confirmed by positive culture, two results were unavailable due to loss of the sample or the pouch and 100 (77%) had negative microbiology laboratory results, i.e. were false positives (Table 3).

The overall rate of confirmed bacterial contamination of a platelet unit, sampled on Day 2 was 0.04%. The rate of a true positive result for post-expiry testing was the same (0.04%).

Table 3. BacT/ALERT positive results (n=130)

Variables	Day 2 positive	Post-expiry positive
False positive	79	21
True positive	22	6
Undetermined	1	1
Total	102 (0.17%)	28 (0.18%)

All of the microorganisms with the exception of *Enterobacter* were identified as Gram positive. The specificities of the isolates are listed in Table 4. Two thirds (19) of the contaminated units were pooled platelet concentrates and nine were apheresis units. All of the isolates have the potential to be pathogenic in a neutropenic cancer patient.

Table 4. Organisms isolated from platelet concentrates screening using BacT/ALERT

Variables	Group /species	Platelet component		Day of sampling		Total
		Pool	Apheresis	Day 2	Post-expiry	
Gram-positive bacteria	<i>Staphylococcus</i> : coagulase-negative*	13	3	12	4	16
	<i>Staphylococcus aureus</i>		1	1		1
	<i>Staphylococcus lugdenensis</i>	1		1		1
	Viridans streptococci		3	1	2	3
	<i>Streptococcus agalactiae</i> (Group B)	1		1		1
	<i>Streptococcus</i> Group G	1		1		1
	<i>Bacillus</i> spp	1	1	2		2
	<i>Brevibacterium</i> spp	1		1		1
	Mixed skin flora	1		1		1
Gram-negative bacteria	<i>Enterobacter aerogenes</i>		1	1		1
Total		19	9	22	6	28

*Includes strains reported as *Staphylococcus epidermidis* and *Staphylococcus* species

All except two platelet units associated with the 30 true positive or undeterminable BacT/ALERT results were discarded because of the positive BacT/ALERT result or a technical problem or expiry. Two of the 22 culture positive units were transfused, one was a viridans *Streptococcus*-positive apheresis unit and the second was a coagulase negative *Staphylococcus* involving a pooled platelet unit.

The recipient of the Viridans positive unit was a 12-year-old boy with AML (acute myeloid leukaemia) who had a low grade fever prior to transfusion and reported an allergic transfusion reaction (urticaria and dyspnoea), however the unit was culture negative after 5 days incubation. The second case was reported to the National Haemovigilance Programme by one of the authors (2005, Table 5).

The National Haemovigilance Programme has been collecting data since May 2005. Five cases of bacterial transfusion transmitted infection associated with platelet transfusion have been reported to date. Infections that are confirmed by detection of the same strain of bacteria in both the recipient's blood and the transfused unit are assigned a higher imputability score.

Apheresis platelet concentrates were implicated in three cases and two cases involved pools. All five recipients reported symptoms and recovered. The five cases are summarised in Table 5. Coagulase-negative staphylococci were identified in four cases and *Streptococcus bovis* in one case.

Table 5. Bacterial transfusion-transmitted bacterial infections associated with platelet transfusion

Year	Patient	Symptoms	Platelet unit	Organism
2005	49-year-old male, AML	Rigors, shivering	Pool ^a	CNS
2008	Premature infant	Fever, tachycardia	Apheresis ^b	<i>Streptococcus bovis</i>
2009	38-year-old male, AML	Fever, rigors	Pool ^c	CNS
2010	64-year old male, AML	Fever, flushing, rash	Apheresis ^c	CNS
2011	67-year-old female, multiple myeloma	Fever, chills, rigors	Apheresis ^b	<i>Staphylococcus lugdunensis</i>

AML = acute myeloid leukaemia, CNS = coagulase negative staphylococcus

^a BacT/ALERT positive result available after patient transfused

^b Donation not sampled for BacT/ALERT screening

^c Unknown if screened by BacT/ALERT

The contamination rate of platelet components (true positive rate), using the BacT/ALERT detection system ranges from 0.01 – 0.74%, in the published literature. Diversion of the initial flow of blood into a pouch reduces the rate of contamination, range 0.01–0.18%. The rates reported by other authors are shown in Table 6.

Table 6. Comparison of confirmed positive rates using BacT/ALERT screening

Country	Number tested	Confirmed positive	Sampling
Australia ¹	302,386	0.18% ^a	APCs & PPCs Day 1 (24 hour) 7.5-10 mL aerobic & 7.5-10 mL anaerobic
Belgium ²	107,827	0.74% ^b	APCs Day 0 (2-18 hour) PPCs Day 0 (22 hour) 5-7 mL aerobic & 5-7 mL anaerobic
Canada ³	489,847	0.01%	APCs & PPCs Day 1-2 (24-48 hour) 4-10 mL aerobic only
China ⁴	8,000	0.06%	APCs Day 0 (18-24 hour) 5 mL aerobic & 5 mL anaerobic
Denmark ²	22,165	0.15% ^c	PPCs Immediately post-production 8-10 mL aerobic only
Denmark ⁵	22,057	0.32% ^b	APCs & PPCs Day 0-1 (<30 hour) 10 mL aerobic only
Germany ⁶	4,355	0.05%	APCs & PPCs Day 1 5 mL aerobic & 5 mL anaerobic
Germany ⁷	52,243	0.07%	APCs & PPCs Day 0 (18 hour) 7.5-10 mL aerobic & 7.5-10 mL anaerobic
Ireland ⁸	43,230	0.03%	APCs & PPCs Day 2 (36 hour) 7.5 mL aerobic & 7.5 mL anaerobic (35% aerobic only during first 10 months)
New Zealand	59,461	0.04%	APCs & PPCs Day 2 6 mL aerobic only

Country	Number tested	Confirmed positive	Sampling
Norway ⁹	36,896	0.03% ^c	APCs & PPCs Day 1 5–10 mL aerobic only
Taiwan ¹⁰	2,338	0.34% ^c	APCs and PPCs Day 1–5 1 mL aerobic & 1 mL anaerobic
The Netherlands ²	38,664	0.67% ^d	PPCs Day 1 (16-24 hour) 7.5 mL aerobic & 7.5 mL anaerobic
USA ¹¹	5,211 20,725	0.21% ^d 0.10% ^e	PPCs Day 1 or later 8 ml aerobic only
USA ¹²	388,903	0.02%	APCs Day 1 (24–36 hour) 4–5 mL aerobic & 4-5 mL anaerobic
USA ¹³	1,004,206	0.02%	APCs 4 mL aerobic
	781,936	0.02%	APCs 8 mL aerobic
Wales ¹⁴	54,828	0.06%	APCs & PPCs Day 1 8–10 mL aerobic & 8–10 mL anaerobic

APC apheresis platelet concentrate

PPC pooled platelet concentrate

^aincludes indeterminate results

^bdid not use diversion pouch

^cnot stated whether diversion used

^dprior to implementation of diversion pouch

^eafter sample diversion implementation

Discussion

Our reported true positive rate of 0.04% is comparable to that reported by others (Table 6) although there is variability in the timing and volume of sampling, as well as culture media (aerobic only versus aerobic and anaerobic).

We found that the rate of contamination in expired platelet units was the same as that for platelets sampled on Day 2. This indicates that Day 2 screening in New Zealand detects 50% of contaminated units. This is comparable to the Welsh experience where Day 1 culture was reported to have a sensitivity of 40%.¹⁴ However the number of expired units sampled was relatively small. Sampling on Day 1 or Day 2 may not detect contaminated units when the bacterial load is below the level of detection.

Conversely, bacteria in contaminated units may die during the storage and not cause septic reactions. This may explain the phenomenon we recently observed where one unit of an apheresis platelet donation was contaminated with *Staphylococcus aureus* and the other unit was negative on sampling at Day 2 and post-expiry (Figure 1).

Figure 1a. Apheresis platelets from one donation procedure on Day 3. Yellow stained bag noted in one unit (left) which was positive for *Staphylococcus aureus*. The sister unit (right) underwent BacT/ALERT screening on Day 2 and remained culture negative. Both units were withdrawn.



Figure 1b. Same unit (yellow stained bag) on closer inspection showing macroscopic irregular clumps of cocci and fibrin clots, confirmed by microscopy and culture



False positive BacT/ALERT results were not included in our comparison. It is possible that these may include contaminated units which are negative on culture; i.e. the true positive rate may be underestimated. Eder et al¹³ reported on nine negative apheresis platelet culture results which were associated with 11 septic reactions.

Similarly, we identified one case where a contaminated unit (*Staphylococcus lugdunensis*) was transfused in 2011 and the unit was negative on culture when tested as part of a transfusion reaction investigation.

The major source of contamination is skin bacteria and it has been shown that diversion of the first aliquot of blood during collection reduces the risk of BTIs.^{11,15}

BacT/ALERT screening of platelet concentrates produced without diversion of the first aliquot of blood during collection are associated with a higher contamination rate of > 0.21% (Table 6).

Over seven years of haemovigilance reporting, there have been five reports of BTTI associated with platelet transfusion in New Zealand, all recipients were immunosuppressed. One would expect a higher frequency of septic reactions based on the confirmed contamination rate at expiry. Possible explanations for the relatively small number of reports include:

- Under-reporting of transfusion reactions
- Febrile reactions not investigated
- Antibiotic therapy in the recipient
- Contamination may have occurred into the sampling pouch and not the platelet bag
- Bacteria in unit may not survive (this has been observed in apheresis units from one collection where one unit was contaminated and the other unit was sterile)

Day 2 screening in New Zealand prevented the transfusion of 16 pooled platelets and 15 apheresis units which were contaminated. Ideally 100% of platelet concentrates should be screened for bacterial contamination to minimize the risk of BTTI and NZBS aims to reach this target. This has implications on meeting the clinical demand for platelets, which could be compromised if units are not released until Day 2 sampling is completed.

Special donations such as HLA matched platelets and situations where there is a shortage of supply may over-ride the requirement for hold until Day 2 for sampling. BacT/ALERT screening does not detect all contaminated units, so despite all the preventative measures in place (Table 1) there is a residual risk, albeit small.

Our data shows a contamination rate of 1 in 2,500 platelet components produced. It is important for clinicians to be aware of the risks associated with transfusion as these are relevant to the process of obtaining informed consent from the patient prior to transfusion.

The Haemovigilance Programme plays an important role in the surveillance of screening and reported BTTIs. These systems allow us to identify contamination of platelet concentrates and transmission of bacteria that lead to transfusion reactions. It is important to focus on these so that we can measure the effectiveness of strategies used to reduce the risk and identify other factors that contribute to these reactions.

Competing interests: Nil.

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A tale of two cities: paradoxical intensity of traffic calming around Auckland schools

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Abstract:

Background The school journey is a common context for child pedestrian injuries in New Zealand, with children from low socioeconomic, Māori or Pacific families being at increased risk. The extent to which evidence-based environmental strategies that can address this problem are equitably implemented is unclear.

Aim To determine if there is a difference in the distribution of traffic-calming modifications around schools in areas of high and low socioeconomic deprivation in Auckland and Manukau Cities, New Zealand.

Methods From a list of the most and least socioeconomically deprived schools in Auckland and Manukau Cities, 40 of each were randomly selected. The number of modifications within a 1 km radius of these schools was recorded in December 2009 or January 2010. The association of deprivation and region with the numbers of traffic-calming modifications was examined using a general linear model.

Results Socioeconomically least deprived schools had more traffic-calming interventions than the most deprived schools (least square mean (LSM): 25 versus 18; $p=0.05$), and Auckland schools had more interventions than Manukau schools (LSM: 27 versus 16; $p=0.001$).

Conclusion Traffic-calming measures were observed more commonly in less deprived areas where the risks of child pedestrian injuries are generally lower. This apparent paradox could result in increasing socioeconomic inequities in the distribution of child pedestrian injuries.

Road traffic injuries account for 22% of all injury deaths among New Zealand children aged less than 15 years old with children of Māori or Pacific ethnicity and those from low income families over-represented in these statistics.^{1,2}

Internationally areas adjacent to schools and recreational centres are recognised high-risk areas for crashes.³ Many New Zealand children are injured on the road within an hour before and after school.⁴ This risk may lead parents to discouraging children from walking or cycling to school,^{5,6} reducing their opportunities for physical activity and social interaction.

‘Traffic-calming modifications’ are speed management measures (such as road engineering measures such as speed bumps and limits) with demonstrated effectiveness in reducing injuries among more vulnerable road users, including children, pedestrians and cyclists.^{7,8}

While the study was not specifically focusing on proximity to schools, the implementation of 20 miles per hour zones in London which included traffic-calming interventions resulted in a 41.9% reduction in both fatal and non-fatal casualties of all

ages. The largest reduction was seen in young children aged 0–11 years.⁹ A Californian study estimated that the odds of being injured was less than half for children who live within one block of a speed hump.¹⁰

Previous research in Auckland suggests that newly installed roundabouts have resulted in significant reductions in mean and 85th percentile speeds on roads, resulting in average speeds of less than 30 km/hr in adjacent streets.¹¹ Concurrently, average speed on urban roads in Auckland varied between 54.4 and 56.3 kilometres per hour (km/hr).¹²

In the period 1982 to 1987, child pedestrian injury rates in the greater Auckland region were higher in the socioeconomically more disadvantaged areas, such as ‘South Auckland’.¹³ Paradoxically, walking school buses (involving adult-supervised school journeys) were noted to have been more commonly implemented in higher socioeconomic areas in the Auckland region.¹⁴

This study was designed to investigate if there were differences in the distribution of traffic-calming modifications adjacent to schools deemed to be most and least socioeconomically deprived in Auckland and Manukau Cities. The 2010 estimated populations of these cities in the central and southern areas of the greater Auckland region were 450,300 and 375,600, respectively.¹⁵

Methods:

Sampling frame—Sampling frames were formed from Ministry of Education records of all schools within Auckland and Manukau Cities.¹⁶ A total of 101 decile 1 and 2 (i.e. most socioeconomically deprived) schools and 69 decile 9 and 10 (i.e. least socioeconomically deprived) schools were eligible for selection. From these lists, 40 decile 1 or 2 schools (22 from Manukau and 18 from Auckland) and 40 decile 9 or 10 schools (16 from Manukau and 24 from Auckland) were randomly selected for a directly observed survey of traffic calming in the area adjacent to schools.

Areas surveyed—In order to determine an appropriate radius from schools for the proposed survey, we examined Ministry of Transport logged crash data for Auckland and Manukau Cities between 2004 and 2008. Table 1 demonstrates the numbers of day-time crashes involving child pedestrians and cyclists aged from 5 to 18 years occurring within a 0.5 km, 1 km and 2 km radius from schools.¹⁷

Table 1. Number of daytime crashes involving child pedestrians and cyclists aged 5 to 18 years old within a radius of schools in Auckland City and Manukau City 2004–2008

Kilometre radius from schools	Number of crashes	Number of children involved
0.5 km	321	321
1 km	375	378
2 km	375	378

Based on these data, streets within a 1 km radius of the schools, to the nearest intersection of two roads, were surveyed for traffic-calming modifications. Each street within this area was inspected to determine which, if any, traffic-calming modifications were present.

State Highway Motorways and other roads which cannot be crossed by foot were not included in the analysis. Surveying was done manually by the lead investigator (TH) during December 2009 and January 2010.

Street audit of traffic-calming modifications—Traffic-calming measures were systematically recorded using a standardised recording sheet. Traffic-calming measures defined by Land Transport

New Zealand were recorded: road humps, raised tables, chicanes, roundabouts, mid-block/median islands, kerb extensions/road narrowing, threshold/perimeter treatments, one and two-lane slow points, intersection priority changes, channelization, speed cushions, driveway links, left-in/left-out islands, pavement bars/tactile surface treatments.¹⁸

The number of each of these modifications observed within a 1 km radius of the index schools was noted. Further, median islands in roads with four or more lanes were not counted. Care was taken to distinguish temporary changes for road maintenance from tactile surface treatments. For median islands to be counted they had to be raised at least one brick in elevation and be away from or extend at least 5m from an intersection.

In instances where multiple modifications were found within 5m of each other, these were prioritized, with respect to the three modifications with strongest evidence of effectiveness. These are speed humps,^{10, 19} raised platforms and roundabouts.^{20, 21}

The category given top priority was counted: roundabouts took precedence over islands; speed bumps and raised platforms took priority over narrowing or tactile surface treatments. No further overlaps were noted.

Analysis—In order to investigate whether the number of calming devices differed in different deciles or region, a general linear model was fitted with the square root of the number of calming devices as the outcome (to remove the correlation of the mean and the variance). The decile of school (high or low), region (Auckland or Manukau) the Ministry of Education classification of the school (state compared to state integrated or private), were included as explanatory variables.

Initially the interaction of region and decile was also included to investigate whether there was a difference in the influence of deprivation on traffic-calming interventions in the different regions. The analysis was repeated with the device count including only speed humps, raised platforms and roundabouts, the three devices considered to be most important in the literature.

The least square means and their 95% confidence intervals (adjusted for imbalance in the other explanatory variables included in the analysis) were back-transformed to provide an estimate of the mean number of traffic-calming modifications.

Results

79 schools were surveyed as one decile 1 school was excluded from sampling due to a mapping error. There was a median 23 traffic-calming interventions within a 1 km radius of the schools surveyed (10th to 90th percentile 7 to 54)

Table 2 displays the least square means of the number of traffic-calming devices around a school for different groups. There was no evidence of a differing effect of decile on the number of traffic-calming interventions in the different cities ($p= 0.55$). There was however evidence that least deprived schools (25 interventions) had a higher average of traffic-calming interventions adjacent than most deprived (18 interventions) ($p = 0.05$).

There was also strong evidence of Auckland schools having a higher average number of interventions compared with Manukau schools (27 compared with 16; $p = 0.001$).

Table 2. Means* of number of calming devices and the 95% confidence intervals by city, deprivation and school type

Variables	Mean total count	95% confidence interval	P value
Auckland City schools	27	22–33	0.001
Manukau City schools	16	11–21	
Most deprived schools	18	13–23	0.05
Least deprived schools	25	19–31	
State-integrated and private schools	17	11–25	0.10
State schools	25	21–29	

All means are back transformed from the least squared means of square rooted data.

When the analysis was run using the number of important interventions per school rather than the total of all interventions the effect of region, school type and decile was unchanged.

Table 3 demonstrates that most, but not all, surveyed sites contained at least one roundabout (72%) or speed hump (75%), but less than half contained raised platforms (42%).

Table 3. The percentage of schools which had at least one of these interventions located in the area adjacent to them

Traffic-calming intervention	Percentage
Roadhump	74.68
Raised platform/table	41.77
Roundabout	72.15
Chicane	17.72
Mid-block/median islands	92.41
Kerb extensions	50.63
Left-in/left-out islands	20.25
Pavement bars	53.16
Intersection priority changes	21.52

Discussion

Main findings—Our data suggests that the intensity of traffic calming (represented by the mean number of interventions) was significantly greater around socioeconomically least deprived schools than schools that were most deprived. Similarly, traffic calming appeared more intense around schools in Auckland City compared with those in Manukau City.

These findings are disappointing given the socioeconomic patterns and geographical distributions of child pedestrian injuries in the region.

Strengths—The random selection of schools from the study base produced a large representative sample of about half the eligible schools in Auckland and Manukau City, the country's most populous region.

Further, the study operationalised a research design replicating key aspects of a study recently undertaken in the United Kingdom, informed by updated evidence on effective traffic-calming devices.²² We used a standardised approach to observation and data collection in a school zone radius that related to the risk of road injuries in school aged children in the study base.

No assumptions were made regarding students' exposure to, or behaviour when, walking to school. In order to ensure comparability of the types of schools of concern, the study focused on mainstream schools (public and private), with specialised education facilities that are distributed in selected sites of the region (such as teen parent units, special needs schools) replaced during the sampling process.

Limitations—In the absence of digital or geographical information system approaches to identifying road and traffic-calming measures which could have provided a more easily reproducible database, we collected data manually.

The direct observations permitted the assessment of structures that were current and operational. Possible observer bias was reduced through the use of a standardised data recording sheet, and the cross-check of findings with available council records, where such data were available.

A study of two UK cities using a manual audit of traffic-calming measures found that both cities had a greater concentration of traffic calming in socioeconomically more deprived areas.²² Importantly, the city where this concentration was greater also had a significantly greater narrowing of the socio-economic gradient in childhood pedestrian injuries.

As in the UK study,²² we quantified the presence of evidence based measures with the assumption that a greater density of such measures in the zone adjacent to schools is likely to enhance effectiveness of traffic calming in terms of reduced vehicle speed in the area.

Identifying the association between the numbers or specific configurations of calming devices and injury rates in this study region was outside the scope of this investigation. It is also conceivable that specific local conditions, such as geographical features or other structural modifications (such as fencing) which are not examined in this survey could influence risks of injury in this region.

Meaning of study findings—Our findings are in contrast to two studies from the United Kingdom which have demonstrated greater levels of implementation of traffic-calming devices in more deprived areas compared with more affluent areas.^{22, 23}

While these studies did not attribute a reduction of socioeconomic inequalities in child pedestrian injury rates to these policies, the opportunities to have such an impact are clear.

Compared with Auckland, the population of Manukau City has, on average, a median income that is \$2,000 lower,²⁴ and a greater representation of Māori and Pacific populations both numerically and proportionally.²⁵

Given children in these groups are known to be at increased risk of child pedestrian injury, the lower intensity of road traffic-calming measures in Manukau City (compared with Auckland City) is discouraging.

Nine years ago, Land Transport New Zealand reported that 91% of territorial authorities used requests from public or concerns from council members or police to identify need for traffic-calming measures, while two thirds had no formal policies for implementation of traffic-calming measures.²⁶

Relying on community advocacy alone to address these disparities appears misguided given families of lower socioeconomic status and of Māori or Pacific ethnicity are less likely to complete petitions for such interventions.²⁷ The observed disparities make the case for more explicit use of risk prediction when implementing road safety strategies, an approach recommended by regional authorities in 2004.²⁶

Competing interests: Nil.

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The San Francisco Syncope Rule performs well in a regional rural emergency department in New Zealand

Andrew Munro, Rosie Whittaker

Abstract

Aims To assess the utility of a decision rule for determining short-term risk in syncope patients presenting to the Emergency Department (ED) of Nelson Hospital (Nelson, New Zealand).

Methods Sixty-eight of 83 eligible syncope patients who presented to the ED with syncope were consecutively enrolled. Follow-up for an adverse event within 7 days of index presentation was performed. Actual event rate was compared with the prediction tool known as the San Francisco Syncope Rule (SFSR).

Results Sensitivity and specificity for the SFSR was 83% (95% Confidence Interval (CI) of 44–97%) and 82% (95%CI 71–91%) respectively. There was a negative predictive value of 98 % (95% CI 90–99%). Positive and negative likelihood ratios were 4.7 (95% CI 2.5–9.0) and 0.2 (95% CI 0.03–0.1.22) respectively.

Conclusion Syncope patients who present to the ED with no obvious cause and who are being considered for discharge may benefit from application of the SFSR for short-term risk assessment.

Syncope is a common syndrome accounting for between 1 and 3% of all emergency department (ED) attendances.^{1–4} The majority of patients are asymptomatic by the time of medical evaluation and most have a benign cause; nonetheless a small number will harbour life threatening pathology.^{3–8}

Hospital admission favours short-term prognosis for syncope patients⁵ but appears to have little influence on one-year all-cause mortality.^{3–5} ED evaluation for syncope has become more focused on short-term risk, however a validated approach to the ED assessment for short-term risk in syncope remains illusive.

Several recent prospective studies have shown the short-term (7 to 10 day) rate for an adverse event (death, AMI, arrhythmia, PE, CVA, requirement of procedure such as pacemaker insertion, cardio-version or transfusion and/or unplanned related re-attendance) of between 6.1–12%.^{5–9}

The San Francisco Syncope Rule (SFSR) is a simplified decision tool offered as an instrument for defining short-term (7-day) risk.^{10,11}

We wanted to see how the rule would operate for a prospective cohort from a regional rural ED setting in New Zealand.

The primary outcome was to determine the utility of the San Francisco Syncope Rule (SFSR) for predicting short-term (7-day) risk.

Methods

Study design—This was a prospective cohort observational (non interventional) study set in a single regional rural mixed ED, serving a population of approximately 100,000 with an annual attendance of 26,000 and an admission rate of 24%.

The Upper South B Regional Ethics Committee approved the study in July 2011. Iwi (Māori tribal) Health Board approval was obtained through Karake Consultancy. The collaboration group consisted of one ED Consultant and three ED Registered Nurses. The study period was 8 September 2011 to 31 January 2012.

Patients were eligible if they had experienced loss of consciousness and had attained baseline function on ED arrival, were >16 years and were not intoxicated or demented.

Emergency Department medical and nursing staff were asked to identify patients who were potentially eligible. Written consent for a follow-up phone call at more than 7 days following the index presentation was offered. One of the four collaborators made a follow-up telephone call using a scripted proforma; data was collected on a standardised data sheet.

Daily presentations were reviewed to identify patients who missed the opportunity for enrolment. These were recorded as 'missed.' Six months prior to commencement of this study a 3-month syncope audit was presented and the SFSR discussed.

Definitions—Syncope was defined as transient loss of consciousness and loss of postural tone followed by spontaneous return to baseline cognitive function. Patients who had an immediately obvious cause were excluded.

The SFSR uses five risk factors from history examination and testing. A history or findings consistent with congestive heart failure (CHF), haematocrit less than 30, ECG changes, shortness of breath on history or examination, systolic blood pressure less than 90 mmHg in the ED.

Adverse events for the rule were death, pulmonary embolism, myocardial infarction, cerebral vascular accident, cardiac arrhythmia or intervention such as pacemaker transfusion ICU admission or coronary reperfusion. Patients who were unscheduled returns and were admitted requiring specific treatment were considered a serious outcome. An unplanned reattendance requiring no specific treatment subsequent to reattendance was not considered an adverse event.

The ECG was considered abnormal if there was written confirmation in the medical record. The ECG was also judged abnormal if there was no recorded clinical comment and on review the ECG morphology differed from a previously recorded ECG or if there were no recorded previous ECG available and the current ECG was a rhythm other than sinus.

Blood pressure of less than 90 mmHg was recorded as such if a supine systolic of less than 90 mmHg was measured in the Emergency Department.

Shortness of breath was recorded if the clinical notes specifically stated this or the recorded respiratory rate was greater than twenty per minute.

Results

83 patients of 7982 adult ED attendances were identified as eligible, of these 68 had data available for interpretation. The median age was 72 years (ranging from 22 to 91 years), 66% of patients were aged 65 or more.

Eleven patients were missed (two of whom were visitors from outside the region), a further two patients declined to complete follow-up when telephone interview was attempted and one was lost to follow-up (no-operative mobile number). On checking hospital records none were admitted or re-attended our ED within 7 days.

There were 19 missing data points for 13 patients; no haematocrit (n=15), no record of ECG or ECG interpretation (n=1), no record made of presence or absence of congestive heart failure (n=10) and no record of history of shortness of breath (n=2). None of these patients had an adverse 7-day event. Absent data points were therefore interpreted as normal for the purposes of the rule. See Table 1.

Table 1

Variables	Total	7-day adverse event	No adverse event
Admitted SFSR-positive	9	3 (Pulmonary Embolism, pacemaker, urosepsis)	6
Admitted SFSR-negative	8	1 (died-asystolic arrest)	7
Discharged SFSR-positive	7	2 (subdural-secondary to initial syncope, pacemaker)	5
Discharged SFSR-negative	44	0	44

There was a 24% admission rate (n=16) and an overall 7-day adverse event of 12%. Five of the 16 patients who were positive for the rule experienced an adverse event. There were three adverse events for those admitted on initial presentation; one death, one pulmonary embolism, one pacemaker insertion; the latter two were predicted by the rule (shortness of breath and abnormal ECG respectively).

Two of 44 discharged and rule negative patients were unplanned Emergency Department returns. One was admitted no cause determined and no subsequent 7-day event and one who had a beta-blocker stopped and was discharged with no further 7-day sequela. One of the five patients who were positive for the rule due to the presence of CHF experienced an adverse 7-day event (urosepsis).

Seven patients were considered to have an abnormal or changed ECG three of these had a 7-day event (two received a pacemaker and one with a subdural secondary to head injury following syncope).

In this study the SFSR had a sensitivity of 83% (95%CI: 44–97%), a specificity of 82% (71–90%) and a negative predictive value 98% (90–100%). Positive and negative likelihood ratios were 4.70 (2.47–8.95) and 0.20 (0.03–1.22) respectively.

Clinical performance had sensitivity 67% (23–95%), a specificity of 79% (67–88%), and a negative predictive value of 96% (87%–99%). Positive and negative likelihood ratios were 3.18 (1.51–6.69) and 0.42 (0.14–1.32) respectively.

Discussion

This was a small prospective, non-interventional study investigating the sensitivity and specificity a decision instrument aimed at predicting short-term risk in patients who present to a regional rural ED with syncope.

Had the SFSR been the sole determinate of admission while all modifiable short-term outcomes would have been hospitalised.

There was one death during the study period; an 86-year-old female patient admitted for syncope 'no identifiable cause', who 2 days following admission had an asystolic arrest. Although obviously a serious outcome, admission did not prevent death and this was considered non-ameliorable.

All serious events would also have been admitted on the basis of clinical decision to admit and/or SFSR positive. However this would have increased admission rate from 24% to 35%, a similar order of magnitude in the only other published Australasian study of similar size (from 36% to 45%).⁹

Potential weaknesses of this study are study size, ECG interpretation, the requirement for blood testing to fulfill the rule, lack of blinding and retrospective data entry.

This study was performed in a small regional rural ED with limited research resources.

We accept that small differences in outcomes would have a large study effect, however our results are not dissimilar to other recent prospective papers all of which had similar characteristics of similar short-term rates of adverse events of 6 to 12%,^{1,2,4-7,13} sensitivities of 74–90%,^{9,14} and similar percentages of patients diagnosis following their index presentation⁸ (in our case 4.4% of total presentations).

ECG interpretation is open to variability; other papers showing only modest inter-observer agreement.¹¹⁻¹³ We wondered whether serial ECGs or a period of ED telemetry might sharpen the decision tool.

The effect of severity of CHF on the rule may also be open further investigation.

We did not want to mandate blood testing for all syncope patients. Absence of a haematocrit accounted for the majority of missing data points. No patients with missing data experienced a 7-day event.

Clinical autonomy was considered by the authors to take precedence over the rule; we felt this to be strength of the study since the decision to admit is dependent on other factors such as social isolation, time of night and physician gestalt. We therefore did not ask clinicians to change their practice or fill out the five data points required for the SFSR. This did however necessitate retrospect data entry for the rule.

The study was not blinded; the SFSR had been discussed 6 months prior to commencement of the study while the clinical champions of the study were open about the hypothesis under investigation.

Just over half of the 17 patients admitted were positive for the rule, suggesting clinicians were working somewhat independently to the rule.

Clinical practice may be improved by the application of the SFSR as a decision instrument used to modify or confirm disposition and follow-up in patients who present to the ED with syncope.

This approach to the rule is yet to be validated.

Competing interests: Nil.

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The high volume debate in a low volume country: centralisation of oesophageal resection in New Zealand

Edwin Beenen, Welson Jao, Grant Coulter, Ross Roberts

Abstract

Aim Centralisation of oesophageal resection for cancer remains an area of debate. However, no consensus for the requirements of high volume centres yet exists and some low volume centres have been able to produce a comparable outcome. With the small population of New Zealand more than one high volume centre might not be achievable. We reviewed our series of oesophageal resections and compared them to outcomes in the literature to challenge the need for only high volume centres within New Zealand

Methods A retrospective analysis of all consecutive oesophagogastrectomies performed in Christchurch Public Hospital (Christchurch City, New Zealand) from January 1998 until June 2009 was undertaken.

Results Within this period 128 oesophagogastrectomies were performed. Median admission duration was 12 days. The overall complication rate was 53.9% of which 5.5% was an anastomotic leak. Combined in-hospital and 30-day-mortality was 1.6% (2/128). The 5-year-survival was 32.4% for adenocarcinoma and 47.7% for squamous cell carcinoma.

Conclusion This series has shown that a low volume centre within New Zealand is able to deliver a satisfactory level of care for oesophagectomy. Given New Zealand's low population density it is debatable to what extent care should be centralised for treatment of oesophageal carcinoma.

Centralisation of oesophageal resection and the care for oesophageal cancer is an ongoing debate in contemporary literature.¹⁻⁹ It is postulated that high volume centres produce a better short and long term outcome due to maintenance of skills of both surgeon and supporting services. However, no consensus of the definition of high volume exists and individual reports from low volume centres have challenged this assumption by demonstrating comparable outcomes.^{7,8,10}

The issue of centralisation and the need for a high volume centre is also dependant on the ability to deliver such a service. A small and widely spread population results in a low prevalence of oesophageal carcinoma making it more difficult to organise the desired centres of expertise. New Zealand has a relatively low population spread over a large area.

For geographical and political reasons, the creation of a true high volume centre might not be desirable or even possible.¹¹ Due to New Zealand's geographical isolation, a full medical service must be locally available.

To assess the hypothetical need for a high volume centre within New Zealand we have studied our series of oesophageal resections and compared our results to reports

in the literature. We have analysed these results and literature reports to assess the need for centralisation in New Zealand. These issues might also be current in other countries with a low population density and hence a small volume of cases.

Method

Christchurch Public Hospital is a large referral hospital on the South Island of New Zealand within the Canterbury district. It is one of six hospitals appointed by the New Zealand Government to provide specialist oncological health care.^{12,13}

A retrospective analysis of all consecutive oesophagogastrectomies performed in Christchurch Public Hospital from January 1998 until June 2009 was undertaken. Patients were identified by ICD-9 codes and operation theatre records. All patient files were reviewed and demographics, hospital stay, complications, perioperative mortality, re-admissions and histology results were recorded. R1 resections were defined as tumour within 1mm of any of the specimen's surface.

Long term mortality and cause of death were obtained from the National Cancer Registration, which is a compulsory national database registering every cancer patient (Cancer Registry Act 1993). If the patient was understood to be alive and the last follow up date was more than 3 months ago, survival was verified by either contacting the patient or the patient's general practitioner. Complications were scored according to the Clavien-Dindo classification of surgical complications.⁴ Perioperative mortality was defined as death during the initial admission and/or within 30 days following surgery.

All oesophageal resections were performed by two surgeons (GC & RR) of the Department of General Surgery. The operative procedure and management of anaesthetic and postoperative care was standardised deliberately to make management uniform and thus easier for medical and nursing staff. Patients who presented with an oesophageal malignancy were staged and then discussed in a multidisciplinary meeting. Staging consisted of endoscopy with biopsies taken to confirm the diagnosis, followed by a CT-scan of the chest and abdomen.

Further investigations including PET-scanning, endoscopic or radiologically guided fine-needle-aspiration, staging laparoscopy or other investigations were undertaken when required. Subsequent to this study PET scanning has become a routine investigation for potentially resectable oesophageal carcinoma.

Resectability was dependant on the general fitness of the patient and the absence of incurable or unresectable disease following staging. Involved lymph nodes outside the resection zone, e.g. cervical or para-aortal lymph nodes, were considered as metastatic disease and thus presented incurable disease (as did metastatic spread to liver, lungs or peritoneum). Invasion of the aorta, pericardium and/or trachea was considered locally advanced disease and considered unresectable.

The chosen procedure in this series was an Ivor-Lewis resection via a midline laparotomy and a right sided antero-lateral thoracotomy. Paraoesophageal, mediastinal and left gastric artery lymph nodes were routinely resected; extensive two- or three-field lymph node dissection was not routinely performed. The thoracic duct was left in situ. Continuity was restored with an intra-thoracic circular stapled anastomosis. A pyloroplasty was routinely performed.

Two chest drains and a nasogastric tube in the gastric conduit were left for drainage. During the period of this study pain relief changed from an epidural to intrathecal morphine combined with a continuous paravertebral block through an extra-pleural catheter and Patient Controlled Analgesia (PCA). Patients were usually extubated at the completion of surgery.

The patients were taken to the Intensive Care Unit for overnight observation. Oral dietary intake was progressed directly in the days after surgery depending on clinical findings and as tolerated by the patient. Chest drains and nasogastric tube were removed as early as possible depending on drainage. Investigations for anastomotic leakage by water-soluble contrast swallow or CT-scan were only performed if a clinical suspicion arose (sepsis, fever, increasing inflammation markers, content of chest tube). Patients were discharged as soon as they were tolerating sufficient oral intake and were mobile.

Long term follow up in the outpatient clinic was arranged at three to six month intervals for a minimum of 5 years. At follow up additional investigations, e.g. imaging or endoscopy were arranged when indicated. No routine investigations were performed.

The curative treatment for squamous cell carcinoma of the oesophagus changed from primary resection to chemoradiation during the duration of this series in light of studies showing an equivalent outcome

without surgery.^{15,16} More recently neo-adjuvant chemotherapy has been used for adenocarcinoma of the oesophagus.¹⁷⁻²⁰

Due to the poor long-term survival and the increased perioperative mortality of patients older than 80 years,^{9,21} chemoradiation was considered the treatment of choice (if tolerated) for this patient group.

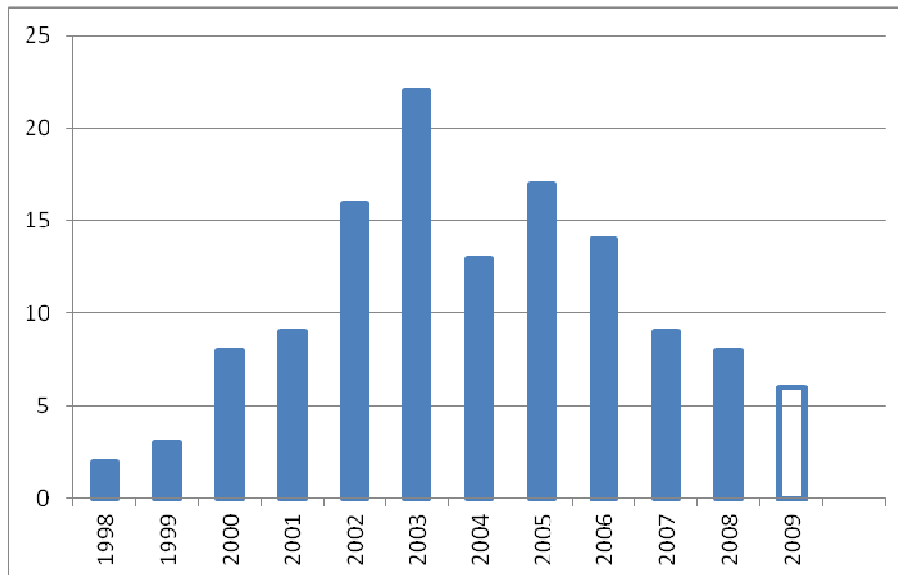
Statistical analysis was performed using StatView[®] v5.0.1 software (SAS[®] Institute Inc.). Basic statistics are presented. A Kaplan-Meier regression analysis was performed to estimate overall survival.

Ethical approval for this study was obtained from the Health and Disability Ethics Committees, Ministry of Health.

Results

From 1 January 1998 until 31 June 2009, 128 oesophagogastrectomies were performed (GC n=90; RR n=38) with an average of 11 and a median of 9 operations per year (range 2–22) (Figure 1).

Figure 1. Number of oesophagogastrectomies performed per year (overall 128 oesophagogastrectomies from 1 January 1998 until 31 June 2009, median 9 operations per year, range 2–22). The open bar represents half a year.



The median age was 64 years (range 37–79 years) and 85.2% (109/128) of the patients were male. The indication for resection was infiltrative adenocarcinoma (AC) (n=99), squamous cell carcinoma (SCC) (n=20), high grade dysplasia in Barrett's oesophagus (n=6), GIST (n=2) and primary oesophageal melanoma (n=1).

The 122 patients with invasive disease had mostly advanced disease with 61.5% (75/122) having pT₃ invasion (AC 64.6%; SCC 50.0%) and 56.5% (69/122) having lymph node involvement (AC 59.6%; SCC 45.0%). The complete pathological stage of disease is presented in Table 1.

Table 1. Histopathological findings per indication. Six patients with high grade dysplasia within Barret's oesophagus are not presented within this table.

Indication for resection	pTx	pN0	pN1	Total
Adenocarcinoma (n=99)	pT1	11	0	11 (11.1%)
	pT2	14	8	22 (22.2%)
	pT3	15	49	64 (64.6%)
	pT4	0	2	2 (2.0%)
	Total	40 (40.4%)	59 (59.6%)	99
Squamous cell carcinoma (n=20)	pT1	2	2	4 (20.0%)
	pT2	3	3	6 (30.0%)
	pT3	6	4	10 (50.0%)
	pT4	–	–	–
	Total	11 (55.0%)	9 (45.0%)	20
GIST (n=2)	pT1	1	–	1
	pT2	–	1	1
	Total	1	1	2
Melanoma (n=1)	pT3	1	–	1

A clear margin (R_0) was obtained in 53.3% (65/122) of all patients with invasive disease (AC 52.5%; SCC 50%). Two patients with adenocarcinoma with local ingrowth (pT₄) underwent a palliative R_2 resection and the remaining patients had a R_1 resection (defined as tumour present within 1mm from any surface of the specimen).

The R_0 resection rate would increase to 82.0% if a R_1 resection was defined as the microscopic presence of malignant cells on the specimen's surface. (Neo-)adjuvant chemotherapy was administered to 15 patients (AC, n=12; SCC, n=2; GIST, n=1).

Overall the median hospital stay was 12 days (range 7 - 63). In uncomplicated cases the median hospital stay was 11 days (range 7–17). In patients with a complication the hospital stay was prolonged to a median of 14 days (range 8–63).

There were 99 complications in 69 patients (53.9 % of all patients). Nearly three quarters of these complications did not require further treatment or pharmacological treatment only (Clavien-Dindo grade I & II). The most common complications were pulmonary (e.g. pneumonia or aspiration), which was mostly managed with antibiotics or without further intervention. The most common cardiac complication was atrial fibrillation (n=13).

Anastomotic leakage occurred in 7 patients (5.5%). Re-operation and wash out plus further drain placement was undertaken in 4 cases of which one patient died due to persistent sepsis (Clavien-Dindo grade III-B & grade V). Three patients were treated by endoscopic placement of a covered stent.

Of these 2 developed organ failure and required additional ICU support (Clavien-Dindo grade III-A & IV). Other than the 4 patients with anastomotic leakage there were no additional re-operations. Two patients with chyle leak settled without further intervention. The entire list of complications scored according to the Clavien-Dindo classification is presented in Table 2.

Table 2. Presentation of all complications, 2 complications leading to death

Complication		Grade of complication						Total
		I	II	III-A	III-B	IV	V	
Surgical	Anastomotic leak			1	3	2	1	7
	Wound infection	6						6
	Chyle leak	2						2
Pulmonary	Pneumonia		19					19
	Aspiration pneumonia		1			2	1	4
	Atelectasis	3						3
	Pleural effusion	5				2		7
	Exacerbation COPD		2					2
	Pneumothorax	7				1		8
	Resp failure					4		4
	Pulmonary Embolism		1					1
Cardiovascular	Atrial fibrillation		12			1		13
	Myocardial infarction		3			4		7
	Cardiac arrest					2		2
	Hypotension due to epidural		1			1		2
Neurological	CVA		1					1
	Delirium		3					3
	Neuropraxia arm	1						1
Other	UTI		4					4
	Urinary retention	1						1
	Nose bleed	1						1
	Sepsis due to pressure sore		1					1
	Total	26	48	1	3	19	2	99

Note: Of all patients 53.9% (69/128) suffered one or more complications. Complications scored according to Clavien-Dindo classification.¹⁴ Complications were scored to the highest impact.

Summarized explanation of Clavien-Dindo classification; Grade I: Deviation from normal postoperative course not requiring further treatment, Grade II: requiring pharmacological treatment, Grade III: requiring surgical, endoscopic or radiological intervention (III-A: under sedation, III-B under general anaesthesia), Grade IV: life threatening complication requiring ICU support, Grade V: leading to death.

The in-hospital mortality consisted of 2 patients (1.6%) (Clavien-Dindo grade V). As mentioned one patient died from sepsis and multiorgan failure following an anastomotic leak. The second patient died from sepsis and multiorgan failure following aspiration pneumonia. There were no early deaths following discharge within 30 days after surgery.

Thirteen patients required readmission after a median of 11 days post discharge (range 1–37 days). The reasons for readmission were varied (general malaise, Augmentin-induced rash, shortness of breath, epigastric collection, dumping, vasovagal induced dizziness, pneumonia, delayed gastric emptying, renal failure secondary to vomiting, reflux oesophagitis, anaemia, pulmonary effusion and dehydration due to vomiting), but all could be managed non-operatively and the patients were discharged safely.

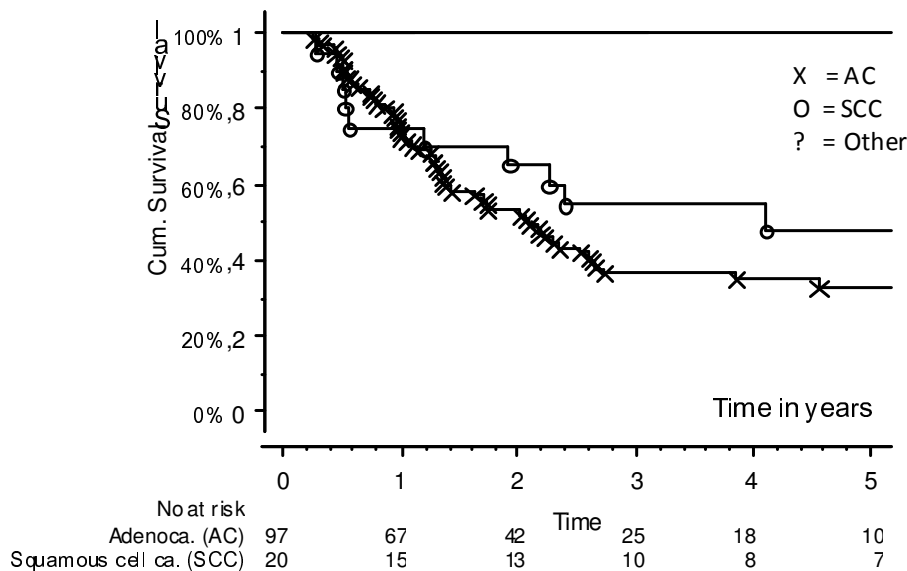
At the last date of follow-up before analysis (31 December 2009) only one patient was lost to follow-up; post resection for adenocarcinoma he moved to Singapore 4.2 years after the surgery.

Of the remainder, 74 patients had died. Recurrence of oesophageal cancer was identified as the cause of death in 70 of these patients. Two patients died 3.5 and 4 years after the oesophagogastrectomy of a Cerebral Vascular Accident. In the other 2 patients a concurrent malignancy developed (colon and prostate cancer) and from the cancer registry it was not clear which malignancy was the final cause of death.

For the calculation of the survival curve however recurrence of oesophageal cancer was presumed for both these patients. The median follow-up of the survivors was 3.6 years (range 0.5–9.5 years).

The overall estimated 3 and 5-year survival were 44.2% and 39.7% respectively (AC: 36.7% and 32.4%; SCC: 54.5 and 47.7%). The patients with high grade dysplasia, GIST and melanoma had a 100% survival at the time of analysis. Survival per indication is demonstrated in the Kaplan-Meijer survival curve (figure 2). An analysis of the determinants of survival was not the aim of this article and therefore not undertaken.

Figure 2. Kaplan-Meijer curve for estimated survival split by indication, in-hospital-mortality (n=2) excluded



Note: The 100% survival line represents high grade dysplasia (n=6, median follow-up 5.1 yrs, range 3.4 – 7.8 yrs), GIST (n=2, follow-up 0.9 – 3.1 yrs) and primary oesophageal melanoma (n=1, follow-up 1.2 years). One patient with adenocarcinoma was lost to follow-up at 4.2 years. Two patients developed concurrent cancers (prostate and colon, data uncensored).

Discussion

Despite being a low volume centre, although no strict consensus regarding qualifying volume yet exists, in this study we have shown a satisfactory outcome post oesophageal resection.

Our rates for in-hospital and/or 30-day mortality of 1.6% and an anastomotic leak rate of 5.5% are well within the rates found in the literature (Table 3).¹⁻⁹ By grading our complications according to the Clavien-Dindo classification our morbidity results are more transparent and open to comparison²².

Despite several analyses showing an advantage for high volume centres³⁻⁶ the mortality and morbidity rates differ greatly between studies and the low volume centre in one study sometimes performs better than the higher volume centres in another series.^{3,5,6}

Low to moderate volume series, including our series, have shown a comparable level of care.^{7,8,10,22} Not all large studies confirmed the expected advantage of either hospital volume or surgeon work load. Instead they found patient and disease related factors (such as age or stage of disease) far more predictive of outcome.²¹

We feel that some care should be taken in the high versus low volume discussion. Most volume related research has been based on retrospective or large database data producing heterogeneous data without the ability to meta-analyse or determine the reason for any difference that is found.^{5,23}

The lack of knowledge regarding the connection between volume and outcome is disappointing. It is unlikely that a low volume hospital would perform significantly better by increasing their resection numbers alone without a change in their management protocols (anaesthetics, ICU, nursing and training of surgeons).

A recent meta-analysis on volume showed that of the 27 publications that met the inclusion criteria, 3 authors dominated with 14 articles reporting on overlapping patient populations.²³ As shown in Table 3 there is little consensus around the number of operations per centre or even per surgeon that would qualify as high volume.²³

A cut-off of 20 operations per year has been suggested.³ By that measurement Christchurch would be regarded as a low-volume centre.

The volume discussion is complicated further by the observation of one centre that, over a 20-year period, it performed significantly better in the second decade without essentially changing their treatment protocol.² A similar observation has been made in American administrative database studies of major operations including oesophagogastrectomies.

Table 3. Comparison of reported outcomes in a selection of volume studies, ordered per year of publication. Volume is per author's directive.

Author	Year	Type research	Era	Volume	Mean № operations per year	In hospital mortality	Anastomotic leak rate	Morbidity rate	5-year survival	Remarks
Birkmeijer ⁵	2002	retrospect MEDPAR database (USA)	'94-'99	very low	<2	23,1%	x	x	x	Database analysis of 14 procedures of patients 65–99 years old, oesophagogastrctomy presented
				low	2-4	18,9%	x	x	x	
				medium	5-7	16,9%	x	x	x	
				high	8-19	11,7%	x	x	x	
				very high	>19	8,1%	x	x	x	
Gillison ²¹	2002	retrospect regional cohort (Wales)	'92-'96	low	<2	23,8%	x	x	x	Also surgeon workload analyzed, no relation found. No long term relation found
					5-8	8,4%	x	x	x	
				high	11-19	10,7%	x	x	x	
				>20	10,2%	x	x	x		
Atkins ⁹	2004	retrospect single centre cohort (USA)	'96-'02		54.1	5,8%	14,0%	64,0%	x	
Mariette ²	2004	retrospect single centre cohort (France)	'82-'93	1st decade	9.3	5,4%	9,8%	36,3%	31,0%	742 patients in total; upper third (n=247), transhiatal resection (n=109) excluded
			'94-'02	2nd decade	30.4	2,9%	2,2%			
Metzger ³	2004	systematic review	'98-'03	very low	<5	18,0%	x	x	x	Based on 13 studies
				low	5-10	13,8%	x	x	x	
				medium	11-20	11,0%	x	x	x	
				high	>20	4,9%	x	x	x	
Zhang ⁷	2005	retrospect single centre cohort (Australia)	'85-'03		6.7	5,0%	7,0%	36,0%	20,0%	
Rouvelas ⁶	2007	retrospect national database (Sweden)	'87-'00	low	1.0	9,0%	x	x	23,8%	
				high	18.0	4,0%	x	x	27,4%	
Low ⁵	2007	prospective single surgeon cohort (USA)	'91-'06		22.7	0,3%	3,8%	45,0%	34,5%	Survival of stage III disease
Omudsen ⁸	2007	retrospect single centre cohort (New Zealand)	'92-'04		5.2	10,4%	6,0%	27,0%	23,0%	Major complications reported only
Wouters ⁴	2008	retrospect regional cohort (Netherlands)	'90-'99	low	3.5	13,0%	17,0%	74,0%	± 20,0%	Survival estimated based on provided curve.
				high	56.0	5,0%	5,0%	56,0%	± 25,0%	
Al-Herz ¹⁰	2012	retrospect single centre cohort (New Zealand)	'93-'10		3.9	4,4%	10,3%	57,4%	30,3%	
Current series	–	retrospect single centre cohort (New Zealand)	'98-'09		11.1	1,6%	5,5%	53,9%	39,7%	

The studies showed that following the trend to recommend high volume centres the (richer and privately insured) white population transferred to the high volume centres for their surgery.^{5,24} However, over time, a decrease in the difference and, for some operations, even an equalisation in mortality rates was seen.²⁴

The improvement was partly credited to the shift towards high volume hospitals but could not be entirely attributed to it.²⁵ While these studies could not demonstrate the cause of this improvement, the ongoing tendency for super-specialisation, leading to better trained surgeons working in small volume hospitals (resulting in technical and protocol improvements), was suggested as a more important predictor than volume itself.^{24,25}

It is reasonable to expect initiatives in health care improvement to come from large volume centres, which have the capacity and necessary patient population to perform research and training. This newly acquired knowledge then needs to be passed on to the smaller centres, which may take time.

We found our overall 5-year survival rate of 39.7%, and 32.2% for adenocarcinoma to be in keeping with literature.^{1,2,6-8,10} The Swedish, an English and the Dutch comparative studies failed to show a 5-year-survival benefit for high volume centres or surgeons.^{4,6,21}

Even if high volume centres were recommended it is highly unlikely there would be enough cases, given New Zealand's small population, other than in the Auckland region. At 31 December 2010 the estimated population of New Zealand was 4.4 million people.²⁶

The latest revised edition cancer registry report counted 219 new cases of oesophageal cancer in 2005 (overall incidence 3.7/100,000/year) and this had been a fairly consistent number for the decade prior.²⁷ Of these 219 patients 65 were aged between 70 and 80 years and another 58 patients were over 80 years old, making it a mainly a disease of the elderly.

The incidence data unfortunately did not distinguish between adenocarcinoma and squamous cell carcinoma. A previous New Zealand analysis showed that only 15.4% of patients with oesophageal malignancy underwent surgical resection.²⁸ This low rate was confirmed by a Swedish nationwide analysis which found a resection rate of 24.4%.⁶

Although both analyses were not designed to determine the cause of the low resection rate, inoperability due to co-morbidity in the aged, presentation with incurable (metastatic) disease and a preference for treating squamous cell carcinoma with chemoradiation rather than resection were suggested reasons.²⁸

Combining the two national incidences with the expected resection rate means that approximately 34–53 patients (15.4%–24.4% × 219 cases) would undergo resection within New Zealand per year. This would then justify at most two high volume centres if a 20-resections-per-year threshold was applied.

Two high volume centres within New Zealand would mean that people were required to travel longer distances²⁹. Although an increased travelling distance does not per se lead to a delayed diagnosis, reduced access to health care or prospect of survival, as seen in New Zealand based research,^{12,13} there was a reduced compliance with follow

up treatment sessions after the primary treatment.¹² There are also significant geographical barriers to travel between, and within, the islands that make up New Zealand.

Since the treatment of oesophageal cancer has now become multi modality, particularly with the acceptance of neoadjuvant chemotherapy, it is a concern that willingness to complete both pre- and postoperative chemotherapy might decrease if the travelling distance to the centre became excessive.

We acknowledge that we have presented a retrospect analysis in which the influence of patient selection and protocol criteria on outcome cannot be determined. The workload for our clinic changed each year and, being a low volume centre, small fluctuations in numbers will have a large relative effect.

With improved staging and case selection (plus nonoperative management for squamous cell carcinoma) some reduction in numbers of patients undergoing resection is likely. However, this is not expected to be a long term trend given the rising incidence of adenocarcinoma at the gastroesophageal junction.

A complete representation of all available literature was beyond the scope of this article, and a selection of representative articles was therefore chosen to demonstrate our position.

Conclusion

Three low volume series from New Zealand including this series (low-volume defined as less than 20 operations per year) have shown an acceptable level of care for oesophageal resection.

The purpose of this article was to offset the tendency to advocate large volume centres on the basis of database originated research in order to balance the ongoing discussion. The lack of research into how volume determines outcome is disappointing and this limits improvements in the hospital systems other than increasing patient numbers.

Since New Zealand's population size and isolated location will not be able to provide this large increase in numbers, improvement in care has to be achieved through other mechanisms in care then just sheer case load volume. The assumption that volume will not be the game breaker can only be justified if small volume centres are able to prove that they do provide a good quality service.

Instead of aiming for highly concentrated surgical care it might be more appropriate, in the New Zealand environment, to rather encourage the appropriate management of oesophageal carcinoma by the increased use of MDT meetings and standardising treatment. Transparency and collaboration between the six appointed cancer centres should lead to comparison of results and the exchange of expertise and thus improvement in treatment protocols and standards.

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Reduction mammoplasty and resource allocation— are patients being treated fairly? An examination of the current New Zealand situation, and looking towards the future

Eloise E Dickie, Jeremy W Simcock

Abstract

Aim To review the access to publically-funded reduction mammoplasty for New Zealand (NZ) women. Additionally, to evaluate quality of life gains from reduction mammoplasty and other surgical treatments of chronic conditions. Ultimately to determine whether access to surgical treatment for this condition is equitable.

Method Four tertiary referral centres for Plastic Surgery in NZ completed a survey to characterise patient access. A literature search was done to investigate the global situation and obtain quality of life information following breast reduction and other operations for chronic conditions.

Results The survey showed there was significant inequity in allocation and access to breast reduction surgery in NZ over time and geographical location. There were hopes that the Ministry of Health Prioritisation Tool would ensure more equitable access to plastic surgical procedures nationally in the future. A similar situation exists in Europe in regards to allocation, and insurance companies dictate access in the US. There was overwhelming evidence to support quality of life gains with reduction mammoplasty, which are equal to if not greater than more accessible operations.

Conclusion In NZ there is inequitable access to surgery for patients who would be treated by breast reduction surgery, with substantial variation across geography and time. A new Prioritisation Tool may address this discrepancy. Much evidence exists that quality of life gains for reduction mammoplasty are equivalent to other surgical procedures, which are more readily available. The challenge is to improve equity of access across all surgical conditions.

A public health system is characterized by an excess of demand over supply, necessitating rationing of scarce resources. This is particularly evident within surgery, where there are many patients who, despite having a surgically treatable condition, will never receive a publically funded operation. This results in a growing group of patients who have no other option but to continue to suffer, with reduced quality of life.

All clinicians want the best for the patients in their care. When treatment cannot be provided due to resource limitations, it is important that we are able to convey to the patient that the situation for them is as fair as possible. By investigating a common condition, we aim to assess the fairness of access to surgery for patients across New Zealand.

Symptomatic macromastia is one of many chronic conditions, which is effectively treated by surgery. It is a common complaint, as demonstrated by over 63,000 breast

reduction procedures being completed in the United States in 2011.¹ For some conditions (such as cancers), it is a question of when rather than if a patient will be treated. Here we wish to focus on the likelihood of a patient suffering from breast hypertrophy, receiving treatment in New Zealand.

Macromastia is a disease, with chronic symptoms, that do not relapse nor remit. For those who are not obese, medical management is ineffective. Yet, the allocation of resources to treat macromastia, in the form of breast reduction surgery, a highly effective treatment appears not to match the burden of disease. This may be due to a perception in some quarters that reduction mammoplasty is a cosmetic rather than reconstructive procedure. Or, perhaps due to ignorance as to the extent of the health burden for these women, and the effectiveness of breast reduction surgery.

Surgical treatments remain inaccessible to many patients in New Zealand. The aim of this paper is to illustrate the equity of access to breast reduction surgery both across the country and between conditions. Our focus is on access to surgery, not waiting time prioritisation for patients who have already been accepted for treatment—a topic explored previously by MacCormick,² Doughty³ and Hadorn.⁴

We will compare the effects of surgical treatment of macromastia with other surgically treated chronic conditions. This will inform our response to the patient's question – am I getting a fair chance of surgery?

Method

A survey was completed by the tertiary referral centres for Plastic Surgery in New Zealand (Auckland, Waikato, Wellington and Christchurch). These were the four units performing publically funded breast reduction surgery during the study period (March 2007 to March 2010).

Oncoplastic surgery within general breast surgery services were not surveyed. The survey focused on the factors affecting the progression of the patient from referral to breast reduction surgery. These included patient and non-patient factors. We also enquired after each centre's plan for the future.

A literature review was performed to determine the quality of life gains from breast reduction surgery and other operations, for comparable conditions, such as joint replacements and cataract surgery.

Results

The survey was completed by three of the four centres. Despite similar catchment populations, over the three years reviewed, there was a geographical difference in operative numbers in the order of up to nine-fold (Table 1). Although not surveyed, anecdotal information indicates that two secondary referral centres, with plastic surgeons on staff, complete few, if any breast reduction operations, and one does not accept any referrals.

Temporal differences in each centre were also evident. Two of the three centres had four and five-fold variation in treated patients from year to year.

Table 1. Patient operation numbers per financial year in three New Zealand centres

Period	Centre A	Centre B	Centre C
2007–2008	12	23	3
2008–2009	47	35	5
2009–2010	18	23	16

The same inclusion and exclusion criteria for patients to receive a specialist appointment were used in different ways across the country. The presence of physical symptoms was universally required. Non-smoking status was a strict criterion in two institutions and preferred in the third. Body Mass Index (BMI) was variably utilized as a threshold.

One consistently accepted BMI's less than 30, another reduced the threshold from 35 to 30 over the three-year survey period, and another centre accepted a BMI up to 40. In addition, a single centre also utilised an algorithm developed locally, called the Breast Reduction Index (BRI). This score was calculated based on measured breast volume, estimated volume of the torso, degree of ptosis, and asymmetry. Those with the highest BRI scores progressed to surgery. Surgical thresholds were typically reviewed annually, and did not tend to change over time.

Limited information was available on what proportion of referred patients were offered a specialist appointment, and then progress on to surgery. In one hospital, less than 10% of those referred received a specialist appointment, and two-thirds of those were booked for an operation. Once booked, approximately 90% had surgery completed. In another centre, virtually all seen in clinic progressed on to surgery.

The main determinant of numbers of operations performed was staff and theatre capacity in all centres. Therefore fluctuating "spare" surgical capacity after other conditions had been treated determined the number of breast reductions performed.

In regards to the future situation, all units acknowledged that the Ministry of Health Breast and Body Prioritisation Tool would most likely determine triaging of breast reduction surgery. The impact of life component of the tool was seen as a significant benefit compared to the current stratification tools. Additionally, all centres appreciated the greater spread of scores obtained with the new tool.

Discussion

What the survey results mean to a patient with macromastia is that without any change to the severity of their condition or health, the chance of their referral progressing through to surgical treatment is likely to vary a huge amount from year to year. Similarly, a move to another region will also result in much variation. This is despite the departments utilising similar indications for surgery.

The survey illustrated the marked variation in service provision depending on geographical location and time, and the resultant inequity that currently exists in our public health system. The Ministry of Health Breast and Body Prioritisation Tool, if adopted nationally, we expect would improve equity of access.

It is of interest to compare local circumstances with the global situation in respect to patient prioritisation for reduction mammoplasty and resource provision.

In the United Kingdom, the NHS and British Association of Plastic Surgeons produced national guidelines, which the Primary Care Trusts could adapt for local implementation in 2005. Indications for surgery were neck ache, backache and/or intertrigo, and a BMI less than 30. In 2007, only 11 of 303 were accurately following the guidelines.

Almost two-thirds of Trusts had stipulated a maximum BMI (ranging from 25 to 32), and a similar number accepted musculoskeletal symptoms as an indication. Many Trusts included further restricting criteria, which weren't in the recommended guidelines, and 21 Trusts indicated they would not normally fund the operation. This study showed that despite agreed national guidelines, there was considerable variation in local funding criteria for breast reduction.⁵

It is disheartening that these findings followed a sentinel study published in the BMJ in 1996, examining whether breast reduction surgery should be rationed, and by what means.⁶ It wholeheartedly supported the inclusion of breast reduction surgery in NHS purchasing contracts, yet debate continues years later, and the discrepancies in access are as significant as they have ever been.

The European publically funded health system is not too dissimilar to our own. An internal market results in so called 'cosmetic' operations, such as breast reduction, being increasingly pushed from the repertoire due to rationing pressures.

In Finland, breast reduction operations are covered in the public system provided certain criteria are met, including physical measurements, neck and shoulder symptoms, and performance limitations. Barriers to access persist though, in that operations regarded as functional, reconstructive or therapeutic warrant public financing, but breast reduction, which is often considered aesthetic, does not. Consequently, many patients who wished to have a reduction were not referred to a plastic surgical consultation.⁷

Healthcare resources in the United States are almost exclusively available to those with private insurance, and there is significant policy variation in regards to coverage of reduction mammoplasty. The majority of third party payers are amenable to paying for futile alternate treatment options, such as physical therapy, special brassieres, and weight loss programmes, although there is much greater resistance when it comes to covering the costs of the proven treatment, in the form of surgery.^{8,9}

A study conducted in 2007 reviewed the criteria for different medical policies in regards to their coverage of breast reduction surgery.¹⁰ It acknowledged that insurance companies would evaluate the medical necessity of surgery based on internal company medical policies, which often seemed ill informed, and lacking of any scientific basis.

Of the 90 insurance companies medical policies reviewed, in most, the policies were arbitrary with little support from the literature. Common determinants of surgical cover in the policies were weight of breast tissue resection, symptom presentation, failed trial of conservative therapy, obesity, and mammography requirements. The

evidence supporting these determinants was at best scant, at worst often to the contrary.¹¹⁻¹⁶

As a result, women have been denied insurance coverage for a medically necessary procedure, which would have provided them with significant quality of life benefits. Thus both publically and privately funded, access to reduction surgery is difficult.

Conservative measures, such as weight loss regimes and special brassieres are not successful for treatment of macromastia.^{8,10} Alleviation of symptoms is solely achieved with surgical management, and so reduction mammoplasty is analogous to joint replacement and cataract surgery. These are chronic diseases whose only definitive management is surgical.

Breast reduction surgery is an example of access to treatment for a chronic condition in New Zealand—particularly timely given the recent *New Zealand Medical Journal* article entitled ‘Unwarranted variation in healthcare organization and practice for long-term conditions’.¹⁷

Evidence of the effectiveness of breast reduction surgery is compelling. Many outcome studies, using a variety of different measures, show clear quality of life gains in women who have had a reduction mammoplasty.

Disproportionately large breasts cause both physical and psychosocial symptoms. Commonly reported physical symptoms include headache, upper and lower back pain, neck pain, shoulder pain, arm pain, hand numbness or pain, painful bra-strap grooving of the shoulders, and intertrigo.

Psychosocial symptoms include difficulty in participating in sports and running, difficulty finding clothes to fit, very expensive underwear and swimwear, discomfort sleeping, being subject to embarrassing comments and scrutiny, low self-esteem, self-consciousness, intimacy issues, feelings of unattractiveness, depression, and anxiety in social situations.

Numerous quality of life studies have examined the changes following breast reduction surgery.¹⁸⁻²⁴ Most utilised the Health Survey Short Form 36 (SF-36) and the Rosenberg Self-esteem Scale in conjunction with other assessment tools, including customized breast symptom questionnaires.

All studies, irrespective of which health outcome measures were used, reported improvements in health related quality of life in both physical and psychosocial spheres postoperatively compared with pre-operative assessment. These health gains are maintained well into the future.²⁵

The Health Utilities Index Mark 3 score evaluates the effect of different ailments on quality of life. In this tool, 1.0 is equal to perfect health. Breast reduction candidates pre-operative score was 0.76; for age matched non-institutionalised women in the general population of Canada, it was 0.93. Twelve months following breast reduction surgery, the score increased to 0.89.

Living with breast hypertrophy confers a significant reduction in quality of life compared to the age-matched norm, comparable to some other serious health

conditions, such as moderate angina (0.90), and kidney transplant (0.84). Other chronic diseases mean utility scores were: stroke 0.68, asthma 0.86, arthritis 0.78, back problems 0.81, diabetes 0.79, heart disease 0.77, and epilepsy 0.78.²⁶

A phenomenological study examining women's perception of life following breast reduction found four themes that emerged—enhanced physical health, increased self-esteem, self-confidence, and improved body image.²⁷ No studies found evidence to the contrary.

One can prioritise rigorously within a specialty, but what is often of greater relevance is a comparison between specialties, when establishing equity of resources and maximization of benefit. Examination of quality of life gains achieved, where quality of life is impacted by the severity of the pre-operative condition and the subsequent improvement from surgery, enables this comparison.

Saariniemi et al²⁸ published an article in 2008, which directly compared breast reduction with large joint arthroplasty in Finland, where musculoskeletal disorders are associated with the greatest loss of quality of life among 29 chronic conditions. The 15D quality of life index was used, which assesses 15 different health dimensions including breathing, mobility, vitality and distress. The health deficit in those waiting for breast reduction was comparable to that of patients awaiting major joint arthroplasty.

Postoperatively, both reduction mammoplasty and total hip replacement gave a greater improvement in health-related quality of life than total knee replacement. Furthermore, it highlighted that breast hypertrophy tends to affect a younger demographic, ultimately resulting in patients following reduction having a cumulatively greater improvement in health-related quality of life than those after major joint replacement. There is potential for greater disability if definitive treatment is delayed, so the aim should be early intervention, and consequently an increased number of illness-free and illness-reduced life years.

The SF-36 is one of the more widely used tools to assess quality of life, and a point of reference when comparing different operations from different specialties. The eight subscales examined are physical functioning, role physical, bodily pain, general health, energy and vitality, social functioning, role emotional, and mental health.

Following cataract surgery, the SF-36 found a statistically significant improvement in the mental health subscale only in one study;²⁹ a second study showed an improvement in visual symptoms, but no difference in any SF-36 subscale post-operatively.

Total hip joint replacement results in clear improvement in quality of life. Most studies have found an improvement in at least half of the eight SF-36 subscales.^{30–35} These results following THJR are comparable, or slightly less than quality of life improvement following breast reduction. Less research has been published looking at outcomes following total knee joint replacement.

Those utilizing the SF-36, found an improvement in less than half of the subscales.^{36–39} Two further papers were identified which compared quality of life outcomes between hip and knee arthroplasty. Their findings were consistent with other

literature, that, total hip arthroplasty confers superior short-term outcomes when compared with total knee arthroplasty,⁴⁰ and total knee replacement patients experience a significantly poorer functional outcome than total hip replacement patients 5 to 8 years postoperatively.⁴¹ Joint replacement procedures have a major positive impact on pain in the actual joint, but improvement is less in other dimensions of health.⁴²

A Finnish study has reported that the cost per quality adjusted life year following breast reductions is similar to that following hip replacement.⁷

Clearly symptomatic breast hypertrophy is a significant health burden,⁴³ and the evidence that reduction mammoplasty successfully relieves the symptoms of breast hypertrophy is consistent. There is no basis for macromastia to be considered a cosmetic condition. Quality of life improvement measures show that breast reduction surgery effectively relieves a substantial health burden for these patients. This should be the basis of prioritisation of patients for access to healthcare.

In recent years, the Ministry of Health has developed a Clinical Prioritisation System for Breast and Body Surgery, with the aim of creating a reproducible method of triaging many conditions referred for Plastic and Reconstructive Surgery. It is a simple tool, covering conditions as diverse as post-massive weight-loss surgery, breast hypertrophy, breast reconstruction, and soft tissue disease such as neurofibromatosis.

An 'Impact on Life Questionnaire' is completed by prospective patients, assessing their difficulty with social interaction, personal interaction, personal care, personal safety, and leisure activities. Based on their responses, a score is calculated. Further scores are yielded from predicted degree of reversal of impact on life, risk of complications/adverse effect of the surgical procedure, and likelihood and degree of avoidable developmental and/or psychosocial consequence of delaying surgery.

The scores are added to obtain a total, which facilitates triage. A benefit of this, is you would expect that those most debilitated by their disease would receive a higher total score, and gain access to surgery. An advantage of this approach is that different conditions are triaged using the same methodology—i.e. it is a patient-centered approach rather than a condition-centered approach. A disadvantage is that conditions are compared within a single specialty, and not compared with conditions treated by other specialties.

We would encourage private health funders to consider surgical conditions in the same way. The development of evidence-based criteria for defining medical necessity may simplify the process of insurance coverage, and add a measure of consistency and predictability, which until recent years has been lacking.⁴⁴ Acknowledgement that macromastia is a chronic health burden, which can be remedied with surgery, greatly improving quality of life will result in fairer access for patients.

Future demand for health services will result in a greater number of patients going without surgical treatment. The challenge for the sector is to ensure that patients are treated fairly, irrespective of their particular condition.

Conclusion

Doctors can reduce the increasing dissatisfaction by steadily improving equity of access to treatment. We have demonstrated that we have a long way to go for those suitable for breast reduction surgery. Firstly, there is significant geographical and yearly variation in service provision nationally for the procedure. Secondly, there is substantial evidence that the quality of life gains for reduction mammoplasty are at least equivalent to those for other surgical conditions whose procedures are more readily available. Therefore, a patient presenting today faces inequity in access when compared with others with the same condition (macromastia), based on time and geography, and also between conditions treated by other specialties.

The Ministry of Health Prioritisation Tool should address the first discrepancy, if nationally adopted, and reduce variation in access within the specialty based on time and geography. The greatest challenge is the development of equity in access across surgical conditions from different specialties, so that those operations with the greatest quality of life gains are those most available to patients.

Patients have not been getting fair access to breast reduction surgery based on the year that they are referred, the region in which they live, nor their condition. Steps are being taken to reduce variation in prioritisation within plastic surgical conditions nationally, however without addressing the inequity between health conditions, these steps will provide little benefit to women with macromastia.

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Murine typhus and leptospirosis presenting with undifferentiated symptoms of an acute febrile illness to Waikato Hospital, New Zealand, 2009–2010

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Abstract

Aims This prospective observational study aimed to identify what proportion of patients presenting to Waikato Hospital with undifferentiated symptoms of an acute febrile illness (USFI) have leptospirosis or murine typhus infection, and to identify factors at presentation predictive of each infection. It also aimed to identify infecting rickettsial organism(s) causing murine typhus in the region.

Methods Between 15/10/2009–15/10/2010 all adult patients presenting with USFI of ≥ 72 hours with no clear diagnosis on presentation were invited to participate in the study. A structured questionnaire and examination were administered and acute and convalescent serology was performed. For patients returning positive murine typhus serology, rickettsial PCR analysis was performed on stored acute blood samples.

Results Fifty-seven patients were recruited. Nine were diagnosed with leptospirosis, five with murine typhus, three with Epstein-Barr virus (EBV), two with cytomegalovirus (CMV), five with bacterial sepsis and six with other diagnoses. Twenty seven had an acute febrile illness for which no diagnosis was found. A low platelet count ($p < 0.001$) was associated with murine typhus infection, and rural occupation ($p < 0.001$) and a low lymphocyte count ($p = 0.001$) with leptospiral infection. There was a trend towards rural residence being associated with murine typhus infection ($p = 0.059$). Two of four patients with positive murine typhus serology returned positive PCR analysis for *Rickettsia typhi*.

Conclusion A significant proportion of patients presenting to Waikato Hospital with USFI had leptospirosis or murine typhus infection. A low platelet count and rural residence were associated with murine typhus infection, and rural occupation and a low lymphocyte count with leptospiral infection. *R. typhi* was identified as a rickettsial organism causing rickettsial fever in the Waikato region.

Acute febrile illness is a relatively common cause of presentation to hospital, and it is our perception that many such patients leave hospital without receiving a confirmed diagnosis. Prevalent causes of acute febrile illness in adults in New Zealand (NZ) include infection with CMV,¹ EBV,¹ influenza virus² and leptospirosis.³

In the Waikato and Auckland regions murine typhus infection is also prevalent.^{4,5} In current clinical practice two of these infections (murine typhus and leptospirosis) are usually diagnosed with serological methods requiring paired acute and convalescent serology. It is our observation that for patients presenting with USFI to Waikato Hospital that serology for these infections is often either not performed or is only performed acutely. If this were true then a proportion of these patients discharged without a diagnosis may have an unrecognised leptospiral or murine typhus infection.

Clinical features of murine typhus and leptospirosis overlap considerably, making clinical differentiation difficult.⁶⁻¹⁰ Additionally, clinical and laboratory features typical of either infection may be similar to features in patients who present with USFI for whom no diagnosis is made. A rash (typically erythema maculae on trunk more than limbs and sparing hands) is more common in murine typhus,^{6,7} and conjunctivitis may be more common in leptospirosis.⁸⁻¹⁰ In both conditions renal, hepatic and respiratory complications can present in more severe infections.^{7,8}

Murine typhus is a non-specific febrile illness, caused by the bacteria *R. typhi*. Its lifecycle involves infection of mammalian hosts (classically rats) and flea vectors, where transmission occurs through flea bites, the inoculation of infected faeces into pruritic bite lesions or the inhalation of infected faeces.¹¹ Humans are infected opportunistically and do not help maintain the lifecycle of *R. typhi*. Murine typhus infection is more prevalent in warmer climates and in NZ has been detected in Auckland and its surrounds, and in the Waikato region.^{4,5} In NZ infection has occurred almost exclusively in people living in a rural environment.^{4,5}

All previous diagnoses of murine typhus in the Waikato region have been made with serological testing.⁵ This method lacks specificity as it displays cross reactivity between rickettsial species.¹² *R. typhi* has been confirmed by PCR analysis as the infecting organism of a number of patients serologically identified as having murine typhus in the Auckland area,⁴ and is the most likely infecting organism causing murine typhus infection in the Waikato region. However, the possibility exists of a different rickettsial organism causing infection, the most likely alternative being *Rickettsia felis*. *R. felis* has been identified as causing human illness in many countries,¹³ and has been detected in a significant proportion of cat and dog fleas in Palmerston North.¹⁴

Leptospirosis is also a non-specific febrile illness caused by the spirochaete *Leptospira* and may be contracted when liquid containing infective spirochaetes is inhaled, ingested, or contacts mucous membranes or broken skin.¹⁵

Cows,¹⁶ pigs,¹⁷ sheep¹⁸ and deer¹⁹ are all hosts of *leptospira* species in NZ and the urine of these animals may be infective.¹⁵ Leptospirosis is a common zoonosis in NZ (incidence of 2.2 per 100,000 per year), and incidence in the Waikato region is higher (6.1 per 100,000 per year) due to increased occupational risk (farmers, dairy farmers, abattoir workers).²⁰

Rats are also hosts to leptospira (*L. borgpetersonii* sv. *ballum*),²¹ and infection may result from exposure to contaminated groundwater.¹⁵ The most common serovars causing human infection in NZ are *L. borgpetersonii* sv. *hardjo* and *ballum*, and *L. interrogans* sv. *pomona*.³

A definitive diagnosis of leptospirosis may be made from culture or PCR analysis of blood, cerebrospinal fluid or urine,¹⁵ and for murine typhus infection by culture or PCR analysis of blood or infected tissue.²² However, in current clinical practice the diagnosis of both infections is usually serological.

A serological diagnosis of leptospirosis requires a fourfold rise in titre of antibody against leptospiral antigen in acute and convalescent serum in association with a compatible clinical illness.³

In NZ, if only a single specimen is obtained the Institute of Environmental Science and Research (ESR) considers a titre of 1/800 or greater as diagnostic of acute leptospirosis.²³

A serological diagnosis of murine typhus requires a four-fold rise in titre of antibody against *R. typhi* antigen, in association with a compatible clinical illness.²² Single titres of 1/512 (IgM) and 1/1024 (IgG) have previously been considered as consistent with a probable diagnosis of murine typhus.⁵

Antibiotic treatment is routinely given to patients with leptospiral or murine typhus infection. Doxycycline is effective against both bacteria, and for both illnesses reduces the duration and severity of symptoms.^{6,24}

This study sought to determine what proportion of patients with USFI presenting to Waikato Hospital have leptospirosis or murine typhus infection, and to identify epidemiological, clinical and laboratory features at presentation associated with these infections.

The identified proportion of leptospirosis and murine typhus infection in this patient group may allow hospital physicians to more accurately assess the likelihood of either infection when assessing future patients. The prospective analysis of epidemiological, clinical and laboratory features of each illness may further aid in this assessment.

A secondary aim of this study was to obtain a species specific diagnosis of the infecting rickettsial organism causing murine typhus in the Waikato region. The identification of an alternative rickettsial species to *R. typhi* as a causative agent of rickettsial fever would alter expected epidemiological patterns of rickettsial disease in NZ.

Methods

Ethical approval for this study was obtained from the Northern Y Ethics Committee. Between 15/10/2009–15/10/2010 on weekdays a request was made to the General Medical Service at Waikato Hospital for details of all patients presenting with USFI.

Symptoms of an acute febrile illness were defined as the presence of sweats, myalgias, rigors or chills of at least 72 hours duration with or without documented fever. For logistic reasons patients younger than 15 years old were not included (this study was run through the adult medicine service at Waikato Hospital).

If no diagnosis was identified on review of the data available to the admitting registrar the patient was invited to participate in the study. Informed consent was obtained and a structured questionnaire and examination was administered. Investigations performed during the hospital stay were recorded.

The study personnel did not direct management, excepting to perform acute and convalescent (three week) serology for leptospirosis and murine typhus. Patients who did not perform their convalescent blood test were reminded by one or more telephone calls.

Recorded parameters were chosen to include epidemiological factors, symptoms, signs and laboratory parameters that are considered to be associated with leptospirosis^{8–10} and murine typhus infection.^{6,7} We also attempted to record parameters associated with possible differential diagnoses including infectious mononucleosis.

Epidemiological parameters collected were age, ethnicity, location of residence (urban or rural), occupation (dairy farming, sheep and beef farming, agricultural contracting, abattoir work, stock agency, and horse training were considered rural occupations), overseas travel in the prior three months, having seen rats in the prior 6 weeks, and the presence of household pets.

Clinical parameters collected were date of presentation, duration of symptoms before presentation, diagnosis at study end, antibiotic use and timing of antibiotic use, recovery from illness, presence of

headache, aching muscles, cough, shortness of breath, having noticed an insect bite in the prior 6 weeks, the presence on examination of rash, conjunctivitis, lymphadenopathy and the presence of recorded fever $>38^{\circ}\text{C}$ in the first 24 hours of hospital stay.

Laboratory parameters on admission collected (if performed) were haemoglobin level, white cell count and differential (WCC), C reactive protein, creatinine, bilirubin, alanine transaminase (ALT), chest x-ray report (CXR), midstream urine report (MSU), lumbar puncture result, CMV serology, EBV serology, toxoplasmosis serology, human immunodeficiency virus serology (HIV), blood culture report, and acute and convalescent leptospirosis and murine typhus serology.

Murine typhus serology was performed using a commercial Indirect Immunofluorescent Assay (IFA) test (Product Code IF0100M, Focus Diagnostics, Inc. 11331 Valley View Street, Cypress, California 90630-4717 USA). This assay uses antigen from *R. typhi* and *R. rickettsiae*, representative of typhus and spotted fever groups of rickettsia respectively.

Leptospiral serology was performed by an in-house Microscopic Agglutination Test (MAT), using as antigen eight live serovars of leptospira obtained from the ESR on a monthly basis. (*L. borgspetersenii* sv. *ballum*, *hardjo* and *tarrassovi*, *L. kirschneri* sv. *grippotyphosa*, *L. interrogans* sv. *canicola*, *copenhagenii*, *pomona* and *australis*).

A small proportion of convalescent serology was performed in a private laboratory under hospital contract, using a commercial macroscopic agglutination test (product code 79623, Bio-Rad, 3 bld Raymond Poincaré, 92430, Marnes-la-Coquette, France) as a screening test. All positive sera identified with this test were sent to ESR for species conformation and titration of antibody using a MAT.

A definite leptospirosis infection was defined as a compatible clinical illness in association with a fourfold rise in titre of antibody against leptospiral antigen in acute and convalescent serum, or a single titre of 1/800 or greater.

Probable leptospirosis was defined as a compatible clinical illness with a single titre of 1/200 or greater. A high titre which did not change between acute and convalescent testing was considered consistent with previous leptospirosis infection.

A definite murine typhus infection was defined as a compatible clinical illness in association with a four fold rise in titre of both IgG and IgM antibody against *R. typhi* antigen, or with a single titre of 1/512 (IgM) and 1/1024 (IgG) or greater.

A probable diagnosis of murine typhus was defined as a compatible clinical illness and a single titre of antibody against *R. typhi* antigen of 1/128 (IgM) and 1/256 (IgG) or greater. An isolated high IgG titre without an associated high IgM titre was not considered consistent with acute murine typhus infection. Titres which did not change between acute and convalescent testing were considered consistent with previous murine typhus infection.

EDTA blood specimens from all patients were stored on presentation, and species specific PCR analysis was performed on specimens from patients returning positive murine typhus serology using the method outlined by Roux et al.²⁵

Statistical analysis was performed using R statistical software.²⁶ Clinical and epidemiological parameters were correlated with diagnoses, generating crude proportions of association. Diagnostic groups analysed were murine typhus, leptospirosis and 'all others'. Prop.test²⁶ in R was used to determine the significance of difference of proportions for categorical data, and Student's T test for difference of means of continuous data.

Tests were two-tailed, and a p-value of 0.05 was considered statistically significant. Correlation between significant parameters was analysed.

Results

Fifty-seven patients were included in the study, whose baseline demographics and final diagnoses are shown in Table 1.

The most common diagnosis was 'acute febrile illness without identified cause', while nine patients were diagnosed with leptospirosis (eight confirmed, one probable), five with murine typhus infection and five with bacterial sepsis.

Table 1. Baseline demographics and diagnoses

Variables	Number
Ethnicity	
NZ European	46
Māori	10
Chinese	1
Total	57
Male sex	38 (67%)
Diagnoses	
Murine typhus	5
Leptospirosis	9
EBV	3
CMV	2
Mycoplasma infection	1
Influenza	1
Bacterial sepsis	5
Cholecystitis	1
Still's disease	1
Cancer	1
Possible melioidosis	1
Acute febrile illness without identified cause	27
Total	57

Leptospirosis and murine typhus infection were more common in winter, however acute febrile illness without identified cause was also more common in winter. Investigations performed for patients included an MSU (51/57 patients), CXR (55/57), blood culture (52/57), lumbar puncture (9/57), EBV serology (33/57), CMV serology (27/55) and HIV serology (17/57). Most patients had murine typhus serology (56/57 acute, 53/57 convalescent) and leptospirosis serology (55/57 acute, 52/57 convalescent) performed.

All patients except two (those diagnosed with metastatic cancer and Still's disease) did not die and were not readmitted to Waikato Hospital in the 6 months following the study period, consistent with recovery from illness.

Of the nine patients who were diagnosed with leptospirosis, six had negative initial serology, two had high acute titres (patients 3 and 9) and one a low acute titre (patient 4). Eight of these nine patients were subsequently diagnosed with definite leptospirosis, and one with probable leptospirosis.

One further patient diagnosed with a *S. aureus* joint infection had an initial titre of 1/25 with no subsequent rise. Serovars diagnosed were *L. borgpeteronii* sv. *ballum* (3), *L. interrogans* sv. *pomona* (3), *L. borgpeteronii* sv. *hardjo* (1), *L. borgpeteronii* sv. *canicola* (1) and *L. borgpeteronii* sv. *tarrassovi* (1).

Table 2. All positive serology results (19/57 patients). Duration of symptoms records days of symptoms before presentation to hospital

ID	Diagnosis	Duration of symptoms (days)	Leptospirosis		<i>R. typhi</i>		<i>R. rickettsia</i>		Rickettsial PCR
			Acute	Convalescent	Acute	Convalescent	Acute	Convalescent	
1	<i>L. ballum</i>	8	neg	1/800	neg	neg : 1/256	neg	neg : 1/256	
2	<i>L. ballum</i>	3	neg	1/1600	neg	neg : 1/1024	neg	neg : 1/1024	
3	<i>L. ballum</i>	21	1/200	ND	neg	ND	neg	ND	
4	<i>L. canicola</i>	8	1/25	1/1600	neg	neg	neg	neg	
5	<i>L. hardjo</i>	4	neg	1/1600	neg	neg	neg	neg	
6	<i>L. pomona</i>	4	neg	1/100	neg	neg	neg	neg	
7	<i>L. pomona</i>	4	neg	1/200	neg	neg	neg	neg	
8	<i>L. pomona</i>	5	neg	1/3200	neg	neg	neg	neg	
9	<i>L. tarrasovi</i>	4	1/400	1/1600	neg	neg	neg	neg	
10	Murine typhus	7	neg	neg	1/128 : neg	1/1024 : 1/1024	neg	1/64 : 1/256	pos
11	Murine typhus	12	neg	neg	1/256 : 1/256	1/1024 : 1/1024	neg	neg	ND
12	Murine typhus	10	neg	neg	1/256 : 1/256	1/1024 : 1/1024	neg	neg	neg
13	Murine typhus	5	neg	neg	neg	1/1024 : 1/1024	neg	1/128 : 1/256	neg
14	Murine typhus	6	neg	neg	neg	1/1024 : 1/1024	neg	neg	pos
15	Undiagnosed	5	neg	neg	1/256 : 1/2048	1/256 : 1/2048	neg : 1/64	neg	
16	Undiagnosed	7	neg	neg	neg	neg	neg : 1/128	neg : 1/128	
17	Undiagnosed	4	neg	neg	neg	neg	neg : 1/128	neg	

Note: *R. typhi* and *R. rickettsia* serology recorded as IgM:IgG titres, neg=negative serology, ND=not done.

Of the five patients diagnosed with murine typhus two had negative and three had positive initial serology. All were subsequently diagnosed with definite murine typhus. One patient had persistently positive serology consistent with past infection (patient 15). Two of the three patients diagnosed with *L. borgpetersonii* sv. *ballum* returned negative acute and positive convalescent *R. typhi* IgG serology in an atypical pattern.

Rural residence, having seen rats in the 6 weeks preceding illness, a low platelet count, a rash and a low creatinine were associated with murine typhus infection.

A low lymphocyte count, rural occupation and having seen rats in the 6 weeks preceding illness were associated with leptospiral infection. There was a correlation between having seen rats and rural residence or rural occupation, and a strong correlation between ethnicity and rural residence (no Māori lived rurally). Ethnicity was therefore not considered an independent variable.

Table 3. Continuous parameters associated with leptospirosis or murine typhus infection

	Mean (All Others) (n=43)		Mean (Murine Typhus) (n=5)		P-value	Mean (Leptospirosis) (n=9)		P-value
		+/- SD		+/- SD			+/- SD	
Age (years)	41.5		44.2			36.1		
Symptom Duration (days)	11		8			7		
Platelet count (x10 ⁹ /L)	241	(134-349)	140	(105-175)	<0.001	192	(82- 301)	
White cell count (x10 ⁹ /L)	10.4		6.3			8.1		
Neutrophil count (x10 ⁹ /L)	7.5		4.5			6.8		
Lymphocyte Count (x10 ⁹ /L)	1.7	(0.12-3.9)	1.3	(0.12-1.9)		0.6	(0.16-1.0)	0.001
CRP (mg/L)	114		115			126		
Creatinine (mcmol/L)	99	(19-180)	72	(55- 89)	0.07	232	(0-541)	
Bilirubin (mcmol/L)	12.9		11			17.2		
ALT (IU/L)	83		196			87.8		

Note: Significance calculated using Student's T test for difference of means, "All Other Patients" used as comparison group. P-values < 0.10 shown

Table 4. Categorical parameters predictive of leptospirosis or murine typhus infection.

	All Others (n=43)	Murine Typhus (n=5)	P-value	Leptospirosis (n=9)	P-value
Maori ethnicity	10	0	NC	0	NC
Female sex	15	3		1	
Rural occupation	9	2		8	<0.001
Rural residence	19	5	0.059	7	
Overseas travel past 3 months	5	1		1	
Pets in house	24	4		8	
Seen rats past 6 weeks	16	5	0.028	7	0.063
Noted insect bite past 6 weeks	8	1		2	
Headache	37	5		8	
Aching muscles	31	4		6	
Cough	19	3		6	
Shortness of breath	12	1		4	
Stiff sore neck	27	3		2	
Photophobia	22	1		4	
Documented fever > 38°C	28	5		6	
Conjunctivitis on examination	6	0	NC	2	
Lymphadenopathy on examination	7	1		1	
Rash on examination	7	3	0.096	1	
Abnormal CXR	6 (n=41)	1 (n=5)		1 (n=9)	
MSU nitrate positive	4 (n=37)	1 (n=5)		1 (n=9)	

Note: Significance calculated using Prop.test²⁶ for significance of proportions, 'all other patients' used as comparison group. P-values <0.10 shown.

When analysis was limited to those of rural residence, having seen rats in the previous 6 weeks was non-significantly associated with a diagnosis of murine typhus (5/5 murine typhus vs. 17/26 all others, prop. test; p=0.31) When analysis was limited to those with rural occupation, having seen rats in the previous 6 weeks was not significantly associated with a diagnosis of leptospirosis (7/8 leptospirosis vs. 8/11 all others, Prop.test; p=0.83).

Four of the five patients with a serological diagnosis of murine typhus infection had PCR performed. Two of these returned *R. typhi* as the infecting organism, and two had no organism detected. Both patients with negative PCR had been administered antibiotics before their blood sample was taken, as did one of the two with a positive PCR result. There was no difference in duration of symptoms before presentation (6 and 7 days, positive PCR vs. 5 and 10 days, negative PCR) for the two groups.

The five patients with bacterial sepsis were diagnosed with *E. coli* bacteraemia without focus, streptococcal pneumonia, *S. aureus* bacteraemia without focus, *S. aureus* septic arthritis of the knee, and *S. aureus* bacteraemia with dental abscess.

Discussion

Over the course of a year 57 patients presented with USFI of three or more days duration to Waikato Hospital, which serves a population of approximately 300,000 people.

Leptospirosis, murine typhus and bacterial sepsis were the most common diagnoses. The majority of patients with leptospirosis or murine typhus required convalescent serology for diagnosis, and a high proportion of patients required reminding to perform a convalescent blood test. These observations suggest leptospirosis and murine typhus are probably under-diagnosed in routine clinical practice.

We have prospectively shown that rural residence and a low platelet count are associated with murine typhus infection, and rural occupation and a low lymphocyte count with leptospiral infection.

The Waikato is a region with high rural residence and high numbers of dairy and other farms. However, a significant proportion of New Zealand's population live on semirural or "lifestyle" properties on the outskirts of towns or cities.

The majority of cases of murine typhus infection in NZ have been diagnosed in the Auckland region, mainly in people living on rural properties.^{4,5} Therefore we feel that the identified associated factors may still be useful in identifying patients with leptospiral or murine typhus infection presenting to larger urban hospitals in NZ.

Leptospirosis has been diagnosed in all regions of New Zealand,³ whilst murine typhus has been diagnosed only in the north.^{4,5} One of our patients diagnosed with murine typhus lived in Cambridge, which is the most southerly diagnosis of which we are aware in NZ.

While being an infection most commonly described in warmer climates, it has also been identified in regions which have cold winters, for example Salamanca in northern Spain.²⁷ Greater clinician awareness of this infection may lead to the diagnosis of murine typhus in more southerly regions in the country.

Rats are known to be a reservoir of murine typhus infection and the association of having recently seen rats with murine typhus infection is not unexpected. However, seeing rats appears to be a part of rural Waikato life, as the majority of rural living patients reported this.

The presence of a low platelet count was predictive of a diagnosis of murine typhus, and a low lymphocyte count predictive of leptospirosis. Thrombocytopenia has previously been reported as a feature of murine typhus infection and of leptospirosis infection.^{10,28} Lymphopenia has been reported as a feature of acute leptospiral infection,²⁹ but not in murine typhus where papers have tended to report only total leukocyte count.

Patients with EBV or CMV also had low platelet and lymphocyte counts. In urban populations where murine typhus and leptospirosis may be less common these parameters may be less predictive of either infection, and more predictive of EBV or CMV infection.

Five patients were diagnosed with bacteraemia. It remains important to screen patients with undifferentiated fever for bacterial sepsis by performing blood cultures.

Two of three patients diagnosed with *L. Borgpetersonii* sv. *ballum* infection underwent IgG (but not IgM) seroconversion to *R. typhi* antigen. The absence of acute or convalescent IgM antibody to *R. typhi* antigen suggests this represents the presence of an IgG antibody to *L. borgpetersonii* sv. *ballum* which is cross reactive to the *R. typhi* antigen present in the commercial rickettsial ELISA kit used in our laboratory.

A literature review did not identify published reports of such an interaction, although cross reactivity of *R. typhi* antibodies to antigen from other bacteria, for example *Legionella bozelle* antigen, has been described.³⁰

PCR analysis confirmed *R. typhi* as an infecting rickettsial organism causing murine typhus in the Waikato region. Although it is probable that PCR yield is higher when blood samples are taken early in infectious illness and before the administration of antibiotics, these trends were not observed in our study, possibly because of small sample size. The possibility remains of other rickettsial species causing febrile rickettsiosis in NZ.

Although its prospective design gives strength to the observations made in this study, there are a number of weaknesses. The exclusion of patients younger than 15 years of age means our data cannot be extrapolated to paediatric populations.

Secondly, not recruiting patients on weekend days will have underestimated the incidence of presentation with USFI. However, only patients admitted on Saturday and discharged before Monday were likely to have been missed, as almost all patients in our cohort were admitted for at least one night.

Thirdly, parameters collected by interview were subject to patient and interviewer interpretation. For example, questioning regarding having seen rats relied on the patient's ability to visually differentiate a rat from other small animals, and the interviewer's interpretation of their answer. We cannot confirm whether patients actually saw rats, but can confirm that the observed relationship exists between the

patient's response to each question posed, and murine typhus or leptospirosis infection.

Conclusion

A significant proportion of patients presenting to Waikato Hospital with USFI had leptospirosis or murine typhus infection, the diagnosis of which often required convalescent serology. Rural residence and a low platelet count were associated with murine typhus infection, while rural occupation and a low lymphocyte count were associated with leptospirosis. *R. typhi* was identified as a rickettsial organism causing rickettsial illness in the Waikato region.

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Is it time to advocate for a vulnerable road user protection law in New Zealand?

Harold Weiss, Aimee Ward

Abstract

After a spate of recent New Zealand cyclist deaths, cycle advocates and several policy makers have been pondering the issue of increased penalties aimed at drivers deemed at fault. A key question is whether vulnerable road users (VRUs), including pedestrians, workers, animal riders, stranded motorists, skateboarders, cyclists, and others, are likely to be protected through enhanced penalties for at fault drivers of motor vehicles. We explored current policy and the international literature to examine whether or not enhanced penalties would be likely to increase motor vehicle driver motivation to exercise greater caution around VRUs leading to improved road safety.

Proponents of vulnerable road user (VRU) protection laws, hoping to improve driver behaviour and safety, point out that legal redress often results in no or minor penalties to careless motorists (as opposed to the distinct case of alleged criminally negligent defendants) with little equivalency to the severity of harm to the injured victim or survivors. There may be several motivations to such a law ranging from politics, to justice, to injury control, and road safety. From an effectiveness standpoint, however, there are no studies examining whether such laws actually have the desired population level effects.

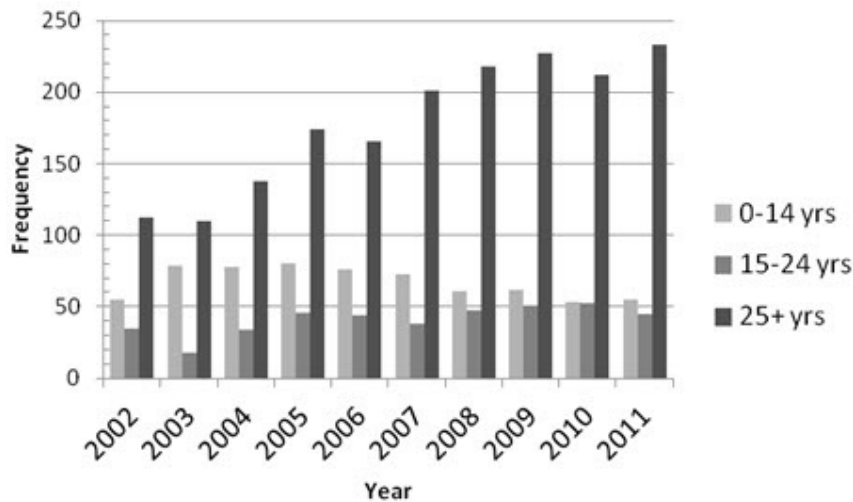
Little is known about the effectiveness of VRU laws and, any positive impact is far from guaranteed. The possibility of unintended consequences, as well as the time, resources and effort to lobby, enact, publicise, enforce and prosecute under vulnerable road user laws might best be spent elsewhere if the primary aim is to improve road safety.

Policy explored

According to the World Health Organization, a “vulnerable road user” is any “non-motorist” road user in the role of a pedestrian, a highway worker, a person riding an animal, a stranded motorist, a skateboarder, roller skater, a scooter, or a cyclist, to name a few.¹

The definition may even be extended to other “motorists” such as operators or passengers of powered scooters, electric bikes, farm equipment, and motorcycles; thus commonly including any road user that is not enclosed in the relative protection of an automobile or truck.^{1,2}

Figure 1. Trends in serious cyclist traffic injury, New Zealand, 2002–2011



Discussions about VRU protection laws periodically emerge following a specific case, a widely publicised group of cases or VRU deaths or concern over increasing trends. Such a cluster of cyclist fatalities occurred in New Zealand in 2010 and 2011.

The Waikato Coroner, heading a National investigation, reported 34 bicycle fatalities involving motor vehicles since 2007. This has led to regional hearings looking for common factors among these deaths.³ Prior to this group of fatalities, there was also evidence of increased number of cases over time of serious traffic-related injury among adult cyclists (Figure 1).⁴ Thus, there have been calls for increased legal protection of vulnerable road users in New Zealand.

The purpose of this commentary is to discuss, from a public health perspective, the background and ramifications of enhanced penalties to at fault drivers for injuries to VRUs in general and for New Zealand and cyclists in particular.

Everyone is a VRU at one time or another. Most drivers walk at some point each day, if only from a parked car to their destination. There will come a time for almost everyone when they will no longer drive due to age or illness. Thus, the aims and possible implementation of VRU laws should be of interest to all.

Generally, VRU laws do not try to criminalise a new set of behaviours. Instead, when a victim is seriously injured or killed through “carelessness”, such laws increase the likelihood of enhanced penalties, costs, and other burdens upon the driver.

By specifying a narrow set of circumstances where such laws apply, they attempt not to burden the legal system while theoretically attempting to send a deterrent message to other drivers. They come into play when incidents to VRUs, leading to either serious injury or death, go unpunished or under-punished, especially if the victim was not at fault or shared any blame.

This can occur when law enforcement and judicial officials are unable or unwilling to penalise motorist actions that result in serious injury to vulnerable road users for

“carelessness” that does not rise to the level of dangerous driving, criminal negligence, leaving the scene or intent to harm. The situation of concern is distinct from when the driver of the non-vulnerable vehicle is engaged in ‘dangerous’ driving or is criminally negligent; for example, due to drink or drugged driving, speeding, cell phone and texting use or wilful intent. These latter types of events are usually treated separately or as criminal cases and are not a focus of this discussion. We focus here on those situations where driver actions or inactions are related to *careless* errors and unintended collisions that result in serious injury or death. These include, for example:

- Failure to “see” the VRU due to cognitive or perceptual limitations (“*I never saw him, Officer!*”);
- Misjudging the traffic environment and vulnerable user movements (“*I really didn't think he was moving so fast, Officer!*”); and
- Distracted driving from a large variety of common but not necessarily prohibited activities (e.g. passenger distractions, operating audio and GPS equipment, pets, insects, eating, smoking, adjusting climate controls, scanning dashboard instruments, moving windows and visors, etc., “*By the time I looked up, Officer, it was too late to stop!*”).

While drivers involved in a crash under these types of circumstances may be charged with an offence, imposed penalties are not always proportional to the seriousness of the collision. However, the lay and legal concept of “carelessness” in bicycle (and other)/motor vehicle crashes is complicated by reports that in as much or more than half of all car/bike crashes, the drivers claim they never saw the cyclist or saw them too late to avoid the crash. Similar results are reported from the motorcycle injury literature.⁵

Cognitive research backs up these claims as a real phenomenon.^{6,7} Is this “carelessness”? Or, does the concept of carelessness lead, in some circumstances, to penalising limits to human perception in all its nuances and variations? A law cannot have much impact on deterrence if the people it is directed against are not aware they are doing or have done anything that they perceive to be wrong. Then there is the question of how law enforcement officials are able to determine if the driver really did not “see” the vulnerable user or is instead lying, forgetful or confused?

The problem of driver carelessness escalates when the legal outcome results in little or no sanction to the motorist, leading to an unbalanced scale of redress to the seriously injured victim or their family. Some believe a VRU protection law makes the point that responsibility and respect should accompany the privilege of operating powerful, large, fast-moving vehicles and this could help make VRUs feel safer, thus encouraging more people to cycle and walk.^{8,9}

Choosing the right mix of penalties is also important in gaining acceptance from both advocates and potential opposition. Too harsh an increased penalty and politicians, police, judges, media, and the driving public will struggle against its heavy handedness. Too light, and advocates will feel it doesn't accomplish anything.

Questions that come up around balancing penalties include:

- Should the new law add penalties to existing offences?
- Should the new law create a new class of offences?
- Should the law account for partial fault by the VRU?
- If so, what type of penalties (increased fines, suspensions, court hearings, public service)?
- How high should the fines be?
- Should the law contain an option to attend a traffic safety course and or transport related community service in lieu of the monetary fines?
- How will such a law be enforced and treated by the courts?

How the health burden is addressed

Current laws—Laws to protect VRUs are in place in several countries and local jurisdictions. Such a law might look like the 2008 Oregon state statute (USA), one of the first such laws that strengthened the penalties for careless injuring or killing of a VRU, without making it a crime.¹⁰

As one advocate explains, it “incorporates the inherent vulnerability of humans who use the roads without being encased in a protective steel shell”.¹¹ Other US states have had VRU bills passed including Oregon, New York, Delaware and Washington State (see Table 1).^{10,12-14}

The pace of VRU law introductions in the US appears to be picking up with bills being introduced as of early 2012 in Connecticut, Massachusetts, Michigan, Nevada, and Rhode Island.¹⁵⁻¹⁹ Other states have introduced VRU bills in the last few years, but have not had them signed into law. These include Texas, Illinois and New Mexico.²⁰⁻²²

Strict liability rules for compensation currently apply in the Netherlands and Germany.²³ Similarly, England is considering making car drivers' insurance companies legally liable for compensating pedestrian and cyclist victims of road crashes.⁹ Strict liability says that anyone who uses a potentially dangerous vehicle should be liable to compensate for injuries arising from the use of that vehicle.

A government publication, *Cycling in the Netherlands*, puts it this way: “The Dutch philosophy is: Cyclists are not dangerous; cars and car drivers are: so car drivers should take the responsibility for avoiding collisions with cyclists. This implies that car drivers are almost always liable when a collision with a bicycle occurs and should adapt their speed when bicycles share the roads with cyclists”.²⁴

The responsibility is put on motor vehicle operators, sending the message the road is a shared space. But with far better cycling infrastructure than most of North America and New Zealand, lower speeds, and safety in numbers from a much higher number of cyclists on Dutch roads, it is unknown what impacts this policy has on the lower rates of Dutch cycle injuries. These are also laws that impact on liability. It is not clear how they apply to traffic fines, penalties and criminal proceedings. With no-fault insurance

schemes in New Zealand and some US states, it is problematic how such strict liability policies can be applied with such schemes in place.

Law effectiveness—Unfortunately there are no published evaluations of the effectiveness of any such laws in reducing VRU injury risk. It would probably be very difficult to do so from a research methodology perspective unless many more states and countries passed such laws allowing properly controlled cross-jurisdictional comparisons. In the absence of VRU law evaluations, it is worth exploring conceptually whether such a law would be expected to have much effect.

Like all such laws, acceptability and passage depends on it appealing to a broad constituency, designed not to offend too many people, and to be consistently enforceable. Drunken driving laws are acceptable and work to the extent that they do by fulfilling these criteria. Importantly, they also dissuade many people from breaking the law before they do any harm, while removing (by arrest) some offenders from the road before harm is done to others. A large part of the dissuasion comes from drivers knowing they can get caught and punished for breaking the law, *even if they don't have a crash and harm anyone*. By definition, careless drivers impacted by VRU laws will usually be charged only after their actions or inactions lead to harm.

Few drivers will exhibit or even be aware of actionable pre-crash event careless behaviours, until something actually happens. Thus, considerably lower rates of deterrence would be expected against the ill-defined after-the-fact behaviour that amounts to carelessness, compared to laws against drunk driving and speeding where fear of getting caught may be the primary deterrent.

The added dissuasion of increased penalties beyond mere traffic fines also assumes that drivers are constantly aware of the law and will usually take additional actions. This is unlikely to play out in the real world due to limitations of driver perceptions, knowledge and focus on a new law, over and above the already existing moral, financial and legal incentives to avoid harming fellow road users. The only effect VRU laws are likely to have is in perceived justice where the punishment for being responsible for the event better fits the impact the event had on the victim. That is not prevention, however, it is retribution.

Absent criminal conduct such as alcohol and drug use or evidence of medical problems, the kinds of people charged under VRU laws are not likely to serially reoffend and thus a focus on drivers that have been careless will have little impact on the long tail of drivers likely to be involved in future crashes related to carelessness.

Lastly, without evaluation, unintended consequences cannot be ruled out. One theoretical scenario has some VRUs feeling they are more protected by such a law resulting in letting their guard down and practicing less defensive movement (risk compensation theory).²⁵ Another unintended consequence might be alienating and threatening so many drivers that support for other more effective initiatives lack public support or garner active opposition.

Table 1. Enacted vulnerable road user (VRU) laws in the United States compared to New Zealand’s careless driving law

Component	Oregon	New York	Delaware	Washington State	New Zealand
Name/URL	HB 811.135	A07917D (S.5292)	SB 269	SB 5326	Not a VRU - Careless Driving, Land Transport Act
Effective Date	1/2008	8/2010	9/2010	7/2012	1998
Definition of Vulnerable User	Pedestrian, a highway worker, a person riding an animal or a person operating any of the following on a public way, crosswalk or shoulder of the highway: A farm tractor or implement of husbandry without an enclosed shell; A skateboard; Roller skates; In-line skates; A scooter; or A bicycle.	Bicyclist Pedestrian Domestic animal.	A pedestrian, including those persons actually engaged in work upon a highway, or in work upon utility facilities along a highway, or engaged in emergency services within the right-of-way; or A person riding an animal; or A person operating any of the following on a public right-of-way, crosswalk, or shoulder of the highway: 1. A farm tractor or similar vehicle; 2. A skateboard; 3. Roller skates; 4. In-line skates; 5. A scooter; 6. A moped; 7. A bicycle; or 8. A motorcycle.	A pedestrian A person riding an animal; A person operating any of the following on a public way: A farm tractor or implement of husbandry, without an enclosed shell; A bicycle; An electric-assisted bicycle; An electric personal assistive mobility device; A moped; A motor-driven cycle; A motorized foot scooter; or A motorcycle.	Careless or dangerous driving may be charged if any person is injured or killed, so it is not necessary to specify user types in injury crashes.
Fine and punishment	Up to \$12,500	No more than \$500 or by imprisonment for not more than 15 days or both.	Up to \$550 and suspension of driving privileges if course and community service not fulfilled.	\$1,000 to \$5,000; and have his or her driving privileges suspended for 90 days.	Maximum 3 months imprisonment or a fine not exceeding \$4,500; and licence disqualification for 6 months or more.
Community service option	Yes	No	Yes	Yes	Yes

Penalty for in-complete service	Yes	NA	Yes	Yes	Yes
Misdemeanour or Crime	Misdemeanour	Misdemeanour	Misdemeanour	Misdemeanour	NA
Comments	According to Doug Parrow, the chair of the Bicycle Transportation Alliance's legislative committee, the Oregon law has been reported to result in few fines being charged but one pedestrian case was reported in 2011.	Law sets up new traffic violation called careless driving for cases where conviction on a charge of criminal negligence or recklessness is unlikely. Requires that every driver of a vehicle shall exercise due care to avoid colliding with the defined road users.	Amends the careless or inattentive driving law by enhancing the penalty for a careless or inattentive driver who contributes to the serious physical injury of a vulnerable user in a public right of way.	A new traffic offence is created that fills the gap between a simple ticket and a crime. It establishes an enhanced offence for those drivers whose behaviour maims or kills and reinforces the need to exercise due care when driving around vulnerable populations.	Careless driving causing injury – section 38 of the Land Transport Act 1998: “It is an offence to operate a vehicle on a road carelessly or without reasonable consideration for other persons using the road, and by that act or omission cause an injury to or the death of another person.”

New Zealand laws—Recently, the New Zealand Ministry of Transport explored the cost/benefit of increasing the penalty for both categories of careless and dangerous offences.²⁶ They examined the possible impacts of raising the maximum imprisonment for careless driving from 3 months to 3 years for deaths, and 2 years for injury and a fine of up to \$10,000 (up from \$4,500) and license disqualification for 1 year or more (up from 6 months). They utilised an estimate of the range of the potential deterrent effect of these increased penalties from 1 to 5 per cent. How this five-fold range of effect was estimated was not described, casting doubts that it was empirically derived.

Some complexities aside, the break-even point for balancing the social cost savings against the increased costs of prison beds and court costs for increasing the penalties was estimated to require a 3.8 per cent deterrent effect, a level they considered unlikely to be obtained.

Since there is no-fault financial liability in NZ through the Accident Compensation Corporation (ACC) scheme, injured VRUs already receive comprehensive personal injury coverage. Therefore, a financial liability policy like in the Netherlands serves little remunerative purpose.^{27,28} But can a careless driver, whose actions, inattentiveness, or failure to see and avoid the VRU that lead to serious injury or death, go unpunished relative to the harm that resulted under current law?

New Zealand Transport Law already differentiates careless driving causing death or injury from: a) Aggravated careless driving and careless driving under the influence of drink or drugs, and b) Dangerous driving (refers specifically to dangerous/reckless driving, illegal street racing, drink/drug driving, and failing to stop after a crash involving injury or death).²⁶ A comparison of dangerous driving penalties to the United Kingdom, United States, Australia and Canada suggest that NZ penalties are more lenient in terms of maximum prison sentences for dangerous driving.²⁶ However, careless driving penalties are generally stricter than the US VRU laws (see Table 1).

The relative contribution of dangerous and careless drivers to casualty crashes of all types, not just those involving a VRU, was reported by the Ministry of Transport for 2009.²⁶ Among 10,106 police-reported injury crashes where the driver of at least one vehicle was deemed “at fault”, 1,004 (9.9%) were convicted of careless driving; and 291 (2.9%) were convicted of dangerous or reckless driving. Road user type was not described in that report.

A separate study reported in 2009 there were 546 “at fault” drivers involved in a bicycle/single motor-vehicle casualty collision (5.4% of all at fault crashes).²⁹ A breakdown of the convictions for the bicycle-related incidents was not reported. This suggests that among at fault casualty crashes, only a small proportion of drivers are convicted for careless driving. Whether this is due to injuries being minor, and what proportion of serious injuries/deaths did not lead to a careless driving conviction is unknown.

Taken together, these data suggest that convictions for vulnerable road user injury for careless driving already takes place in New Zealand, but the consistency of convictions in cases of serious injury and death is not known. This is a critical gap in current knowledge that needs to be filled before making any final conclusions about

the adequacy of current New Zealand laws to consistently, much less fairly, penalise careless drivers of vehicles at fault for injuring VRUs.

Conclusions

From a preventive (deterrent) perspective, it is difficult to envision how VRU laws can accomplish much by themselves. Realistic expectations can help avoid future criticism and loss of credibility. If retribution is the goal, it appears adequate laws are already on the books in New Zealand to penalize careless drivers.

It remains a question whether these laws are enforced consistently and regularly brought to bear on the most egregious cases of harm inflicted to VRUs by careless drivers. But it should be acknowledged that stricter enforcement, if undertaken, will probably come at a price of increased penalties for some road users in situations they may not have much real control over.

Hoping that a law, by itself, will have any measureable effect on changing driver behaviours and “Copenhagnize” our transportation system is naive. Slowing traffic down, lowering traffic density, designing and building safer intersections, making cars come to a full stop instead of giving way at intersections, separating motor vehicles from VRUs, greatly increasing the numbers of calmed bicycle boulevards, designing actual shared spaces, and greatly increasing the number and visibility of VRUs; those are the efforts that will likely have a much more certain and larger impact on reducing dangers to VRUs than increased penalties or enforcement for careless driving.

Seen as one facet in reducing the culture of road danger for all users, VRU laws may provide an impetus for attitudinal change that sets the tone for operating our transport system with safety for all users among its most important characteristic. But it would not be the only such way to achieve that goal.

Great care and wisdom needs to be taken when to rollout these types of punitive changes in our public spaces. The success of VRU laws at reducing injury are far from guaranteed and implemented too early in the evolution of a more balanced modal share approach could come at a cost of time, effort and resources that might best be spent in other endeavours.

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Duck shooting injuries in Southland, New Zealand

Martin Watts, Ian Densie

Abstract

Duck shooting is a common sport in New Zealand. The opening weekend is anticipated and celebrated, often with significant alcohol intake which is cause for concern, and potentially very dangerous. Hunters are annually warned about the dangers. There have been few duck shooting incidents which lead to injury or death. In the last decade two duck shooters in New Zealand have been killed, while 16 suffered non fatal gunshot injuries. We present a series of injuries identified during the 2012 duck shooting season in Southland Province.

Case report

We prospectively studied patients attending the Emergency Department (ED) at Southland Hospital (Invercargill, New Zealand) and identified eight patients with injuries as a result of duck shooting activities. Of these, five were male, three female, with an age range from 9 to 72 years.

Discussion

Overall the numbers were small but may be representative, as duck shooting is a common activity with family groups often participating.

There were no injuries from shooters being shot either by other shooters or by themselves. Five injuries occurred while shooting a gun, four of these as a result of recoil of the gun, causing injury to the shoulder, chest, face and indirectly to the scapula. The other shooting injury occurred after a foreign body irritated the eye of a shooter. The three non-shooting injuries occurred as a result of falls while the participants were walking from the shooting areas, the falls resulted in a fractured ankle, a fractured finger and an acromio-clavicular joint dislocation.

Two patients injured were documented as having consumed alcohol at, or around the time of injury. Both cases were adult males who fell when walking from the shooting areas.

It is not unexpected that several injuries resulted from falls. Ducks are hunted in rural areas that usually require travel across unformed paths. The ED frequently sees injuries associated with falls on uneven ground. The small number related to duck shooting is not significant, and a similar pattern might be expected from walking across uneven ground associated with any outdoor activity.

Half of the injuries were due to the recoil effect of the gun. This is in itself a complex subject. There are numerous factors affecting the recoil and potential for injury from this, including the gun, its calibre, length of the stock and its weight, the cartridge used, the number of shots fired and both the physical build and the technique of the shooter involved.

A range of recoil reducing devices are available, from gel recoil pads through to the Beretta Xtrema 2 Kick-Off recoil reducing shot gun. Our study did not identify what guns or safety equipment were used, and was not able to make conclusions about this subject, except to identify that recoil was the most frequent mechanism of injury.

Dramatic injuries such as shotgun wounds are uncommon, but attract media attention and are remembered by those who treat them. Emotional events tend to be recalled with more frequency and clarity than memories not associated with extreme emotions. It is likely that this may be responsible for the perception that serious duck shooting injuries are more common than they actually are. Minor injuries are in fact much more common, less memorable and are not newsworthy.

Shooting injuries are easily preventable by using common sense and following basic safe firearms handling guidelines. However promotion of recoil injury prevention techniques and devices may be beneficial in decreasing less serious but more frequent injuries.

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Lead poisoning from Ayurvedic medicines

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Abstract

A case of lead poisoning with established exposure to Ayurvedic medicines is presented. This patient migrated from India to New Zealand 8 years previously. He regularly visits India where he purchases “herbal remedies” for his wellbeing.

Case report

A 40-year-old Asian Indian male presented with 2 months of lethargy, malaise, myalgia and arthralgia. His spouse had noted pallor, intermittent memory loss and personality changes as well. Medical background included diabetes (on metformin and gliclazide), hypertension (on cilazapril, atenolol, and indapamide), dyslipidaemia (diet controlled), gout (on allopurinol) and oesophageal reflux (on omeprazole).

Blood tests revealed anaemia (97 g/L from 147 g/L a year ago). Liver function tests were within normal range. The blood film showed basophilic stippling (Figure 1).

Figure 1. Basophilic stippling seen within the red blood cell



Whole blood level was 3.5 $\mu\text{mol/L}$ (0.0–0.47) and thus was referred to our hospital for further management. Examination findings included a “lead line” on his gums (Figure 2). There were no neurological findings.

Figure 2. “Lead line” – blue pigmentation seen along the gum line



He had no occupational or domestic exposure to lead. Three Ayurvedic medicines were suspected to be the cause.¹ These were sent to Environmental Laboratory Services Ltd for analysis and elevated lead levels were found. The patient recalled taking these tablets consistently for the past 8 years, which equated to approximate cumulative exposure of 166 mg (56.8 mcg/day) (Table 1).

Table 1. Environmental Laboratory Services report with daily exposure dose

Variables	Himalaya Liv 52 DS	Neem Guard	Jambrulin
Lead content	2.7 mg/kg	4.4 mg/kg	14.8 mg/kg
Tablet weight	0.6812 g	0.5918 g	0.5392 g
Dose	2 tab daily	2 tab daily	6 tab daily
Exposure	3.7 mcg / day	5.2 mcg / day	47.9 mcg / day

He was treated with dimercaptosuccinic acid (DMSA) for 19 days due to his symptoms. Lead levels decreased from 3.4 $\mu\text{mol/L}$ to 1.9 $\mu\text{mol/L}$ at 29 days. The haemoglobin improved from 94 g/l to 120 g/l at day 31 as did his symptoms.

Discussion

A blood lead level of greater than 0.48 $\mu\text{mol/L}$ (10 mg/dL) is notifiable to the Ministry of Health. Although overt clinical symptoms are unlikely at this level, there is a potential for subtle chronic effects.² In New Zealand (NZ), 201 total cases of lead poisoning were reported in 2010, equating to a rate of 4.6/100,000.³ Though lead poisoning is rare, it is crucial that we identify the source of exposure by good history-taking.

Hepatotoxicity is an additional typical finding in lead poisoning⁴ although this was not seen here. We have also reported this case to the NZ Pharmacovigilance Centre.

It is said that 99% of serum lead is bound to erythrocytes and the remaining 1% is free for exchange with soft tissues such as cortical bone, bone marrow, kidney and liver.⁵ The half life of lead is approximately 30 days in serum. However, once lead is deposited into other tissues, it will vary significantly and can be lengthened e.g. if deposited in bone, the half life can be up to a decade due to slow release into the blood stream, leading to prolonged elevation of lead levels.⁵

The characteristic blue “lead line” is caused by lead deposition in plaque rather than in the tissues of the gum or tooth.⁶

There are four reliable forms of chelation therapy. These are; Ca disodium EDTA (ethylenediaminetetraacetic acid), dimercaprol (BAL), DMSA (dimercaptosuccinic acid, an analogue of dimercaprol) and d-penicillamine. DMSA, being the effective oral form, is used typically in mild to moderate poisoning and should be used whenever possible to avoid hospital admission.⁷ However, in practice, NZ clinicians’ initial choice of chelating agents is often limited by what is promptly available and in what quantity.

Regular monitoring of lead levels is recommended to confirm a decrease in levels along with improvement of symptoms.⁸ The NZ National Poisons Centre (NPC) has developed guidelines for the management of lead poisoning, based on periodic review of the international literature. These are available for subscribers to the NPC electronic database⁹ or on phone consultation with the NPC.

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The lady who lost her marbles—food for thought

Andrew J Ing, Shi Jane Pang, Grant Coulter

Background—Oesophageal foreign bodies are an infrequent cause of adult hospital presentation and an even less common incidental finding.¹ Microcytic anaemia is however a common reason for further investigation, particularly in the elderly. It involves excluding sources of occult blood loss, initially focussing on the gastrointestinal tract.²

An 84-year-old female without significant medical history presented acutely under the general surgical service following a motor vehicle accident. Whilst haemodynamically stable, examination demonstrated significant seatbelt bruising and generalised abdominal tenderness. A CT scan at this stage showed no intra-abdominal pathology.

Clinical—The patient was noted to be anaemic with a haemoglobin of 91 g/L (normal 115–155), MCV 79 fL (80–99), and ferritin 19 ug/L (20–350). She specifically denied any symptoms of her anaemia.

Upper and lower gastrointestinal endoscopy were performed 6 weeks after index presentation. Gastroscopy identified a pharyngeal pouch containing a marble clearly seen in Figure 1 as a rounded smooth structure within a lumen. Figure 2 is a contrast study of the oesophagus performed after marble retrieval.

Unfortunately there is no radiological image which demonstrates the marble *in situ*. The pouch fills to the right side of the image with contrast seen as black. Colonoscopy identified a sigmoid polyp which could not be removed endoscopically and this is seen in Figure 3. A large caecal tumour was also identified and is pictured being biopsied in Figure 4. The biopsy confirmed adenocarcinoma.

After discussion in clinic, the patient proceeded to open right hemicolectomy as well as sigmoid colotomy and polypectomy. She made an uneventful recovery from this and was discharged on the sixth day post-operatively. Histology described a T3N0 adenocarcinoma of the caecum. The sigmoid polyp was reported as adenoma.

Figure 1. Smooth marble (arrowed) within a pouch

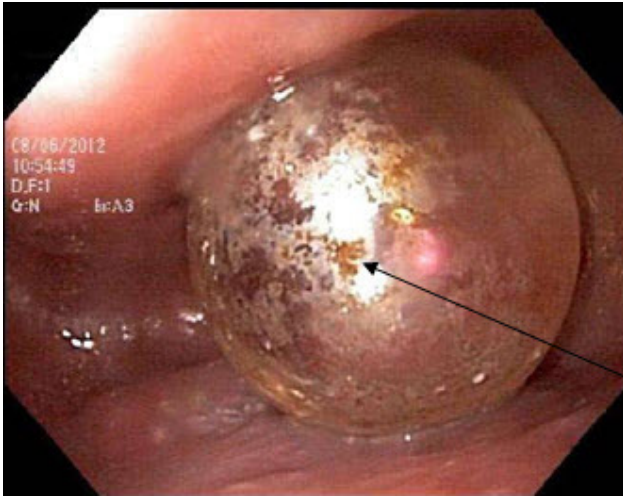


Figure 2. Pouch seen filling with black contrast (arrowed)

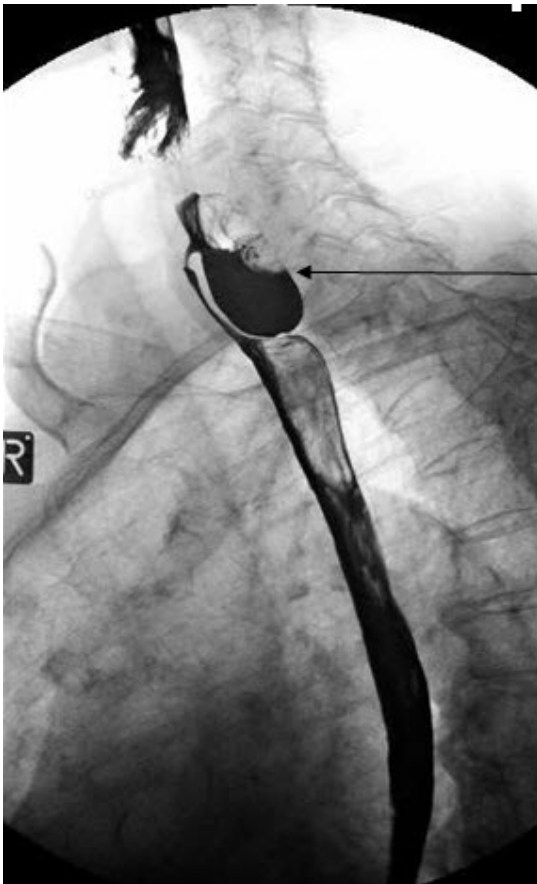


Figure 3. Large villous-appearing lesion (arrowed) within large intestine

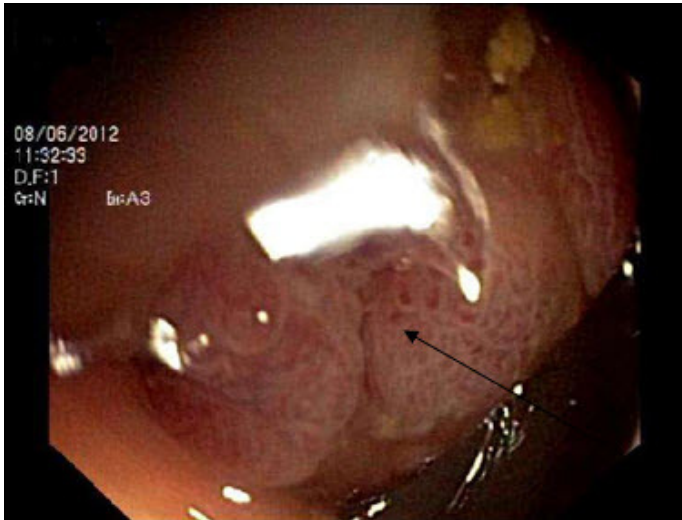
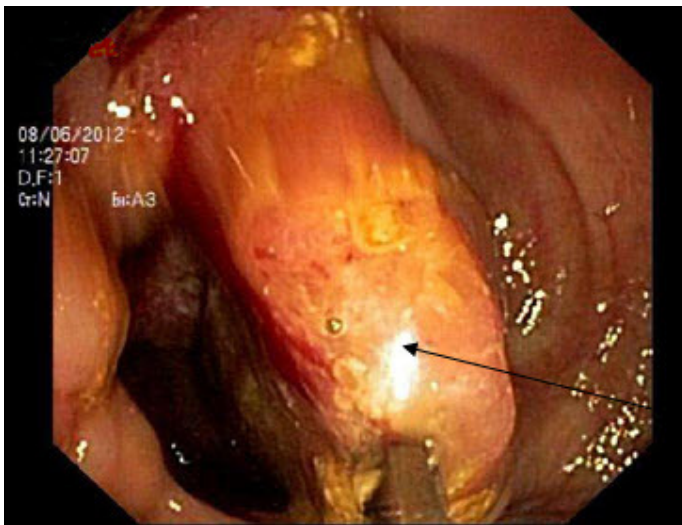


Figure 4. Tumour (arrowed) within lumen of caecum



Discussion—This patient, initially asymptomatic of her anaemia, was admitted to hospital following a motor vehicle accident. She made a speedy recovery following this and pleasingly went on to have her anaemia investigated appropriately. Two separate bowel lesions were identified and managed appropriately with predicted good long-term outcome.

Of greater interest to the patient was the identification of a marble in an oesophageal pouch. She could specifically remember her mother making jam some 30 years previously and a long discussion about the marbles in the pot to “stop the sugar

sticking”. This is a commonly-used technique and is not previously described in the medical literature as causing any harm.

On the occasion in question the marble was lost and nothing further was thought of it until now. It is likely that the marble has been resident in the patient’s oesophagus for 30 years.

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Mediastinal air-fluid level with substernal pain

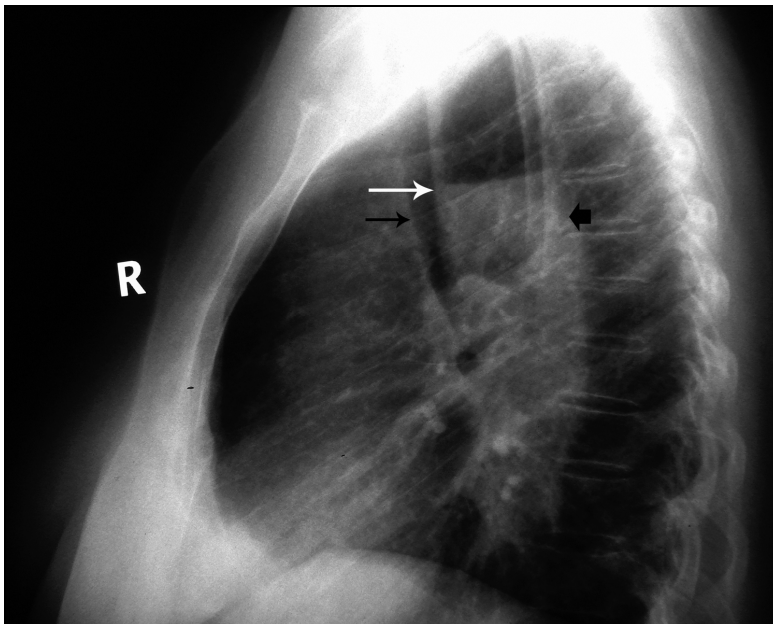
Prem P Gupta, Rohtas Yadav, Dipti Agarwal, Krishan B Gupta

Clinical details

A 55-year-lady was referred to our Institute from a primary health centre for recurrent substernal chest pain. She also had a history of regurgitation. She had no hypertension or diabetes mellitus. The cardiovascular examination revealed no contributory findings; electrocardiograph (ECG) had no abnormal finding.

At the time of examination at our Institute, her chest radiograph was as shown in Figure 1.

Figure 1. Chest radiograph, lateral view showing air-fluid level in oesophagus that is dilated abnormally [white arrow]. The tracheal lucency can be seen anterior to it [thin black arrow]. A likely confusion with the aortic arch [thick small black arrow] needs to be carefully avoided.



What is the abnormality seen in Figure 1?

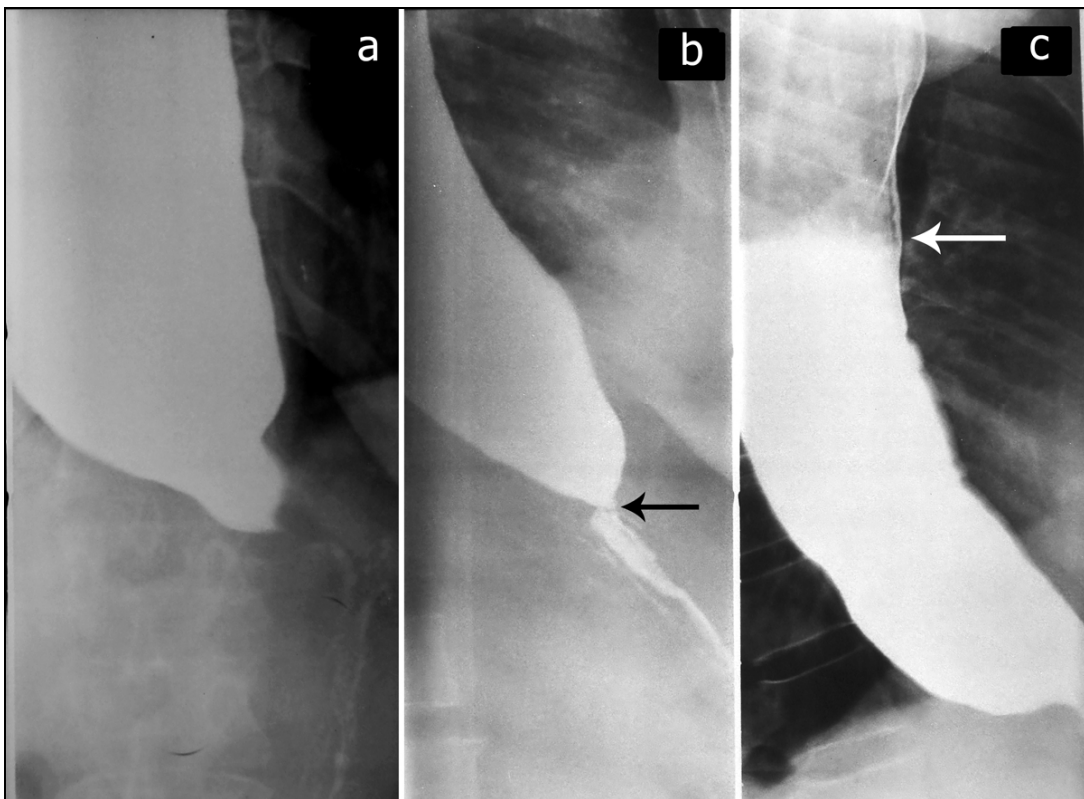
What is your diagnosis based on chest radiograph and clinical details?

Answers

The chest radiograph (Figure 1) is showing air-fluid level in the mediastinum along with an absent shadow of gas in stomach—both these features are characteristics of achalasia cardia.

Chest films taken during barium study (Figure 2) confirmed the diagnosis of *achalasia*.

Figure 2: Chest radiographs taken as a part of barium study: [a] the oesophagus is markedly dilated; [b] gastro-oesophageal junction is seen [black arrow]; and [c] a lateral view showing dilated oesophagus with air-fluid level. An air-fluid margin is seen due to the lack of peristalsis.



Discussion

Achalasia is a rare disorder of oesophagus with unknown aetiology, characterised primarily by oesophageal aperistalsis along with impaired inhibition of the lower oesophageal sphincter (LES).¹

The exact incidence vary from region to region; 1–2 per 200,000 per year is often reported, with males and females affected equally. This disorder most frequently manifests between the ages of 20 and 50 years.

The usual clinical symptoms include dysphagia (initially, for solid foods; later on even for liquids), regurgitation, substernal pain, heartburn, coughing, reactive airway symptoms (wheezing) and even features of aspiration pneumonia.²

Recurring coughing or choking episodes during recumbent position have been reported in these subjects. The various tools commonly used for diagnosis of achalasia are listed in Box 1.

The treatment of achalasia is largely palliative since the underlying aetiology remains elusive.^{2,3} Various pharmacological measures like nitrates, calcium-channel blockers, anticholinergics etc. have been tried with variable results.

Endoscopic balloon dilatation and injection of botulinum toxin (Botox) have been used in some subjects. The Heller myotomy with fundoplication is the best treatment for those who are fit, success rate being 85–95%; though up to 15% may suffer from a reflux.

Box 1. Diagnostic tools for achalasia

Chest radiograph

Widened mediastinum
Air fluid level in the oesophagus
Absent gastric air bubble
Signs of aspiration pneumonia

Barium studies

Narrowing at the level of gastro-oesophageal junction (bird's beak appearance)
Dilated and tortuous oesophagus

Fluoroscopy

Aperistalsis
Elongated and dilated oesophagus
Sigmoid oesophagus

Endoscopy

Dilatation and atony of the oesophageal body
LES that resists procedure

Oesophageal manometry (gold standard)

Aperistalsis of the oesophageal body
Elevated LES pressure
Impaired relaxation of the LES during swallowing

Computed tomography

Confirmation of the lesion
Evaluation of surrounding structures to rule out alternate aetiologies

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Alcohol-related injuries requiring surgery

Swain and colleagues' recent study published in the April assessing the establishment of safe zones at major rugby events in Wellington and the introduction of an alcohol intoxication pathway,¹ highlighted the impact alcohol can potentially have on healthcare workload and costs if not managed effectively. It is clear, however, that alcohol's impact on healthcare is not just limited to large sporting events.

The Law Commission 2009 paper '*Alcohol in Our Lives*' noted that, "[i]f there is no decrease in alcohol consumption we can expect to see hospital admissions continuing to increase."² This is concerning as it increases the cost and resource burden on the health system.

The Alcohol Advisory Council of New Zealand estimated that alcohol accounted for 3.9% of all deaths in 2000, with trauma related to alcohol consumption (51%) being the biggest contributor to this figure.³ Previous studies examining the extent of alcohol related trauma leading to hospital admissions in New Zealand have tended to focus on maxillofacial injuries and orthopaedic patients.⁴⁻¹¹

In order to characterise alcohol related trauma requiring surgery in Dunedin Public Hospital, we conducted a retrospective cross sectional analysis of all alcohol-related trauma cases requiring surgery between 1 November 2007 and 30 April 2008, irrespective of surgical sub-speciality. The list of all acute surgical procedures (procedures that are unplanned and urgently required) performed was obtained from the Department of Surgery.

Admissions that were due to trauma were identified by ACC documentation. Any diagnosis recorded in the notes that seemed to have arisen from underlying pathology not related to trauma, as in the case of slipped upper femoral epiphysis, was excluded. Documentation (via patient report or physician assessment) of alcohol consumption relating to the injury was recorded.

Over the 6-month period examined, there were a total of 1344 admissions that required acute surgical intervention. Of these admissions, 689 cases had associated ACC documentation. Two cases of slipped upper femoral epiphysis were excluded. From the 687 case notes of the study population, 592 were available and analysed (86%).

The Orthopaedic Department had the highest proportion of trauma (91%), followed by Maxillofacial (86%), whereas there was no trauma-related surgery in Obstetrics and Gynaecology.

Length of Stay (LOS) as inpatient varied from Neurosurgery (14.3 days) to Urology (1.5 days), with median LOS of 4.9 days. Of the 592 cases analysed, there were 55 (9.5%) clearly documented cases of alcohol-related trauma.

Univariate comparisons showed significant differences between the alcohol-related and non-alcohol-related trauma groups. The alcohol-related trauma group consisted of more males ($p = 0.003$), non-Europeans ($p = 0.017$), and unemployed individuals ($p <$

0.001) than the non-alcohol group. Multivariate analysis showed that older age (odds ratio, OR) = 1.72, $p = 0.046$) and male gender (OR=1.89, $p = 0.020$) were significant predictors of alcohol-related injuries requiring surgery.

Unemployment was the strongest predictor of alcohol-related trauma requiring surgery compared to those who were employed (OR=5.91, $p < 0.001$), after adjusting for age, gender and ethnicity. In comparison with the unemployed, students were less likely to present with alcohol-related trauma (OR=0.111, $p < 0.001$).

Of the 16 referral letters transferring care to a surgical speciality, six (38%) failed to mention alcohol-related injury. Emergency Department notes documented 28 cases (50%) of alcohol-related injury, but only 11% focused on background consumption of alcohol (outside the injury).

When focusing on house surgeons, there was a high rate of reporting of alcohol-related trauma (63%) and background alcohol consumption (63%). However, in discharge summaries, there was a marked drop in reporting of alcohol-related trauma (32%), and only 4% of background alcohol consumption was documented. Seventy-three percent of anaesthetists did not mention alcohol use in the preoperative anaesthetic notes although alcohol-related injury was stated elsewhere within these patients' notes.

In summary, alcohol-related trauma places even greater pressure on an already strained health system, diverting theatre resources away from elective surgeries. The minimisation of such trauma is clearly important.

Whilst younger males have been well known to be likely to abuse alcohol, this study found unemployed individuals significantly more prone to alcohol-related injury. A link between alcohol and employment status has been previously found.^{12,13} However, there is a clear need for further research into the relationship between unemployment and alcohol use.

Documentation of alcohol-related trauma was also found to be poor. Poor documentation of alcohol use in New Zealand was first raised by Hamilton and Menkes, who suggested more emphasis needed to be given during medical school about obtaining accurate information about alcohol use.⁸

After nearly 20 years, however, there has been little progress. Improvement in the accuracy of documentation is vital in addressing the health burden of alcohol use.

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Cancellations on the day of elective gynaecological surgery: the Counties Manukau experience

Cancellation of surgery is a significant and costly issue for many surgical units, with rates of 7.2–16.5% reported in developed countries.^{1–5} Cancellation rates of gynaecological surgery were usually lower than most other specialties at 4.5–8.9%.^{1,2,5} Common classifications for cancellation include “clinical or non-clinical”, “service-related or patient-related” and “avoidable or non-avoidable”.^{1–5}

There are significant costs of unused staffing, theatre equipment, waiting list prolongation and rescheduling. In patients, cancellations are associated with worse health outcomes, reduced trust in service, loss of working days and unnecessary stresses. The continuing burden of waiting list for elective operations and tight health budget makes it of utmost importance to investigate cancellations of surgery, which has not been previously reported in New Zealand.

The aim of this study is to ascertain the rates and reasons for cancellations on the day of elective gynaecological surgery at Counties Manukau District Health Board (CMDHB). Ethical approval for this study was granted by the Northern Regional Ethics Committee (NTX/11/EXP/223).

Consecutive elective gynaecological surgery patients who had day of surgery cancellations between September 2010 and August 2011 were retrospectively identified from the Manukau Surgical Centre database. Relevant demographic, clinical, operative and administrative characteristics were extracted from both computerised and written records. All cancellations were then classified as one of 10 categories listed in Table 1. Two investigators (TW and CS) independently categorised each case, and any discrepancies were resolved by consensus. Data were presented as mean (standard deviation) for continuous variables and percentages (frequency) for categorical variables.

A total of 1572 elective gynaecological operations were performed during the 1 year study period, with 232 day of surgery cancellations. Thirty-four of these were excluded: 14 were acute operations, 16 were administrative error with cancellations not on day of surgery, three were duplicates, and one case was done without cancellation. For the 198 included cancellations, mean age was 42.8 (12.9) years, and ethnicity included NZ European 15.7% (31), Maori 25.3% (50), Pacific 40.4% (80) and other 18.7% (37).

“Clinical” and “non-clinical” made up 39.2% (76) and 60.8% (118) with 4 unable to be classified; “service-related” and patient-related” made up 34.5% (67) and 65.5% (124) with 4 unable to be classified; and “avoidable” and “unavoidable” made up 24.4% (44) and 75.6% (136) with 18 unable to be classified. The inter-assessor variability for each classification was low: 2.5% (5/198) for “clinical” or “non-clinical”, 1.5% (3/198) for “service-related” or “patient-related”, and slightly higher at 6.1% (12/198) for “avoidable” or “unavoidable”. Characteristics of each reason category are listed in Table 1.

Table 1. Characteristics of day of surgery cancellations by reason category

Classification	Clinical reasons					Non-clinical reasons				
	Intercurrent illnesses	Not worked up	Not nil by mouth	Different treatment	Surgery not needed	Did not attend	List overrun	Treatment declined	Staff unavailable	Transport difficulty
Percentage of all cancellations	19.1% (37)	7.7% (15)	6.2% (12)	4.6% (9)	1.0% (2)	27.3% (53)	14.9% (29)	10.8% (21)	5.7% (11)	2.6% (5)
Age	41.2 (11.2)	46.7 (15.6)	45.3 (13.9)	41.7 (15.3)	51.0 (4.2)	39.0 (9.6)	51.2 (15.1)	39.0 (12.6)	44.2 (14.5)	44.8 (11.9)
Ethnicity:										
Europeans	8.1% (3)	13.3% (2)	16.7% (2)	11.1% (1)	0.0% (0)	11.3% (6)	55.1% (16)	14.3% (3)	18.2% (2)	20.0% (1)
Maori/Pacific	73.0% (27)	80.0% (12)	33.3% (4)	66.7% (6)	0.0% (0)	84.9% (45)	27.6% (8)	76.2% (16)	63.6% (7)	80.0% (4)
Other	18.9% (7)	6.7% (1)	50.0% (6)	22.2% (2)	100% (0)	3.8% (2)	17.2% (5)	9.5% (2)	18.2% (2)	0.0% (0)
Type of operation:										
Hysteroscopy	60.0% (18)	33.3% (5)	33.3% (4)	22.2% (2)	50.0% (1)	65.7% (23)	25.0% (7)	50.0% (7)	30.0% (3)	40.0% (2)
Laparoscopy	13.3% (4)	20.0% (3)	8.3% (1)	33.3% (3)	0.0% (0)	11.4% (4)	21.4% (6)	14.3% (2)	30.0% (3)	40.0% (2)
Laparotomy	10.0% (3)	26.7% (4)	8.3% (1)	33.3% (3)	50.0% (1)	0.0% (0)	14.3% (4)	14.3% (2)	30.0% (3)	0.0% (0)
Other	16.7% (5)	16.7% (3)	50.0% (6)	11.1% (1)	0.0% (0)	15.1% (8)	37.9% (11)	21.4% (3)	10.0% (1)	20.0% (1)
Operation time (min)	50 (22)	68 (30)	56 (22)	93 (39)	40 (0)	41 (7)	69 (25)	47 (14)	93 (39)	55 (23)
Referring/operating doctor match (%)	20.7% (6)	33.3% (4)	27.3% (3)	44.4% (4)	0.0% (0)	14.3% (5)	27.3% (6)	31.3% (5)	44.4% (4)	33.3% (1)
Waiting time (days)	105 (66)	127 (59)	147 (97)	125 (76)	19 (26)	149 (101)	144 (88)	119 (74)	173 (198)	155 (98)
Pre-op clinic (%)	32.4% (12)	53.3% (8)	33.3% (4)	77.8% (7)	0.0% (0)	11.3% (6)	48.3% (14)	14.3% (3)	45.5% (5)	40.0% (2)
Delayed surgery (%)	43.2% (14)	46.7% (7)	75.0% (9)	66.7% (6)	100.0% (2)	26.4% (14)	72.4% (21)	23.8% (5)	81.8% (9)	40.0% (2)
Delay time (days)	25 (16)	29 (24)	26 (20)	53 (20)	(11)	44 (31)	15 (13)	41 (58)	9 (4)	46 (1)

1. For type of operation, other includes vaginal approach, cervical approach and incision and drainage procedures.

2. Operation time is the estimated mean duration of operation

3. Referring/operating doctor match is the proportion of cases with the referral doctor being the same as the operation doctor

4. Delayed surgery means having the arranged surgery at a later date after cancellation, but before Sep 2011. Delay time means the time between the dates of arranged and delayed surgeries.

The overall DOS cancellation rate for elective gynaecological surgery in our study was 12.7% (198/1555), high amongst contemporary studies for gynaecological surgery in developed countries.^{1,2,5} There was an estimated 10,800 minutes of cancelled operations in one year, equivalent to 45 × half day (4 hours) lists. This may be attributed to the population CMDHB serves. It should be highlighted that Maori and Pacific Islander patients made up 63.4% of the cancellations, significantly higher than their corresponding ethnic make-up of Counties Manukau district of 39%.⁶

Important factors include greater deprivation and poverty limiting access to transport or means of communication; language or education barrier that may affect understanding of medical problems and treatment; and discrimination of health care providers or systems in administering health care.^{7,8} Addressing these issues would not only reduce cancellations significantly but also improve health outcomes in these ethnic groups.

From our findings, strategies have been developed to target different cancellation reason categories. For “intercurrent illness”, call-centre staff should enquire about illness from patients during the phone calls already established for 2 days before operation to identify potential cancellations.

Reminding the surgeons and anaesthetists to check patients’ clinical records to ensure all necessary investigations are performed at least one week earlier will reduce “not worked up”. Addressing language barriers by utilising interpreter services and providing written information in patients’ languages may assist in decreasing “not nil by mouth” and “did not attend”.

To decrease “list overrun”, reducing turnaround time between operations, reviewing the time allocated for each procedure and allowing more time for a procedure if a registrar is operating under supervision may be beneficial. For patients who have been waiting on the waiting list for more than four months for their operations, where relevant, a brief outpatient clinic review with a consultant may be beneficial to ensure the patient still requires the operation, to prevent “surgery not needed”.

In conclusion, there is room for improvement in day of surgery cancellation rates. We have identified the characteristics of the different reasons for cancellation, which enables the development of strategies to lower cancellation rates of each subgroup. We recommend other surgical services to review their own cancellation rates in order to implement the appropriate strategies to reduce this costly problem.

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Nutritional balance of ANZAC's military rations

A recent *NZMJ* article by Wilson and colleagues¹ dealt with the nutritional quality of food rations at Gallipoli in 1915. While it makes for interesting historical reading, it also incites us to ponder the “link between nutrition and deficiency-diseases”.² Indeed, the authors not only documented the typical diet of the ANZAC soldier at the time but also simulated three alternative, better diets.

The implications of their results might pass unnoticed, though, if only because of the very nature of nutritional science: it deals with multiple variables which are co-dependent and too free to vary. This work tries to reduce complexity by offering a more “systemic” view of the results.

Methods—I consulted Wilson et al's¹ Table 2 for identifying the relevant foods and their weight contribution to four diets. Typical nutrition information about those foods was extracted from USDA's database³ instead of from Wilson's paper (because of some information missing).

Diet R-A comprised 14 foods (USDA codes: 13348, 18069, 18232, 20481, 10123, 01009, 19297, 19335, 16085, 16037, 11378, 02047, 02024, 02030), diet R-V expanded diet R-A with three other foods (11308, 09357, 11531), diet R-O comprised six foods (18069, 20481, 01009, 16085, 11531, 20038), and diet R-OV comprised 11 foods (18069, 18232, 20481, 10123, 01009, 16037, 09357, 11531, 20038, 09370, 15126).

The resulting diets were assessed using the Balanced Nutrition Index (BNI) formula,⁴ which compares actual percentage contribution against ideal contribution (i.e. Recommended Dietary Intakes, RDI) and adds up any differences as natural numbers. BNI '0.00' indicates a diet which is nutritionally balanced, and the greater the difference from '0', the more unbalanced a diet is.

Results—The ANZAC rations at Gallipoli (R-A) were extremely unbalanced (BNI 60.90, Table 1), with only protein being within recommended intake levels. A more varied diet (R-V) would have improved the military rations slightly (BNI 46.04), reducing excess of total fats, resolving the deficiency in total carbohydrate and increasing dietary fibre, but also increasing the amount of sugars (something of less concern for New Zealanders⁵ than for the World Health Organization,⁶ apparently).

As per the optimised diets, scenario R-O would have resulted in a significant improvement in the military rations (BNI 12.76), reducing sugars, saturated fats and sodium, but also resulting in low intakes of protein and fibre, and very low intakes of total fats. In comparison, the optimised varied diet (R-OV) would have resulted in well-balanced military rations (BNI 0.33).

Table 1. BNI values, and differences from RDI for simulated Gallipoli diets

Variables	Scenario R-A	Scenario R-V	Scenario R-O	Scenario R-OV
BNI	60.90na	46.04na	12.76c	0.33-f
Protein	Adequate	Adequate	Low	Adequate
Carbohydrate, total	Low	Adequate	Very high	Adequate
Sugars	High	Very high	Adequate	Adequate
Fat, total	Very high	High	Very low	Low
Saturated fat	High	High	Adequate	Adequate
Dietary fibre	Very low	Low	Low	Adequate
Sodium	Very high	Very high	Adequate	Adequate

Discussion—This paper provides a “systemic” perspective to Wilson et al.’s results on the ANZAC diet in Gallipoli,¹ doing so by contrasting the nutritional value of foods against that of a referential standard (RDI) and making it easier to observe any differences among the four simulated diets.

A diet as extremely unbalanced as BNI 60.90, the typical diet of the ANZAC soldier, is akin to a modern diet based on crackers, flavoured soymilk and corn crisps,⁷ the delight, perhaps, of men at leisure but not the most adequate for frontline soldiers. The varied version of that diet (BNI 46.04) is slightly better, yet still extremely unbalanced, akin to a modern diet based on potato crisps, corn chips and soymilk.

The optimised diets, on the other hand, are well-balanced, the delight of heart associations and dieticians alike. As Wilson et al. insinuated, had military planners known better back in 1915, six well-chosen foods would have provided optimal nutrition at a fraction of the cost when it was most needed, especially to prevent major diseases such as scurvy, night blindness, dysentery and typhoid, inconveniences such as constipation and haemorrhoids, and even psychological problems related to low morale and mental health.¹

Modern New Zealanders may own their freedom to the men who fought back then but, alas, they don’t face the same environmental constrains. And yet, unbalanced diets are commonplace nowadays, and so are the diseases of abundance.⁸ May Wilson et al’s work serve to ponder whether the modern New Zealander is in as much need of a well-chosen limited diet for optimal nutrition as they forefathers were in 1915.

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Assessing preoperative nerve damage is the best predictor of outcome following carpal tunnel surgery

Re: Nanavati N, Walker-Bone K, Stanworth H, Williams C. Outcomes of open carpal tunnel decompression. N Z Med J 15 February 2013;126(1369). <http://journal.nzma.org.nz/journal/126-1369/5526/>

This article misses several very important points. Most importantly the authors have not included the severity of preoperative symptoms when they analyse the factors associated with persistent postoperative symptoms. Patients with constant (as opposed to intermittent) preoperative paraesthesia or numbness are likely to have a degree of damage to the median nerve that will not recover fully with carpal tunnel decompression. This is important to determine since the patient must be warned of the likelihood of at least some residual post-operative symptoms. While the authors state that they calculated a symptom severity scale for each subject, this information is not presented.

The authors should also distinguish between persistence of carpal tunnel symptoms and recurrence of carpal tunnel symptoms. Persistent “carpal tunnel symptoms” may indicate that the nerve has some permanent damage, the diagnosis was incorrect or that the carpal tunnel has not been completely released. Recurrence of carpal tunnel symptoms implies a symptom-free interval followed by a return of symptoms. While unusual, this can happen; scar formation may be one cause.

Almost all patients with intermittent carpal tunnel symptoms will experience dramatic and prompt resolution of their symptoms once the carpal tunnel is released. The night of surgery they no longer wake with symptoms. Where the preoperative symptoms are constant, suggesting median nerve damage, patients will usually report some change in their symptoms and often report a significant reduction in their pain levels. Visualisation of a hyperaemic segment of median nerve and identification of the carpal ligament completely released at both ends (particularly proximally where it is continuous with the deep forearm fascia) help reassure the surgeon that the diagnosis and treatment are correct.

The elderly are more likely to present with advanced carpal tunnel symptoms which indicate permanent nerve damage. However, even in this situation, carpal tunnel release is effective in improving symptom severity and functional status.

Unfortunately the authors’ failure to address these points invalidates their conclusions. The factors they assessed, which failed to gain statistical significance, are not useful predictors of outcome following surgical intervention. The most important factor that predicts outcome is the severity of symptoms preoperatively. It is imperative that the carpal tunnel is released before there is permanent damage to the median nerve, i.e. while the symptoms are intermittent and before the onset of thenar muscle atrophy.

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Down syndrome: the notion of expert

Cole and Jones's *NZMJ* article, *Testing times: do new prenatal tests signal the end of Down syndrome?* (March, 2013), highlights some of the issues associated with Non-Invasive Prenatal Diagnosis (NIPD), however it fails to acknowledge two important issues which should be part of the screening debate. Firstly, that medical practitioners continue to be the authority on Down syndrome (DS), and secondly, medical practitioners' role in the continued marginalisation of an already vulnerable group.

Since the diagnostic label of DS (formerly Mongolism) was created, medical practitioners have been trained to identify and label such individuals. These diagnostic powers have enabled medical practitioners to embody the role of gatekeeper to the screening, diagnosis and prognosis of DS.

The issue at hand, however, is that medical practitioners should have no role in the prognosis of individuals with DS, as the consequences of having DS are largely social in nature. Medical practitioners are not the experts on the lived experience of people with DS, nor the family consequences of having a child with DS. Indeed, medical practitioners should not claim to be expert on such social experiences. Any effort to assert such a claim would be erroneous.

Through the ever-increasing practice of prenatal screening, identifying foetuses with DS is becoming a normative experience. Whilst society has increasingly *tolerated* people with disability, medical practitioners continue to actively arrange situations to identify the *risk* of having conceived such individuals, situations in which termination is one of its endpoints.

Medical practitioners need to reflect on their role in the termination of the 90% of foetuses diagnosed with DS. Instead of declaring the role of medical practitioner as neutral, I assert that by actively seeking out, labelling and handing out prognoses of DS, medical practitioners are unwittingly contributing to the marginalisation of an already vulnerable group.

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No smoker left behind—a policy mix for everyone

Against an international backdrop of increased tobacco control surrounding branding and packaging (including that of the New Zealand Government¹) the Action on Smoking and Health (ASH) Year 10 Snapshot Survey (which audits the attitudes to smoking of approximately 30,000 New Zealand students in one of the largest survey of its kind), turned two questions to the students' preferred brand of cigarette.

Students were asked: “which brand of tobacco/cigarettes do you prefer to smoke?”, and “Thinking about your preferred brand, how important are the following things [price, taste, easy to get, packaging, brand name] in terms of your preference of that brand?”.

Given these are all aspects which could be tackled with different tobacco control policy, the results give us not only a glimpse into the raw number of students who might be targeted by any one policy, but a sense that different policy might target different students.

In broader brushstrokes, the data told us the most important consideration for students when considering their preferred brand of cigarette was taste (82%). Accessibility (75%) and price (74%) were of equal concern, as were brand name and packaging (both on 47%). The finer detail, however, suggests different policies might target different demographics.

The packaging of the preferred brand was considered important by 47% of students overall, although significantly higher amongst Māori, Pacific Island and Asian students (odd ratios: 1.5, 1.7 and 1.8 respectively). When the results were broken down by the socioeconomic status (SES) of the school, smokers with a lower SES were 1.2* times more likely to think it was important than those from a high SES school.

Approximately the same pattern was seen when looking at the importance of brand names, with New Zealand European students less likely to assign the brand name any importance when compared to Māori (1.3)*, or Pacific Island students (1.5)*, and with Asian students being twice as likely to find it important. It would be fair to assume these students would see the greatest benefit from plain packaging legislation.

By comparison, price—which has been the main locus of recent tobacco control policy—was less discriminatory when it came to ethnicity, but was more likely to be important to females than males (odds ratio 1.6)*.

Accessibility, too, was more likely to be considered important for females than males, as well as students from wealthier schools (1.5*, when compared to schools of lower SES), and making them more likely to be hit by accessibility measures.

Then there is taste: the latest front for tobacco control. Measures which can be taken, such as those recommended in the *World Health Organization Framework Convention on Tobacco Control* include the elimination of sugars and added

sweeteners, spices and herbs such as ginger, mint or cinnamon, or banning masking agents such as methanol.²

Even this seemingly ubiquitous concern, if translated into policy, might have targeted results, most significantly, with females, who were more likely to consider it important (1.5).

With these results in mind it can be argued a multi-stranded tobacco control policy is more likely to reduce smoking among teenagers than one that focuses solely on packaging or price.

In fact, to achieve the goal of a Smokefree Aotearoa New Zealand by 2025, what is needed is a policy mix that reaches across ethnicity, social economic status and gender—with a “leave no smoker behind” emphasis. Anything less may well reduce smoking across the vast majority of the population, but is destined to leave pockets of smokers overlooked.

(*Statistically significant)

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FIZZ: a new advocacy group to Fight Sugar in Soft-drinks

Sugar-sweetened beverages (SSBs), most of which are sugar-sweetened soft/pop/soda/fizzy-drinks (SSSs) have been identified as the leading single food item contributing to the global epidemic of unhealthy weight gain.¹

A large evidence base demonstrates significant, positive associations between high intakes of SSBs and poor health outcomes which include: overweight and obesity, type II diabetes, gout, CHD, CVD and its risk factors, and dental caries.²⁻⁷ The consistency of these associations found in observational studies—along with supporting randomised trial evidence of weight loss following replacement of SSBs with low-calorie alternatives—strongly suggest that these associations are causal, so justifying action to protect health.⁸

Conversely, some studies report either no adverse effects or even benefits from SSBs intake.⁹ The majority, however, have been either commissioned, or supported directly, by the industries that produce SSBs, or both. This debate sounds familiar, resembling the early arguments between Big-Tobacco and Public Health.

We believe that many parallels link SSBs and tobacco, and strong public health action is required to reduce intake of sugary drinks and raise their profile as a major cause of poor health. It is also clear that industry will strongly oppose any action which will affect their bottom line.

In New Zealand the organised fight against smoking was initially led by ASH (Action on Smoking for Health), an advocacy group established in 1982 by researchers and concerned health professionals.¹⁰ The important activities of ASH, to this day, continue, given the huge resources and political power of the multinational tobacco industry to block tobacco control efforts.

Similarly, for SSBs, the European NGO Corporate Europe Observatory claims that the food and drink industry invested more than 1 billion Euros in a successful lobby campaign to block an EU-wide traffic light labelling scheme.¹¹

While we strongly support the anti-obesity advocacy groups already established in New Zealand,¹² we plan to establish a group focussed on SSSs alone, called FIZZ (Fighting Sugar in Soft-drinks—but pronounced FIZZ).

We believe that such a campaign is necessary to effectively challenge the activities of the food and drinks industry to increase sales of SSSs. We will use ASH as our model and campaign for an end-game for SSSs.

Twenty years ago a smoke-free New Zealand was a pipe dream, while today it is an increasing reality with strong political support that is leading an end-game scenario becoming accepted. SSSs, like tobacco are both harmful to health and unnecessary to sustain life—and for most of human history they didn't exist.

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Dominion Notes. A thriving institution (Wellington Hospital)

Published in NZMJ 1913 Feb;12(45):363.

The Wellington Hospital has expanded and grown considerably of late years, and, as its scope increases, so does its development. It has now 350 beds, consisting of 100 for surgical cases, 57 for general acute medical cases, 75 for children, 46 for infectious diseases, 40 for chronic diseases, 25 for consumptives, and 7 for other diseases.

In the process of building is a maternity hospital with 10 beds, a diphtheria ward with 12 beds, a new out-patient block and a new pathological block, which will be controlled by a trained pathologist, with a laboratory so constructed as to furnish separate benches for a dozen or more students.

In a few months a dental department will be commenced and a tuberculosis dispensary opened. The number of in patients last year was 4000, and nearly 2000 operations have been performed during the twelve months.

There is also an up-to-date X-ray plant in use at the hospital, together with other electrical apparatus for the treatment of patients. There were nearly 18,000 attendances of general out-patients. The out-patients clinic covers eye, ear, and throat diseases, and there is also a special women's clinic.

The accommodation in the hospital for surgical cases and general acute medical cases had certainly been taxed during the year, especially in the winter months, when a number of chronic sufferers had to be taken in. These cases, sooner or later, would have to be treated in a separate establishment. This was one cause of a certain amount of overcrowding. Another lay in the fact that many patients had no homes to go to—patients such as seamen and casual labourers, who had to be kept in hospital until able to go to work. No doubt some provision would be made for the separate treatment of these cases also.

There was need, too, for a convalescent home for children, where patients who had been treated in hospital and others suffering from malnutrition might be sent. Schools in connection with these institutions for children would meet a need.

To the necessity for proper attention to the health of children the public was beginning to become alive. Medical inspection in schools and physical education were steps in the right direction. (From a local newspaper).



**Proceedings of the 216th Scientific Meeting of the
Otago Medical School Research Society**

Wednesday 1 May 2013

How does a rural medical workforce perceive providing palliative care? E Dwight, S Dovey. Department of General Practice and Rural Health, Dunedin School of Medicine, University of Otago, Dunedin.

The aim of this study was to reveal issues that General Practitioners (GPs) and District Nurses (DNs) have with providing palliative care. In many rural New Zealand communities, GPs and DNs must provide palliative care for their patients because there are no local palliative care specialists or palliative care inpatient facilities available. Many DNs and GPs are providing care to their dying patients with little specific training in end-of-life care. Key focus areas of this study included whether healthcare professionals embraced or avoided palliative care and whether they felt prepared and supported to provide palliative care in their rural communities.

Face-to-face open-ended interviews were conducted with twelve GPs and nurses (five GPs and seven DNs) from a rural area in New Zealand. All district nursing bases and medical centres within the study region were identified and invited to participate. At least one GP and/or DN from 5 of the 6 towns that had medical centres in the study region participated. The interviews lasted between 35 and 90 minutes. Collected data was transcribed and thematically analyzed.

Of the 12 interviewees, 10 found funding to be a particular issue, and 9 found after-hours care particularly challenging. All interviewees felt supported by the Palliative Care team at the regional base hospital due to a 24/7 phone service they provided, but thought that more frequent clinics or outreach services would be useful. All providers embraced palliative care, regarding it as at least as rewarding as other parts of their clinical practice.

There is limited literature about palliative care provision in rural New Zealand. Further research is essential in order to identify and then make moves to overcome barriers to palliative care provision. This will help to sustain and improve healthcare services in rural areas and potentially attract new doctors and nurses into rural practice.

A2

Defining the genetic basis for a spectrum of rare neurological conditions. S Frentz, M van Kogelenberg, Z Jenkins, T Morgan, S Robertson. Department of Women's and Children's Health, Dunedin School of Medicine, University of Otago, Dunedin.

Multiple phenotypes can result from mutations in the same gene, a phenomenon called genetic pleiotropy. A remarkable example is the X linked gene *FLNA*. Loss-of-function mutations can result in periventricular heterotopia (PH), a neuronal migration disorder with or without connective tissue manifestations, and chronic idiopathic intestinal pseudo-obstruction (CIIPX), an intestinal dysmotility disorder. The pathophysiological mechanism behind this variability has not been fully determined. It was hypothesised that pleiotropy amongst loss-of-function *FLNA* disorders is accounted for by either mutation position within the gene or differential protein expression. The aim of this study was to examine for a relationship between protein expression and clinical phenotype using quantitative western blot analysis.

X chromosome lyonisation presents difficulties when studying *FLNA* protein expression in females; we therefore studied four males with *FLNA* mutations. Patient and control cell lines were either fibroblasts or EBV-transformed lymphoblastoid cells, and controls were matched for sex and cell type.

An individual with a *FLNA* triplication showed overexpression (1.86 ± 0.14 , mean \pm 95% confidence intervals, $n = 3$), however did not manifest PH or intestinal dysmotility. A subject with both PH and CIIPX had a similar reduction in expression to another individual presenting with PH alone (0.31 ± 0.07 and 0.37 ± 0.09 , respectively). Finally, an individual only presenting with CIIPX had greater but still suboptimal *FLNA* expression (0.51 ± 0.01) on the basis of a mutation in *FLNA* that may only be represented in some transcripts. A literature-based analysis of the distribution of *FLNA* mutations causing PH demonstrated clustering at the 5' end of the transcript ($P < 0.001$, $n = 50$, χ^2 test). Mutations leading to CIIPX were few ($n = 4$) but were clustered at the extreme 5' extent of the transcript ($P < 0.001$).

These data suggest that overexpression of *FLNA* does not necessarily result in PH, and that phenotypic variation between patients with a spectrum of conditions are likely to relate to both mutation position and the degree to which these sequence variants affect protein expression.

Cardiac effects of diazepam intervention in a rat model of status epilepticus. R Millen, M Read, J Harrison, D Kerr, I Sammut. Department of Pharmacology and Toxicology, Otago School of Medical Sciences, University of Otago, Dunedin.

Persistent seizures or status epilepticus (SE) is associated with a high risk of mortality. Increases in sympathetic activity have been demonstrated during SE and can lead to ECG changes. Previous work has shown kainic acid (KA)-induced SE leads to bradycardia followed by tachycardia, and subsequent cardiac injury. This study investigated whether the first-line anticonvulsant diazepam (DZP) protected against cardiac injury and functional changes in a KA-induced SE model.

Male Sprague-Dawley rats were divided into saline-DZP (n = 7) or KA-DZP (n = 6) groups. SE was induced with KA (10 mg/kg, subcutaneous, s.c.), and behavioural and telemetric recordings (electrocardiogram [ECG] and electroencephalogram) recorded for 2 h. DZP (10 mg/kg, s.c.) was administered and data recorded for a further hour. Animals were sacrificed at 48 h, and hearts stained with Martius Scarlet Blue for fibrotic deposition.

In the KA-DZP group, DZP administration caused non-significant increase in heart rate (HR) above KA-induced tachycardia. DZP administration in the saline-control group resulted in significant increase in HR above baseline ($14.8 \pm 1.7\%$, mean \pm SEM, $P < 0.05$). QT intervals were similarly affected by KA and DZP intervention. T wave amplitudes were not affected in the KA-DZP group; however in the control group DZP administration lead to a significant increase ($P < 0.05$ vs. pre-DZP value). Histological analysis at 48 h post-SE revealed cardiac damage in both treatment groups, evidenced by oedema, fibrosis, inflammatory cell infiltration, myofibril derangement, and necrosis diffuse throughout subendocardium and septum.

Our study demonstrated novel results whereby DZP treatment produced ECG and morphological changes in both seizure and naïve animals. These results suggest the effects of DZP on vagal activity and on secondary messenger responses consequent to adrenergic stimulation bear further investigation. These results have serious implications in a clinical setting, whereby DZP intervention may potentiate cardiac damage during SE.

A4

Detection of endogenous syntaxin-4 and VAMP3 in Fischer rat thyroid (FRT) epithelial cells. W Bukhari, S Condliffe, K Hamilton. Department of Physiology, Otago School of Medical Sciences, University of Otago, Dunedin.

The intermediate-conductance Ca^{2+} -activated K^{+} channel (KCa3.1) is implicated in a range of functions in the body. It is prominently expressed in the hematopoietic system, T-lymphocytes and in the colon where it plays a crucial role in maintaining the negative membrane potential that drives Ca^{2+} -activated anion secretion. As a result of its significance, KCa3.1 has been a target of interest in many disorders. The correct trafficking of KCa3.1 to the basolateral membrane in epithelial cells is crucial for its normal function. We proposed that SNARE (soluble *N*-ethylmaleimide-sensitive factor attachment protein receptor) proteins syntaxin-4 and VAMP3 are crucial for the correct localisation of KCa3.1. This study aimed to establish FRT cells as a suitable cell line (using SDS gel electrophoresis and western blots) for further experiments involving the trafficking of KCa3.1. Furthermore, the efficacy of two different antibodies for both syntaxin-4 (Alomone Labs and Calbiochem; $n = 4$ each) and VAMP3 (Abcam and BioSciences; $n = 4, 3$, respectively) were evaluated.

Endogenous expression of syntaxin-4 and VAMP3 was detected in FRT cells with all four antibodies, at concentrations of 1/1000, 1/2000 and 1/4000. In all experiments, syntaxin-4 was detected near the predetermined 37 kDa band and VAMP3 near the 15 kDa band which is in agreement with their theoretical masses. Some western blots were conducted with second-hand antibodies which did not compromise the efficacy of detection. When both syntaxin-4 antibodies were preincubated with their respective control peptides, there was a reduction in band-density indicating the antibodies were specific for syntaxin-4.

Hence, the FRT cell line is suitable for further experiments exploring the role of syntaxin-4 and VAMP3 in the trafficking of KCa3.1. The next logical step is to determine the effect that downregulation of Syntaxin-4 and VAMP3 has on the trafficking of KCa3.1.

Identifying factors affecting patient's knowledge of methotrexate therapy and potential risk of unintentional overdose. T Ing-aram¹, J Highton¹, J Dockerty². ¹Department of Medicine, Dunedin School of Medicine, University of Otago, Dunedin, ²Southern District Health Board.

Methotrexate is considered to be the first line treatment of rheumatoid arthritis due to its effectiveness as well as its relatively favourable safety profile. However, there have been several reports of severe, life-threatening events, including deaths, which were attributed to unintentional methotrexate overdose, both in New Zealand and other countries. The study was aimed at identifying gaps in patients' current knowledge of methotrexate therapy and determining whether factors such as education by a rheumatology nurse and duration of therapy have any impact on patient's level of knowledge.

Sixty rheumatology patients were interviewed using a standard questionnaire to obtain information about their methotrexate use, awareness of side effects and toxicity as well as other safety aspects of the therapy, such as alcohol consumption and blood tests. Participants were also presented with a scenario where they were given an incorrect instruction of methotrexate dosing daily instead of weekly and their responses were recorded.

Education by a rheumatology nurse was found to be associated with increased awareness of methotrexate toxicity as well as pneumonitis as a potentially fatal adverse effect. Of those patients that received nurse education 96% were able to name at least one symptom or effect of methotrexate compared with 62% who did not receive such education (prevalence ratio 1.57; 95% confidence interval 1.19-2.06; $P = 0.005$, two-tailed Fisher's exact test). Two patients failed to recognise the incorrect dosing instruction shown to them and would have taken methotrexate daily if such instruction was given to them. Over half of participants consumed on average at least 4 units of alcohol each week.

From these findings, it is recommended that patients taking weekly methotrexate be given a refresher education session periodically by a rheumatology nurse, to provide information such as dosing regime, signs and symptoms of methotrexate toxicity and alcohol restriction.

Long-term *in vitro* expansion of human intestinal organoids. E Dunn^{1,2}, R Kemp², M Schultz³, G Butt¹. ¹Department of Physiology, ²Department of Microbiology and Immunology, Otago School of Medical Sciences, ³Department of Medicine, Dunedin School of Medicine, University of Otago, Dunedin.

In vitro culture of intestinal epithelial cells is difficult due to their rapid turnover. Inability to culture these cells and the lack of reliable models has limited research into the causes of gastrointestinal diseases, such as inflammatory bowel disease. Methods have recently been developed for growing the stem cells responsible for producing the intestinal epithelium. These cells form an *in vitro* culture system called the intestinal organoid, which is representative of the intestinal region from where the stem cells originated. The intestinal organoid harbours mature enterocytes, goblet cells and enteroendocrine cells, therefore representing an accurate model system for investigating human gastrointestinal diseases. In this study, we aimed to establish robust techniques for human intestinal organoid growth.

Three mm² biopsies were obtained from the transverse colon of healthy humans (n = 10), incubated in cell dissociation buffer, shaken by hand in phosphate buffered saline and isolated crypts were embedded in 50 µL Matrigel.

Firstly, methods were established for isolation of human colonic crypts. Next, their survival in cell culture without growth factors was assessed. Under these conditions, 6-10% of crypts isolated from each biopsy survived 48h, some of which formed organoid-like structures. Finally, robust techniques were established for the growth of isolated human crypts into functional organoids. Growth media was supplemented with Wnt3A signalling protein, R-spondin-1 (Wnt3A agonist), nicotinamide and human noggin, as well as other factors, resulting in 6-10% of isolated crypts developing into organoids and surviving in culture for at least 72h.

This methodology can now be used for long-term culture to allow study of intestinal epithelial cells from healthy and diseased patients. Co-culture of intestinal organoids with micro-organisms and immune cells will allow in-depth analysis of physiological, immunological and microbiological parameters. Therefore, this culture technique will further research into many gastrointestinal diseases.

Prevalence of *Staphylococcus aureus* carriage and skin conditions in Otago school children. H Lewthwaite¹, P Priest¹, H Brooks². ¹Department of Preventive and Social Medicine, Dunedin School of Medicine, ²Department of Microbiology and Immunology, Otago School of Medical Sciences, University of Otago, Dunedin.

The incidence of hospitalisation for serious skin infections in children almost doubled between 1990 and 2007, making this an important health priority for New Zealand. In order to understand the drivers behind increased hospitalisation, investigation is needed in the healthy population regarding the prevalence of carriage and low-grade infection by *S. aureus*. The aim of our research was to contribute to an understanding of the prevalence of *Staphylococcus aureus* carriage, and the burden of low-severity skin infections in Otago.

A pilot study was carried out in an Otago intermediate school during November 2012. Questionnaires and consent forms were sent to all pupils following an assembly presentation. From a school of 280 pupils, 54 students consented to take part, giving a response rate of 19%. Nasal and elbow swabs were taken with a sterilised culturette, then used to inoculate culture medium. Colonies underwent confirmatory tests for *S. aureus* including gram staining, coagulase tube and slide tests, DNase production, and methicillin resistance. Questionnaire data was collated and analysed using *Epi Info 7*.

Sample prevalence of *S. aureus* carriage was 51.9%, with males 2.32 (CI 1.1 - 5.1) times more likely to carry the micro-organism compared with females. Carrier children were 2.32 (CI 1.06 - 5.07) times more likely to have been taken to a doctor, although 0.74 (CI 0.35 - 1.59) times as likely to have been bought non-prescription medicines in comparison to non-carrier participants. In the sample, 11.1% of children reported having had doctor-diagnosed cellulitis within their life time.

The carriage rate was higher than those found in international studies, however a low response rate limits the generalizability of this study. This study provides a basis for development of more comprehensive studies to understand the role of *S. aureus* and associated skin conditions in children.

A8

***In vitro* preconditioning of hippocampal slices with GYKI-52466. J Macindoe, S Kerr. Department of Pharmacology & Toxicology, Otago School of Medical Sciences, University of Otago, Dunedin.**

Excitotoxicity is central to many neurodegenerative disorders. However, certain compounds can trigger lasting neuroprotective mechanisms enabling neurons to resist excitotoxicity, a phenomenon called 'pharmacological preconditioning.' GYKI-52466, a 2,3-benzodiazepine derivative, is an ionotropic glutamate receptor negative allosteric modulator and an inverse agonist at G protein-coupled receptors. Acute low-dose GYKI-52466 preconditioning has demonstrated prophylactic neuroprotective efficacy *in vivo* and *in vitro*. Here, we aimed to determine whether prolonged preconditioning with lower dose GYKI-52466 might enhance tolerance to excitotoxic insults.

Hippocampal slices from male Sprague Dawley rats were preconditioned with artificial cerebrospinal fluid (ACSF; control slices) or 3 - 6 μ M GYKI-52466 for >2 h, then subjected to a high dose kainic acid challenge (KA; 3 μ M; 30 min) to induce excitotoxicity. Electrophysiological techniques were used to assess tolerance induction in each slice. Orthodromic Schaffer collateral-evoked CA1 population spikes and excitatory postsynaptic field potentials (field EPSPs) were monitored for 20 min to ensure slice health before KA administration. Data were expressed as mean percentage change from baseline (\pm SEM) and Student's unpaired *t*-test used to assess group differences at a confidence level of $P < 0.05$.

GYKI-52466 preconditioning failed to induce tolerance to excitotoxic insults. Both control and GYKI-52466 preconditioned slices exhibited transient hyperexcitability followed by significant reductions in evoked potentials during prolonged exposure to KA. At 20 min, the population spike amplitude was reduced by $76.7 \pm 9.7\%$ ($n = 11$) in control slices, compared to $65.7 \pm 6.6\%$ ($n = 12$; $P > 0.05$) in GYKI-52466 preconditioned slices. Comparable reductions were likewise seen in population spike area and field EPSP slope, with no significant differences between control and GYKI-52466 preconditioned slices evident during the 30 minute KA exposure.

These findings suggest that prolonged low dose GYKI-52466 is unable to induce prophylactic neuroprotection *in vitro*.

Synthetic lethal interactions for the treatment of E-cadherin negative tumours. A Single, A Chen, B Telford, P Guilford. Department of Biochemistry, Otago School of Medical Sciences, University of Otago, Dunedin.

The inactivation of tumour suppressor genes is a clear-cut molecular event during tumorigenesis, but one that cannot be exploited by conventional drug development as no protein is translated from the inactivated gene. One approach, however, that is not precluded by the absence of the tumour suppressor is known as synthetic lethality. Synthetic lethality is defined as a genetic interaction in which downregulation of a combination of two or more genes leads to cell death. In a therapeutic setting, the term can be applied to the use of a targeted drug to cause cell death exclusively in tumours carrying specific genetic alterations. The targeting of cells which carry mutations in common tumour suppressor genes provides a high degree of tumour specificity, enabling better efficacy with fewer side effects. The present study aims to identify and validate candidate drugs, identified in a previous screen, for the treatment of cancers lacking expression of the tumour suppressor gene E-cadherin, *CDH1*.

In this project, MCF10A and MCF10A *CDH1*^{-/-} cell lines were cultured for 72h with vehicle (0.1% dimethyl sulfoxide) or increasing concentrations of the candidate drugs and assayed for cell viability using the CellTiter-Glo Luminescent Cell Viability Assay. Two of the tested therapeutic agents produced substantial sensitivity in MCF10A *CDH1*^{-/-} cells based on IC₅₀ values. Drug A had an IC₅₀ of 1.3 µM in MCF10A cells and 1.13 µM in MCF10A *CDH1*^{-/-} cells; Drug B had an IC₅₀ of 3.78 µM in MCF10A cells and 2.34 µM in MCF10A *CDH1*^{-/-} cells. These results were further validated by real-time analysis on xCELLigence apparatus over 144h.

This project provides further support for use of the synthetic lethal approach in cancer therapeutics. This data may serve as a foundation for the use of such therapeutic agents in specifically targeting E-cadherin deficient tumours in the clinical setting.

A10

An audit of outcomes for patients treated with Prothrombinex-VF. A Yap¹, J Faed², S Chiruka³. ¹ Department of Medicine, Dunedin School of Medicine, University of Otago, ² NZ Blood Service, ³ Hematology Department, Southern District Health Board, Dunedin.

Prothrombinex-VF (PTX-VF) is commonly used in New Zealand and Australia to reverse the effects of the oral anticoagulant Warfarin. PTX-VF contains human coagulation factors II, IX and X but negligible amounts of factor VII, which is rapidly synthesized after an additional dose of intravenous Vitamin K. However, PTX-VF also contains trace amounts of activated human coagulation factor proteins which pose a prothrombotic risk, especially at higher doses. A recent study in Auckland showed a 4.6% thrombotic event rate within 30 days of PTX-VF treatment, which was attributed to their elderly high-risk patient group. The aim of this study was to audit the use of PTX-VF in Dunedin Hospital and evaluate case records for clinical outcomes, particular thromboembolic events.

A two-year review identified 121 patients treated with PTX-VF. The mean dose of PTX-VF was 24.1 ± 9.4 IU/kg (suggested dose 20-50 IU/kg, as determined by indications). The proportion of patients that achieved a post-PTX-VF International Normalized Ratio (INR – bleeding time test) of <1.5 (target range) was 72.7%. A total of 6 patients (5.0%) had a definite or probable thromboembolic episode and 34 patients (28.1%) died within 30 days of PTX-VF infusion. Causes of death included intracranial haemorrhages (5), sepsis (5) and cardiac failure (5). Concomitant use of fresh frozen plasma, a past conventional treatment, with PTX-VF did not influence the probability of thromboembolic events (definite or possible, 4/45 FFP versus 5/76 non-FFP, Fisher's exact test $P = 0.7203$)

PTX-VF was effective in reversing the effects of Warfarin and in producing substantial correction of coagulopathies in cardiac surgical patients. However, the high 30-day thromboembolic and mortality rates following PTX-VF infusion calls for an ongoing review of the indications for use and outcomes of treatment.

Are vitamin and antioxidant supplements beneficial for the prevention of cardiovascular diseases?

Such supplements are widely used in the belief that they will ward off a variety of disorders including cardiovascular disease.

This systematic review and meta-analysis examines evidence from 50 randomised controlled trials. The supplements involved were vitamins A, B6, B12, C, D, E, folic acid, β carotene and selenium.

Overall in the 50 trials no beneficial effect was noted, the overall relative risk for subsequent cardiovascular events being 1.00. Subgroup meta-analysis by types of cardiovascular outcome and types of supplement revealed no significant benefits. Consequently the conclusion was that there was no evidence to support the use of vitamin or antioxidant supplements in the primary or secondary prevention of major cardiovascular events.

The researchers note that they were unable to evaluate whether such supplements would be beneficial in populations who were deficient in vitamins or antioxidants at baseline.

BMJ 2013;346:f10.

B blockers in patients with heart failure and reduced ejection fraction

An editorial in the BMJ points out that in recent decades, important gains have been made in the treatment of chronic heart failure with reduced ejection fraction. He notes that the β blockers with the strongest evidence base in heart failure are carvedilol, long acting metoprolol succinate, and bisoprolol.

In a research paper in the same issue, an international research group investigate whether this is a class effect? Their study reviews data from 21 randomised trials involving over 23,000 patients in which a β blocker treatment was compared with another β blocker or other treatments. Seven β blockers were investigated: carvedilol, metoprolol (tartrate and succinate), bisoprolol, bucindolol, nebivolol, and atenolol.

The primary endpoint was death from any cause. As expected, β blocker therapy was very superior to treatment without β blocker (odds ratio 0.69). However, evidence from their study did not support any single β blocker over the others. Consequently they conclude that the benefits of β blockers in patients with heart failure with reduced ejection fraction seem to be mainly due to a class effect.

BMJ 2013;346:f55 & f480.

Omalizumab for chronic idiopathic urticaria

Chronic idiopathic urticaria is defined as itchy hives that last for at least 6 weeks, with or without angioedema, and that have no apparent external trigger. Unfortunately this debilitating illness often does not respond to treatment with antihistamines. Treatment options for patients who do not have a response to H₁-antihistamines include the use of H₂-antihistamines, leukotriene-receptor antagonists, systemic glucocorticoids, cyclosporine, hydroxychloroquine, dapsone, methotrexate, sulfasalazine, and intravenous immune globulin. Often these treatments are not effective and some of them have very substantial side effects.

This paper concerns the use of omalizumab, an IgE monoclonal antibody that targets IgE and affects mast-cell and basophil function. 323 patients were randomised to receive three subcutaneous injections of omalizumab at monthly intervals or placebo. The researchers report that “omalizumab diminished clinical symptoms and signs of chronic idiopathic urticaria in patients who had remained symptomatic despite the use of approved dose of H₁-antihistamines.”

N Eng J Med 2013;368:924–35.

Peter James Francis Foley

General Practitioner: b Napier, 28 October 1954; m Jill Long, 2s 2d; d Napier, 15 April 2013, aged 58.

Dr Peter Foley was an old-school GP, who always had an eye on the bigger picture. The Napier doctor worked tirelessly to break down the barriers in the healthcare sector both for patients and for the medical profession.



Even as the cancer took hold of him, his thoughts dwelled on what more needed to be done.

"I had two passions, which I'm really sad not to be able to carry on: the Health Quality and Safety Commission, which is the key to having everyone work together rather than in independent silos like we have now, and locally with the Hawke's Bay District Health Board, I wanted to get rid of the primary and secondary health barriers," he told The Dominion Post this month.

His 'never give up' attitude drove him throughout life and stayed with him till the end, his wife, Jill Foley, said.

Dr Foley was best known as the public voice of the New Zealand Medical Association (NZMA), which he chaired from 2007–11.

"Dr Foley made an outstanding contribution to the NZMA and to strengthening our nation's health service," said NZMA Chair Dr Paul Ockelford. "In his two terms as Chair he worked tirelessly to represent the medical profession and patients, raising awareness of a wide range of issues, including the need to address medical and wider health workforce shortages, ensuring the delivery of quality healthcare, improving health equity and advocating for better end-of-life care.

"Pete represented the NZMA at overseas meetings and conferences, and the high regard in which he was held was shown when he was invited to be part of the NZ delegation to the World Health Assembly in 2010."

Dr Foley's particular contribution was in General Practice. He chaired the NZMA's General Practitioners Council from 2003 to 2007 and was at the forefront of the General Practice effort to seek meaningful engagement with the Government and its agencies during the debate over General Practice fees. The efforts of the initial General Practice Leaders' Forum team, led by Dr Foley, resulted in effective involvement for General Practice in the contracting process, and in a successful outcome.

This achievement was recognised when he was awarded the NZMA's highest honour, the Chairman's Award, in 2006 and an NZMA Fellowship in 2011. Further recognition followed, including a fellowship from the Royal New Zealand College of General Practitioners. Last year Dr Foley also received the Member NZ Order of Merit for his services to health, which was presented in a special ceremony in March by Governor-General Sir Jerry Mateparae.

The NZMA roles were among many he held in a 31-year career.

He was the chief medical officer of primary care for the Hawke's Bay District Health Board, and deputy chairman of the Health Quality and Safety Commission. "I think everyone should contribute to society," he said. "You can't be too selfish in this world."

He chaired an international conference on tobacco control in 2007 and, in 2011, headed the independent panel reviewing health services in the Wakatipu region on behalf of the National Health Board.

He also spent more than 25 years as a senior medic for the police.

Hawke's Bay District Health Board chief executive Kevin Snee said it was Dr Foley's "strategic vision" that led him to take on so many roles. "He cared deeply about people and making a difference."

It was his passion for people and a desire to help the community that influenced his decision to follow the family line of doctors.

"That sounds a bit magnanimous, I know, but I never thought about it from a career point of view or a money point of view. General practice is not where I would have gone if those things were important to me," he said.

His brother, Paul, described him as an old-school GP but a creative "thought leader" across the primary health sector.

He seemed destined for a career in medicine, being christened Peter James Francis Foley: James after his grandfather, who was the medical superintendent at Napier Hospital and Francis after his GP father.

His daughter, Lizzie, recently became the fourth generation of Dr Foleys.

After graduating from the University of Otago in 1981, Dr Foley started his career at Christchurch Hospital, where he met his wife-to-be.

The couple traced the Foley family line in Ireland on their OE [overseas experience], before moving to Napier so that Dr Foley could join his father's practice. A lot of time went into building up his practice.

Fellow Napier GP and incoming Chair of the NZMA, Mark Peterson, described his friend as an "incredibly diligent" doctor. "His patients often emailed him or rang him on his cellphone, and he encouraged that."

Time was also spent being a dedicated sideline dad. He encouraged his four children to always do their best, and emphasised that a loss just meant getting back up and trying again. He would often run on to the cricket pitch with water bottles for the boys in the searing Hawke's Bay summer.

Dr Foley stood on the sideline or the racecourse in a professional capacity working with sports teams and he co-ordinated the medical teams when Napier hosted Rugby World Cup matches.

In the months leading up to his death, sports players were texting Dr Foley, wishing him luck battling the cancer. He would text back with a "Good luck" message for their upcoming game.

Dr Foley learned that a white coat could come in handy even when he wasn't working. As a university student, he would put on the white coat, wave confidently at the gate and walk into the nearest test match.

Pictures of Dr Foley drinking out of the Webb Ellis Cup alongside Richie McCaw proved he could still slip past security many years later. He got past three layers of security at the Rugby World Cup final, walked into the All Blacks' private function and renewed old acquaintances.

Mrs Foley said her fun-loving husband liked to work hard and play hard. He was able to connect with people from all walks of life, which helped him to be such an effective leader.

Dr Peterson and Dr Ockelford also recalled the lighter side of life with Pete—his legendary lateness for meetings; his networking skills; and his ability to speak off the cuff.

"He loved making a speech," said Dr Ockelford. "He could take a three-slide PowerPoint presentation he'd created just an hour beforehand and turn it into an hour-long speech. These were often based around just three points: professional unity, professional values and collegiality. But he said it differently every time and he could hold an audience!"

Dr Peterson spoke of the late-night 'strategy' sessions held after NZMA Board planning meetings over a bottle of Laphroaig. "I still have a bottle Pete signed for us when he was presented with the RNZCGP fellowship—it will be drunk at an appropriate NZMA occasion in his memory."

Dr Foley dreamed of a streamlined healthcare system without egos and duplications. "We need to have a team delivering health across all aspects," he said recently.

"Pete recognised that our health system requires the profession's strong guidance and in striving to do this he researched the issues, engaged in consultation and worked towards achieving consensus," said Dr Ockelford. "In his time as GPC Chair and NZMA Chair, he cultivated strong relationships within the medical profession, the Government and wider health sector.

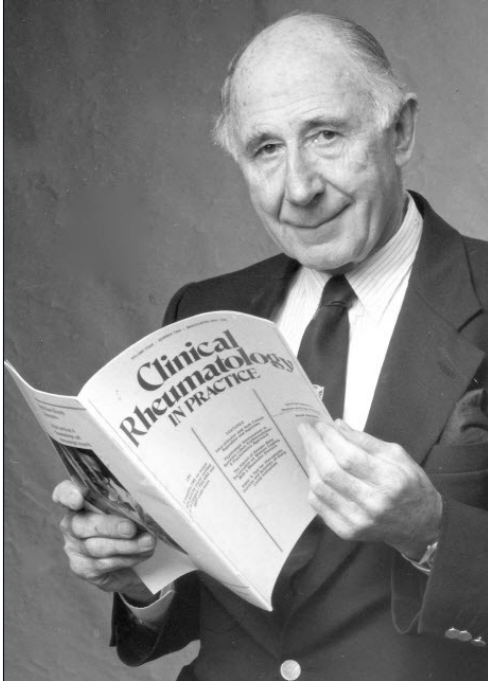
He was always a loyal NZMA member, and held a strong belief in the NZMA's ability to make a difference, and have significant influence. He consistently promoted the hallmarks of the NZMA—its pan-professionalism, its ability to represent all sectors of the profession and its willingness to engage with all sectors within health."

Acknowledgements to Tracey Chatterton (*The Dominion Post*), Dr Paul Ockelford and Dr Mark Peterson.

John Moore Tweed

MBE, MB ChB (NZ), FRACP, FRCP; Born 27 September 1920, died 19 February 2013.

New Zealand rheumatology owes much to Moore Tweed. He was the second trained rheumatologist in the specialty in this country, 3 years after Tom Highton.



Moore was born in Carterton, son of Martin Tweed, medical practitioner, and Marjorie Elvery.

He went to Wellington College, qualified MB ChB at Otago University (1945), then had postgraduate experience in Wellington (1945–46) and scholarships in London (1949–52).

He gained MRCP (London), MRACP (1955), FRACP (1962) and FRCP (1971).

After returning to New Zealand in 1954 he was appointed the Wellington Hospital Board's first rheumatologist in charge at Wellington and Hutt Hospitals.

Moore recounted his journey into rheumatology for Craig McKenzie who wrote "Hospital in the Valley".

"Rheumatic diseases can be defined as medical conditions of the locomotor system or alternatively as anything that hurts being not obviously in the head chest or belly."

In the years immediately after World War 2 the discovery of cortisone sparked an explosion of interest and growth of knowledge in this field. In the 1950s hospital posts were established in Rotorua, Wellington and Christchurch. Moore based his rheumatology treatments on science rather than spa-based treatment.

In 1968 he was joined by Blair Treadwell and together they took over a general medical run at Hutt Hospital on the understanding their rheumatic patients could be admitted under their care. This led to the formation of a Regional Rheumatology Unit at Hutt Hospital.

In 1976 Dr Hugh Burry joined as Wellington's third rheumatologist, allowing a close link to be forged with the Wellington Clinical School of Medicine.

Cooperation between these doctors, the ward sisters, physiotherapists, radiologists and the Hutt orthopaedic surgeons became a feature of the rheumatology unit, which also worked with the local division of the Arthritis Foundation to establish a field worker post.

Moore was the Arthritis Foundation's NZ vice president 1978–1980, Honorary Life Member and 1983–2008 honorary archivist in NZ. In 1991 he was awarded an MBE.

Despite enlisting in the army at the start of World War 2, Private Tweed's ambition to study medicine meant he was never called up. He struggled to come to terms with what he considered this privilege. He later became and Major in the Territorial New Zealand Medical Corp.

Moore married Margaret Watson in 1946 and had his only son Malcolm in 1958. Tragically, Margaret died from cancer at the age of 42 in 1965. Moore showed the fortitude which was a permanent characteristic by caring for his son and maintaining his work responsibilities. In 1967 he married Margie White with whom he had many happy years till she died of cancer in 1995.

Moore was a talented sportsman. He represented Otago at rugby in 1943, played social tennis and good golf into his late 80s. Moore was a well-read man who was considered in his opinions. Throughout his life he demonstrated the qualities of loyalty, dedication to the care of people with arthritis and a quirky sense of humour.

Moore was his own last patient. Aged 92, while lying in bed attempting an accurate neurological diagnosis of what was causing his symptoms of nausea, diplopia and disequilibrium combined with exhaustion from lack of sleep, he asked for three things: a diagnosis; to be put into a therapeutic coma for 2 days (if doctors could not find another way to give him a good sleep); and to be treated with dignity. When these were provided in a manner matching his own clinical practice (and final diagnosis) he died peacefully.

Moore is survived by his son, Malcolm Tweed, daughter in law Debby and grandchildren Jessica and Duncan.

This obituary was written by his son Malcolm with assistance from Blair Treadwell (Rheumatologist, Wellington), Michael Corkill (nephew and Rheumatologist, Hamilton) and Caroline Corkill (niece and General Practitioner, Invercargill).