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

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This Issue in the Journal

Aiming for zero: decreasing central line associated bacteraemia in the intensive care unit

Mary E Seddon, Catherine J Hocking, Pat Mead, Catherine Simpson

Central line catheters are an important aid to managing very sick patients and are used commonly in intensive care units (ICUs), where approximately 50% of patients will have such a line in place. However, these lines may cause serious infections—known as Central Line Associated Bacteraemia (CLAB)—with a 10–50% mortality rate. Overseas literature has shown that the rate of these infections can be reduced to zero through the implementation of a 'bundle' of care—the bundle is a number of evidence-based steps that when combined and used on every patient can significantly decrease infections.

Counties Manukau DHB decided to introduce the CLAB prevention bundle in December 2008, organising the bundle into two checklists (one of inserting the line, and the other for maintaining it). Prior to introducing the checklists, the ICU had 1–2 patients with CLAB per month (a rate of 6.6/1,000 line days). After introduction the absolute numbers affected fell from 14 in 2008 to 4 in 2009 and only 1 in the first 6 months of 2010. The rate fell to 0.9/1,000. We continue to aim for zero and have now spread the learnings from this work to other areas in the hospital that use central lines.

Why Maori women continue to smoke while pregnant

Marewa Glover, Anette Kira

This study interviewed Māori women who continue to smoke during pregnancy. All the women lived with at least one other smoker and most socialise with other smokers. Many found it easy to smoke at home, at work and where they socialise. There was a lack of accurate understanding of the harms of smoking during pregnancy. This research highlights the need for cessation interventions to include the family of the pregnant women.

Post-caesarean section surgical site infection: rate and risk factors

Marcus Ghuman, Deirdre Rohlandt, Grace Joshy, Ross Lawrenson

The aim of the paper was to identify the incidence of surgical site infections after caesarean section (CS), and important contributory risk factors. The study was conducted where the source population was all the women undergoing CS in a 6 month period at a single site—Waikato Hospital (526 patients). Cases (25 patients) were compared with controls (50 patients) to identify risk factors. In total, 25 women had an infection after CS (5% of total). Comparing women with infection with the sample without, key risk factors for surgical site infection post CS identified were elevated BMI, longer duration of labour, and having an emergency procedure.

Self-reported oral health care and access to oral health information among pregnant women in Wellington, New Zealand
Bianca M Claas, Lis Ellison-Loschmann, Mona Jeffreys

The study was carried out in Wellington between June-November 2008 and involved a survey of 405 pregnant women. The research found that most pregnant women had good oral hygiene habits, but 60% reported bleeding gums during pregnancy. Only a third of women went to see the dentist when pregnant and less than half had received any oral health information during their pregnancy. New Zealand European women, with higher educational and socioeconomic levels were more likely to see a dentist and access oral health information during their pregnancy compared to women of other ethnicities with lower socioeconomic and education levels.

Impact of the human papillomavirus (HPV) vaccine on genital wart diagnoses at Auckland Sexual Health Services
Jeannie Oliphant, Nicky Perkins

The national HPV (human papillomavirus) immunisation programme using the quadrivalent vaccine Gardasil, commenced on 1 September 2008. The quadrivalent vaccine provides protection against the four strains of HPV virus, most commonly implicated in cervical cancer and also genital warts. While it may take decades for the expected decrease in cervical cancer to become apparent, the incidence of genital warts potentially could decrease quite rapidly if vaccination rates are high enough. The study found that there was a significant reduction in the number of women in the target age group for the vaccination programme, compared to older women, presenting to the Auckland Sexual Health Service with genital warts. This provides evidence for the publically funded HPV vaccination programme being effective at a population level in New Zealand.

Terminations of pregnancy associated with isotretinoin use in New Zealand
Peter Moodie, Richard Jaine, Jason Arnold, Mike Bignall, Bruce Arroll

Oral isotretinoin is a highly-effective treatment for severe acne. It is also highly teratogenic (can cause abnormalities to the fetus in the womb). Recently, funded access was widened (from vocationally registered dermatologists only) to include general practitioners and nurse practitioners acting within their scope of practice. This decision has caused some debate. This study aims to report on terminations of pregnancy (abortions) occurring while using isotretinoin in New Zealand. This study has revealed that there appears to have been more unintended pregnancies related to isotretinoin use than previously thought. A total of 39 terminations of pregnancy related to isotretinoin use were identified in the year ending June 2008. This gave a crude termination of pregnancy rate of 73 per 10,000 females aged 10–44 years.

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What is high quality critical care?

David Knight

What defines high quality care has perplexed the speciality of critical care for many years. According to the Institute of Medicine, quality care is safe, effective (evidence-based), patient-centred, timely, efficient and equitable.[1] Whilst these terms are laudable, they do not actually answer the "what is quality?" question and too often we limit ourselves to the measurable rather than focussing on actions that actually impact on local healthcare issues.

The science underpinning many quality projects is often enthusiastically extrapolated from a weak evidence-base. As a consequence, many clinicians view quality with a degree of cynicism and suspicion. Concerns are raised that practice is changed purely to improve the measured surrogate rather than deliver any tangible patient-centred outcomes. External bodies may even view the numerical value generated by these narrow metrics as a measure of our global practice and use these data to distribute healthcare funding, a reality in the US health care system today.

The measurement and prevention of central line associated bacteraemia (CLAB) has become one of the major quality targets for the critical care community. The frequency, cost, morbidity and mortality of this ubiquitous aspect of modern ICU makes it an attractive proposition for potential improvement. Fortunately, unlike many other quality predecessors, its implementation appears to be supported by high quality evidence from large, well conducted, multicentre trials.[2,3] These studies not only describe impressive, sustainable results, but also illustrate a "how-to guide" in order that CLABs can be minimised in other jurisdictions. In this week's *NZMJ*, Seddon et al demonstrate a significant reduction in local CLAB rates following the introduction of similar multifaceted quality improvement programme.[4] At first, the reader may question why we need a further study when international data seems so compelling.

The article is important and relevant for a number of reasons. Firstly it demonstrates that a US-healthcare-based CLAB reduction programme can be effective in a large New Zealand hospital. Secondly, it reminds us that a good quality project requires more than just data collection. The planning, education, feedback and local process modifications undertaken by the investigators were, I believe, crucial to ensuring that local practitioners felt engaged by the project. Thirdly, it provides some handy practical solutions to problems faced by others attempting to collect similar data with particular reference to the tally method used for calculation of line days.

Seddon et al demonstrate a CLAB rate reduction rate from 6.8 to 0.9 per 1000 line days over approximately 2 years. These data are impressive and comparable with international data but are still greater than the desired zero. A rate of zero implies that all CLABs are preventable and this intolerant approach has been adopted by the Centres for Medicare and Medicaid Services in the United States, where hospitals are no longer reimbursed for CLAB-related expenses. In reality up to 50% of hospital-

acquired bloodstream infections may not be preventable[5] and a more realistic target of <1 per 1000 catheter days has recently been adopted by the Australian Council of Healthcare Standards.

The authors conclude that their paper makes a case for all ICUs in New Zealand to measure CLAB rates and adopt a similar approach to CLAB reduction. This proposition raises two issues; one about measurement and the other about incidence reduction methods.

Measurement of CLAB rates requires two metrics, a numerator (numerical value of CLABs) and a denominator (numerical value of line days). These two values are derived from a combination of a microbiologist, intensivist and data collector(s) review. At present there is little or no central resource provided to support this process. If this process becomes a mandatory part of New Zealand ICU practice, then can we be sure that this resource shift will not result in reduced effectiveness or even unintended negative consequences on other areas of healthcare? Equivalent multi-centred quality improvement projects have been supported by Federal or State funding.[3,4]

The second point raised is with regard to the actual methods of CLAB reduction. The authors comment on local changes to the originally described CLAB bundle which included preferential access to internal jugular vein, customised central line pack, consideration of a biopatch and a data focus on "time between CLABs". These changes allowed the process to adapt to the hospital, required local staff to take ownership and be engaged in the project. Local adjustment of the CLAB implementation process to optimise its performance and acceptance in each of our unique hospitals is vital to its success. A centrally dictated intervention is doomed to fail.

The assumption that a low CLAB rate equates to high quality critical care is probably naive. However, an appropriately funded national monitoring programme could reduce regional inequality by allowing resources to be focused on environments that have a demonstrable CLAB problem.

Competing interests: None.

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Aiming for zero: decreasing central line associated bacteraemia in the intensive care unit

Mary E Seddon, Catherine J Hocking, Pat Mead, Catherine Simpson

Abstract

Aim To eliminate Central Line Associated Bacteraemia (CLAB) in the Critical Care Complex (CCC)—Intensive Care Unit (ICU) and High Dependency Unit (HDU)—Middlemore Hospital

Method Multifaceted quality improvement programme that included: engagement with ICU leadership and education of ICU staff; the introduction of a CLAB prevention bundle of care through standardised checklists for central line insertion (December 2008) and line maintenance (July 2009); the development of a central line pack; and rapid, visual feedback of results.

Results Absolute numbers of CLAB in the CCC decreased from 14 in 2008, to 4 in 2009 and 1 in the first 6 months of 2010 (despite increase in bed census and a doubling of admissions). The CLAB rate per 1,000 line days decreased from 6.6 to 0.9. The days between CLAB increased from a median of 30 to >100 days, with zero CLAB for 5 of the last 6 months. Mortality for patients with CLAB was 37%, compared with mortality of 13% for all other ICU patients. The conservative cost savings were $200,000 in 2009 and $260,000 in 2010.

Conclusion Using an evidenced-based quality improvement approach, it is possible to significantly decrease Central Line Associated Bacteraemia in the Critical Care Complex. In doing so patient morbidity and mortality are reduced and money is saved for other healthcare needs.

Central venous lines are common in the Intensive Care Unit (ICU)—more than 50% of Middlemore Hospital ICU patients have a central line on any given day—and nationally there are approximately 19,000 ICU admissions each year. In these vulnerable patients, there is a serious risk of central line associated infection, and with it an estimated mortality of 10–50%.[1–3]

The cost of each Central Line Associated Bacteraemia (CLAB) has been estimated to be between $NZ 20,000[4] and $54,000.[5,6] This has become important in New Zealand as we strive to decrease waste spending in a recession. It is even more of an issue in the US where major funders of health care (Medicare and Medicaid) no longer fund hospitals when patients suffer such preventable complications,[7] and there is good evidence that CLAB is a largely preventable complication.

Work by Pronovost and his team has shown that a zero rate could be attained, firstly in Johns Hopkins[8] and then in most of the ICUs in Michigan state.[9] Preventing CLAB was one of the six evidence-based programmes that made up the Institute for Healthcare Improvement (IHI) ‘Saving 100,000 Lives Campaign’.[10]

The IHI suggested that hospitals adopt evidence-based bundles of care for the top conditions that caused harm.[11] The CLAB bundle had 5 components:[12]

- Hand hygiene.
- Chlorhexidine skin antisepsis (chlorhexidine 2% in 70% alcohol).
- Maximum barrier precautions (hat, mask, sterile gloves, sterile gown and full patient drape).
- Optimal catheter site selection (subclavian vein as the preferred site).
- Daily review of the need for the line, with prompt removal of unnecessary lines.

Evidence exists that each of these components can decrease the rate of CLAB. Chlorhexidine skin antisepsis has proven to be better than providone-iodine solutions and other agents.[13,14]

Two studies have shown that not using maximum barrier precautions increases the likelihood of a CLAB by 2.2 and 6.3 times.[15,16] The evidence for hand hygiene in all sterile procedures goes back to Ignaz Semmelweis in the 1840s,[17] the man who first demonstrated that washing hands prevented mortality from postpartum sepsis. The evidence for site selection is less convincing, at least when lines are inserted by experienced critical care doctors.[18] However, in less controlled environments, or where the doctor inserts relatively few lines, the subclavian approach has been shown to be associated with fewer infections.[19,20]

Our working hypothesis was that we could apply the IHI CLAB bundle of care and significantly reduce the rate of CLAB in the Critical Care Complex (CCC).

Methods

There was a good deal of discussion with senior ICU clinicians about the merits of the CLAB initiative generally and the individual components of the bundle. However, in December 2008 the Critical Care Complex Intensivists decided to adopt 4 out of the 5 components of the CLAB bundle (subclavian placement being the exception) and the CLAB initiative began.

The ICU staff, supported by the Quality Improvement Unit, decided to use the IHI CLAB prevention 'how to guide'.[12] The core concepts of the IHI approach are:

- Engage clinical staff with the CLAB bundle
- Ensure all elements of the bundle are used by standardising the insertion and maintenance of central lines using checklists
- Measure and display results for all staff

The definition of a CLAB came from the CDC (see Box 1).[21]

Box 1. Definition of CLAB

Patient must meet either criterion 1 or 2 and have a central line in situ to be classified as having a CLAB.
Criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures
and
organism cultured from blood is *not* related to an infection at another site.

Criterion 2: Patient has at least *one* of the following signs or symptoms: fever (>38°C), chills, or hypotension
and
signs and symptoms and positive laboratory results are *not* related to an infection at another site
and
common skin contaminant (i.e., diphtheroids [*Corynebacterium* spp.], *Bacillus* [not *B. anthracis*] spp., *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus*) is cultured from *two* or more blood cultures drawn on separate occasions.

Any positive blood cultures from the CCC were reviewed by the head of Infection Prevention and Control. If the patient had a central line in situ, the case was reviewed for evidence of secondary infection. In cases where it was unclear, it would then be discussed with a microbiologist and intensivists. Confirmed cases were reportedly directly to the quality facilitator in ICU.

If the CLAB developed within 48 hours of transfer out of ICU, the CLAB was still attributed to ICU (transfer rule).[22] The number of line days was determined by the tally method.[23] This method involves counting patients with central lines 5 days per week and using this sampling to estimate average number of lines per day and therefore the total central line days for the month. If the patient had several lines in, only one line per patient was counted.

The CLAB bundle was formatted into two checklists—one for insertion of the line, and the other for maintenance of that line. The IHI insertion checklist was modified by the ICU staff for local consumption (see Figure 1) and the nursing and medical staff were trained in its use. The nursing staff were encouraged to feedback immediately to the doctor inserting the line, if any of the components of the checklist were skipped. The 5th element of the checklist—to use the subclavian approach preferentially—was rejected by the intentsivists as this approach had become uncommon (with only 2–5% of lines using the approach), due to concerns about the inability to compress the site in patient with coagulopathy and the concern about the risk of pneumothorax in patients with precarious ventilation.

The checklist did not mandate how the line was inserted (e.g. if it was inserted under ultrasound guidance) however, as lessons were learnt from the CLAB cases, antibiotic impregnated lines were recommended for high risk patients (patients with extensive burn injury or neutropenic patients) and it was recommended to consider a chlorhexidine impregnated dressing (biopatch). In most other cases antiseptic lines (chlorhexidine and silver sulfadiazine) were used. The CLAB maintenance bundle was adapted for the nursing shifts in the Critical Care Complex and introduced in July 09 (see Figure 2).

Figure 1. Insertion checklist

CLAB Insertion Bundle Checklist

COUNTIES MANUKAU DISTRICT HEALTH BOARD
A Community Partnership

Preventing Central Line infections in CMDHB

Central Line Definition: Any catheter whose tip terminates in a great vessel	Patient Name NHI Number ***Use patient Label***

PLEASE COMPLETE FOR ALL CENTRAL LINE INSERTIONS ON ALL PATIENTS

Where was the line inserted?	***Insertion site:***	***Catheter Type:***
ICU HDU EC Radiology Theatre MSC MMH Other: _____	Right Left Subclavian Jugular Basilic Cephalic Femoral Other: _____	Central PICC Vas Cath Other: _____ ***Line Coating:*** Antibacterial Antiseptic None

Date Line Inserted:	***Date Line Removed:***

INSERTION BUNDLE:

To be completed by the observer and signed by both proceduralist and observer.

1. Hand Hygiene - Did the proceduralist?	Yes	No
Perform hand hygiene using chlorhexidine solution		
2. Chlorhexidine Skin Antisepsis - Did the proceduralist?	Yes	No
Prep the procedural site using chlorhexidine 2% in 70% alcohol for 30 seconds and allow solution time to dry completely		
3. Maximum Barrier Precautions - Did the proceduralist?	Yes	No
Wear a hat		
Wear a mask		
Wear a sterile gown		
Wear sterile gloves		
Use a large sterile drape that covered the entire patient		
Maintain sterile technique during procedure		
Maintain sterile technique when applying the dressing		

Has a Biopatch been applied to insertion site (NB: only for use in high risk patients)	☐ YES ☐ NO

Proceduralist Name:	Proceduralist Signature:
Observer Name:	Observer Signature:

PLEASE RETURN THIS FORM TO:
THE QUALITY COORDINATOR/FACILITATOR OF YOUR SERVICE

Figure 2. Maintenance bundle

MAINTENANCE BUNDLE CHECKLIST: To be completed on all central lines.					
Ward/Unit: Today's Date: Line Day:		Yes	No	NA	Comments
Was the Central Line reviewed for necessity today?					
Is there a dedicated port being used for the TPN? **(If no TPN infusing then please tick NA)**					
Did you check the site today for inflammation? **(If any signs of infection are seen the catheter should be reviewed promptly)**					
Prevention measure in use e.g. Biopatch disc or chlorhexidine gluconate (CGH) dressing					
Before accessing injection ports did you clean with 2% CHG in 70% alcohol?	AM Shift RN Signature _____				
	PM Shift RN Signature _____				
	Night Shift RN Signature _____				

A CLAB trolley was kitted out with all the necessary equipment for line insertion, including copies of the checklists. In early 2010 we commissioned a central line insertion pack with all the elements (hat, gloves, mask, full-sized drape) necessary to satisfy the checklist and this replaced the trolley.

Nursing staff completed the insertion and maintenance checklists and the results were entered into a database. Compliance with the checklist was a continuous process with every checklist entered. All elements of the checklist were included but compliance was measured as an 'all or nothing' indicator – all elements had to be completed for the checklist to be considered compliant.

Data from the laboratory and the tally of central lines was used to determine two key measures:

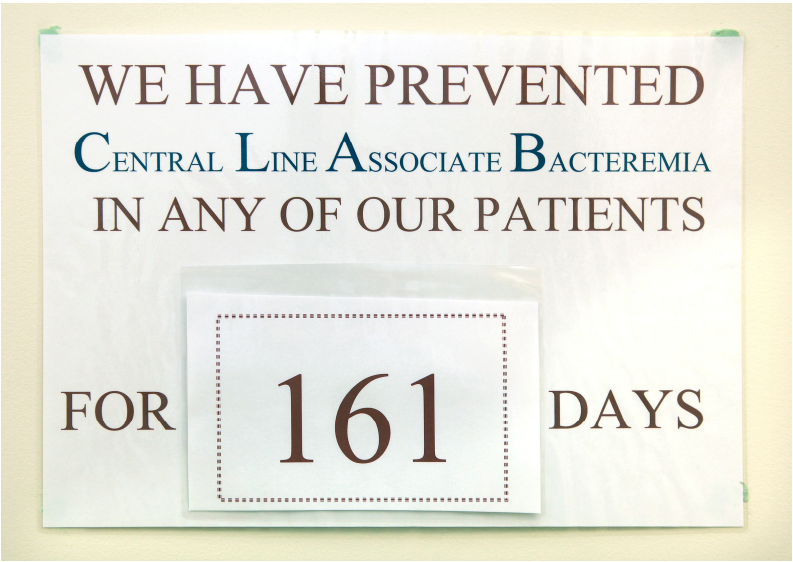
- The number of days between CLAB
- The number of CLAB per thousand line days.

Statistical Process Control methods were used to establish whether our improvements were statistically significant.[24] Process control charts are dynamic displays of variation in data over time. Process Control charts display the median and control limits and determine whether the variation found is special cause variation and therefore significant or the normal background common cause variation. When examining rare events (e.g. CLAB), the best way to display the performance over time is to measure the days between such events.[25]

The 6-month rolling average was used to smooth the CLAB/1000 line day rate.

In a prominent place in the ICU, the number of days since the last CLAB was displayed and updated daily (see Picture 1).

Picture 1. Days since last CLAB displayed in ICU



Central to the programme was the establishment of a quality facilitator within ICU who ran the programme, encouraged staff, analysed the data and fed the results back to the staff.

Results

In 2008 before the CLAB initiative started, the ICU had 14 patients with CLAB, a median of 28.1 days between cases and a rate of 6.8/1,000 line days. (see Table 2). In June 2008 the ICU was expanded from 10 physical beds (7 resourced) to 18 (12 resourced) beds, and in March 2009 a 6-bedded HDU was added. Admission numbers

to the Critical Care Complex nearly doubled over this time (876 admissions in 2008, 1365 in 2009 and 1627 in 2010).

Despite the increased workload in 2009 4 cases of CLAB were identified, the median days between cases increased to 75.8 (see Figure 3) and the CLAB rate dropped to 3.0 CLAB/1,000 line days (see Figure 4). In the first 6 months of 2010, there has only been one CLAB, a rate of 0.9 CLAB/1,000 line days. This CLAB occurred in a central line inserted in another hospital.

Table 2. CLAB results

Variables	2008	2009	2010
CLAB cases	14	4	1
Median days between CLAB cases	28.1	75.8	N/A
CLAB/1,000 line days	6.8	3.0	0.9
Cost of CLAB cases	$280,000	$80,000	$20,000

Figure 3. Days since last CLAB

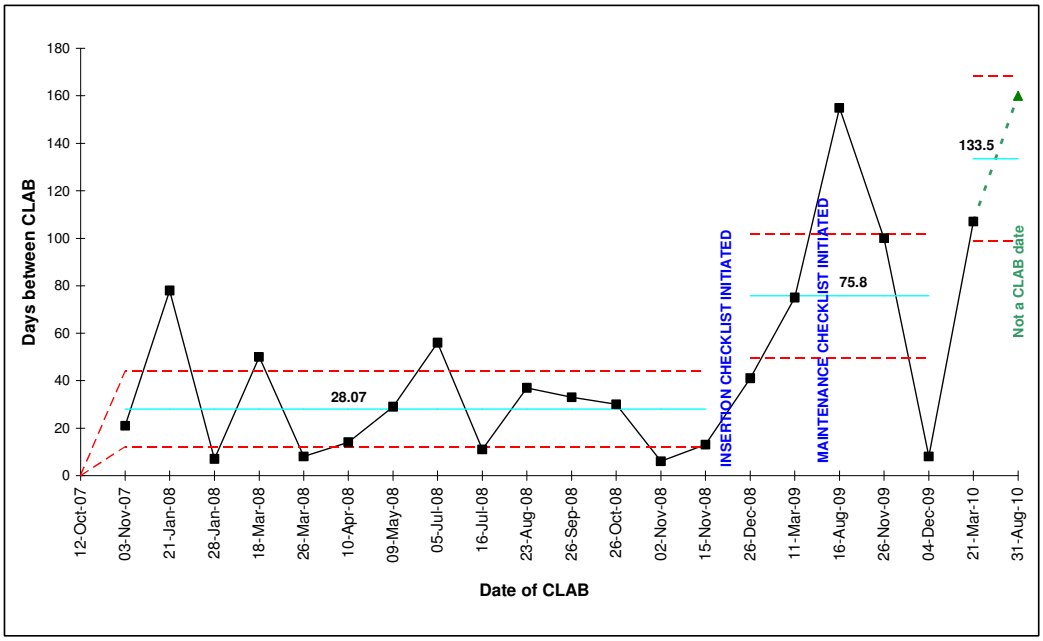


Figure 4. CLAB rate per 1000 line days (6 month rolling rate)

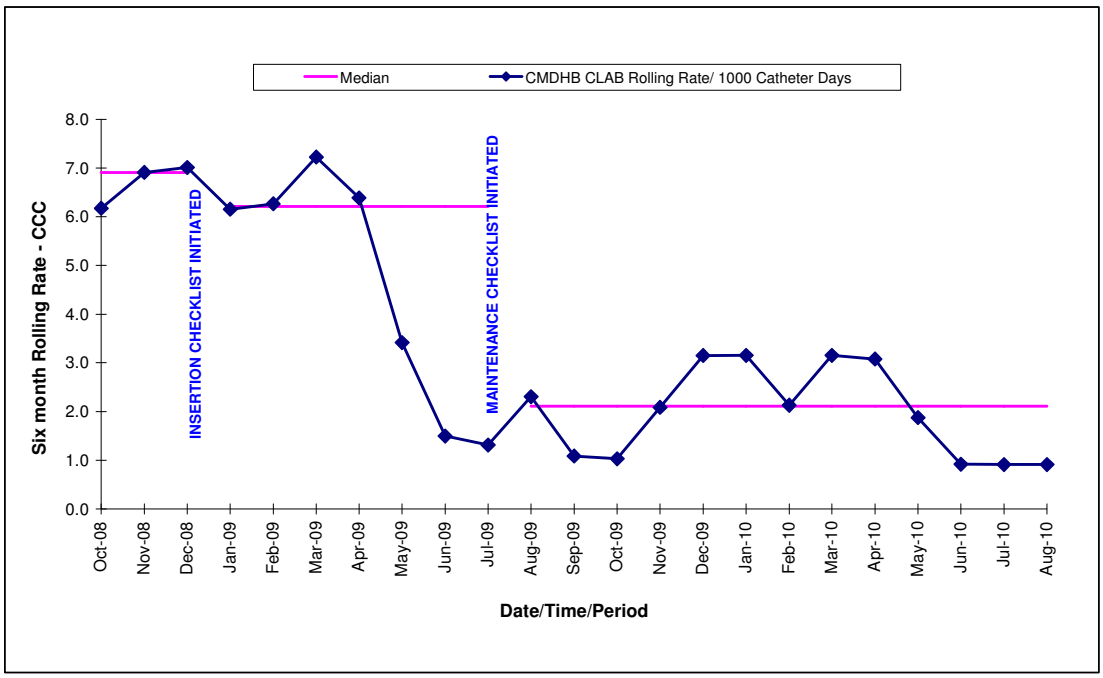


Table 3. Characteristics of CLAB cases

Number of patients with CLAB 2008–July 2010	19
Infection sites	
Femoral	2
Internal Jugular	14
Unknown	3
Organisms	7
Coagulase-negative Staphylococcus	2
Serratia marcescens	2
Candida species	2
Klebsiella pneumoniae	2
Enterococcus faecalis	1
*Acinetobacto*r species	1
Staphylococcus aureus	1
Pseudomonas aeruginosa	1
Orchrobacterium anthropi	
Average duration of line before infection	4.8 (SD 2.1)
Patients with significant burns injury	6
In-hospital mortality for ICU patients with CLAB	37%
In-hospital mortality for ICU patients without CLAB	13%

The most common pathogen in all CLAB cases was coagulase-negative Staphylococcus (mostly *S. epidermidis*) and the average line had been in for 4.8 days (SD of 2.1) before infection was found (see Table 3). The majority of lines with associated CLAB were internal jugular lines (14), 2 were femoral and 2 unknown.

We did not collect line site data in 2008 however, of the total lines inserted in 2009 and 2010, 314 (52.5%) were internal jugular, 206 (34.7%) femoral, 14 (2.3%) subclavian and 72 (11%) 'other' or 'unknown'. The in-hospital mortality of patients with CLAB was 37%, compared to the in-hospital mortality for ICU patients without CLAB at 13%.

The documented compliance with the insertion checklist was 43% in December 2008, 83% in April 2009 and 95% (ICU) /100% (HDU) in August 2010.

The cost to the unit from CLAB cases in 2008 was estimated to be $280,000, dropping to $80,000 in 2009 and just $20,000 in the year to date.

Discussion

We introduced a multifaceted quality improvement approach to prevent CLAB in the Critical Care Complex (ICU and HDU). The approach included staff engagement, education, the introduction of procedure checklists, and real-time feedback to the staff involved.

We observed a dramatic reduction in the absolute numbers of CLAB (despite an increase in bed census and a doubling of admissions), from 14 in 2008, to 4 in 2009 and only 1 in the first 6 months of 2010. We also saw a reduction of the rate of CLAB/1000 line days from 6.6 to 0.9. The time between CLAB cases also extended from one a month to one every 3 months. Another indirect benefit of the CLAB initiative has been the realisation amongst staff that other practices in the ICU could be improved.

We were encouraged to undertake this work based on the success of similar work internationally. In 2002 a study by Coopersmith et al[26] showed that a focussed education campaign for ICU nurses was associated with a 66% reduction in CLAB rates. Higuera et al[27] showed that a programme incorporating education, process control and feedback could significantly reduce intravascular device blood stream infections and mortality in Mexico. Berenholz et al[8] had shown in 2004 that five interventions could substantially reduce CLAB rates.

The interventions were: educating staff; creating a line insertion cart; asking providers daily whether lines could be removed; implementing a checklist; and empowering nurses to stop the insertion of a central line if the procedures were not followed. The CLAB rate dropped from 11.3/1000 line days to 0/1000 line days in Johns Hopkins. The same team then showed that the process could be replicated in multiple ICU sites, with a reduction of CLAB rates by 66% (2.7/1000 line days to 0/1000) in 103 ICUs in Michigan state.

When re-surveyed, the median CLAB rate was zero at 16–18 months, and remained zero at 34–36 months post implementation. It was estimated that the initiative had saved over 1500 lives, 81,000 hospital days and $165 million dollars.[28] So not only was zero CLAB a realistic target, but the gains were substantial and sustainable.

The Institute for Healthcare Improvement (IHI) adopted the ideas and rolled it out in their Saving 100,000 Lives campaign. This involved 3000 hospitals picking from a suite of patient safety initiatives. The IHI 'how to guide' was the blueprint for our work.

It is known that the challenge for quality improvement is the delay from when there is evidence that something is effective, to it becoming common clinical practice. The duration of this lag time is variable, but the average is 17 years. As far back as 2002 Eggimann[29] wrote

"Catheter-related infections should no longer be considered as an indirect tribute to sophisticated care or regarded as a fate, but must become one of the priority targets of a multidisciplinary approach emphasising quality-of-care improvement."

Although Middlemore Hospital's CLAB rate of 6.8/1,000 line days was lower than many other places,[10] the evidence had been available since 2004 that it could be much better, and that it was in fact possible to eliminate CLAB from ICUs So why has it taken a decade for this programme to be started in New Zealand?

Part of the answer lies in the exponential growth in medical knowledge,[30] no one practitioner can keep up to date. Systematic reviews and synthesis of evidence by Cochrane and others can help, but the most sustainable way of translating evidence into practice, is to find a way to embed it into the normal process of care.[6]

The CLAB bundle with its checklists is an example of this approach. In his book—The Checklist Manifesto—Atul Gawande[31] backs the power of checklists to overcome the burden of our ever expanding knowledge base and human fallibility. Gawande, a U.S. surgeon, headed the development and implementation of the WHO Surgical Checklist. The pilot in 7 countries showed that using the checklist significantly reduced in-hospital surgical complications and mortality.[32]

Although the components of the CLAB checklists are based on evidence, there is also evidence from the patient safety literature[33] that standardisation *per se* improves patient outcomes. Much of medical practice cannot be standardised, nor should it be. Clinicians are right to protect their autonomy when the best course of action is not clear, or is affected by numerous patient factors. Such nuanced care is the correct course in such cases. However, common interventions such as central line insertion can and should be standardised.

"When placing a catheter, reliability not autonomy is needed."[34]

The reliability of central line insertion has improved in the Middlemore's CCC and lines that have not been inserted in this standardised way are seen as a higher risk for CLAB. Lines inserted in other hospitals or in emergency situations are replaced as soon as possible.

Another high-risk group are the severely burned patients (Middlemore has the National Burns Unit) and the severely neutropenic patients. Three of the last CLAB in 2009 were from these high-risk patients.

Limitations—Although this study provides data that a multi-faceted quality improvement programme was associated with a significant reduction in CLAB rates, it has potential limitations. Firstly these findings cannot definitively be attributed to our programme.

We cannot exclude specific temporal trends (although there is no data from other hospitals of a reduction in CLABs) and we did not have a control group to compare with. Secondly, as this was an ICU-specific programme, we have small numbers of

patients with CLAB. With only 19 CLAB since 2007, the data on the isolates implicated in these infections is not as robust as larger studies. For instance, in the study by Shannon et al of 1067 patients with central lines and 49 CLAB, it was found that CLAB isolates were more likely to be virulent strains, which is not what we have found.[10]

Likewise not too much can be read into the mortality difference between patients with CLAB, and those without as the numbers are small. Our intervention was multi-faceted and we can't say which of the various interventions were most effective in reducing the CLAB rate. However, as all the interventions are low cost and simple, and the risks associated with CLAB are high, we believe that there is enough reason for all the components to be introduced together. The study was not randomised and the adjudicator of CLAB cases was not blinded to the work being done in ICU. However, this was the same key person and process throughout the study and pre-study timeframes.

Finally, as this study and most in the literature confine themselves to the ICU setting, the generalisability to other healthcare settings is uncertain. We are currently in the process of systematising the CLAB prevention programme throughout the hospital and hope to establish its effectiveness in other ward settings.

Recommendations—As Paul Batalan says[35]

> …every system is perfectly designed to produce the results that it gets

Prior to this initiative the central line insertion system in the ICU at Middlemore Hospital was 'perfectly designed' to harm 10-14 patients a year through central line infections.

Hospitals can choose to stay with the same system, or they can actively choose to have a system that produces zero, or near zero CLAB. Pronovost calls CLAB a bellwether for holding healthcare professionals accountable for patient outcomes.[34] We would recommend that ICUs in New Zealand measure their CLAB rates, engage their staff and implement the CLAB prevention toolkit.

Some of our learnings for success include: identification of a clinical leader; the establishment of a quality facilitator within ICU who can run the programme; adoption of the central line pack; and feedback of results in a meaningful way—we found the 6 month rolling rate to be convincing for clinicians' and the daily up-date of days since the last CLAB to be helpful in keeping the momentum for the programme going.

Conclusion—CLAB is associated with significant mortality and morbidity for ICU patients. It is also an economic cost that the health system can ill afford in these constrained times. In this paper, we report on the CLAB initiative at Middlemore Hospital (MMH) which has dramatically reduced the CLAB rate in the Critical Care Complex and make the case for all ICUs in New Zealand to measure their CLAB rates and to adopt a similar approach.

Competing interests: None.

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Why Māori women continue to smoke while pregnant

Marewa Glover, Anette Kira

Abstract

Aim To investigate why some Māori women continue smoking during pregnancy.

Methods An exploratory qualitative study was conducted with 60 pregnant Māori women aged from 17–43. A questionnaire was used to guide the interviews. Responses were categorised using Te Whare Tapa Wha (the four-sided house), an Indigenous theoretical framework.

Results The women smoked on average 9 cigarettes per day. Many (45%) were very concerned for their baby's health. The main reasons for quitting were for their own and their baby's health. The majority (77%) reported no smoking-related health problems. All the women lived with at least one other smoker. Over half of the participants (62%) predominantly socialised with people who smoked and nearly all said it was easy to smoke in their socialising and work environments. Partners and mothers were the most common source of support or advice to quit, however, often that support person also smoked. There was a lack of understanding of the harms associated with maternal smoking.

Conclusions Motivation to quit smoking was low. The women all lived with smokers which reportedly made it harder to quit; most of them lived in a smoky environment, where family, friends and coworkers smoked. This highlights the need to include family in cessation interventions.

The risks to the unborn child, when a pregnant woman smokes, are well-documented[1] and most pregnant women are aware of, at least some, risks.[2, 3] Despite this, not all pregnant women cease or reduce smoking.[3] Commonly women, who smoke during pregnancy, have a partner who smokes,[4,5] and, come from a lower socioeconomic area where high smoking prevalence is more common.[6]

In New Zealand, smoking is clearly patterned by socioeconomic position: the most disadvantaged groups have the highest smoking prevalence.[7] Māori women are one of the most socially deprived groups in New Zealand[8] and they have the highest smoking prevalence rates. Surveys have put smoking among Māori women aged 15–24 years old as high as nearly 61%; 39% among Māori women aged 25–29 years, and 57% of 30–39 year olds.[9]

In 2007, at first registration with a midwife, 19% of New Zealand pregnant women were smoking and this dropped a little to 15% still smoking when discharged from midwife care.[10] The prevalence was substantially higher for Māori women, with 43% smoking at first registration with a midwife and 34% still smoking at discharge.[10]

From conception, Māori are disproportionally affected by the ill-consequences of tobacco use. Smoking during pregnancy contributes to higher rates of miscarriage, preterm births, low birth weight babies and difficulties during childbirth.[11] Sudden

Unexplained Deaths in Infancy (SUDI), asthma, glue ear, and increased rates of chest infections, all associated with maternal smoking, are commonplace among Māori children.[12] Maternal smoking also sets Māori up for higher rates than non-Māori of cardiovascular disease, many cancers and respiratory diseases later in life.

Quitting in the first 3–4 months of pregnancy and remaining abstinent protects the fetus from some of the adverse effects of smoking.[13] Serendipitously, pregnancy is a powerful motivator to quit smoking.[3] In New Zealand, Ford et al[14] found that whilst 64% of pregnant smokers wished to quit and 30% wished to cut down, this contrasted with what they actually achieved: 34% quit and 50% cut down. In another study, 40% of Māori pregnant women cut down and 23% stopped smoking altogether.[15]

There are several barriers undermining reduction or cessation of smoking when pregnant, including loss of the role and meaning of smoking and negative influence from family or friends.[2, 16] Women who continue smoking during pregnancy are likely to live in a household with other smokers,[17–19] and have partners, family and friends who smoke.[16] Similar results have been found for Māori: living with other smokers effects smoking cessation success Māori.[20] Further, a qualitative study found that addiction, habit and stress were reasons why pregnant women continued smoking.[21]

Reducing smoking among pregnant women remains a challenge. Whilst several qualitative studies have investigated pregnant women's smoking during pregnancy, no previous study has focused on pregnant Māori smokers' attitudes towards smoking and barriers to cessation. Previous studies into Māori smoking have involved few pregnant participants.[20] The high smoking prevalence among Māori women warrants research specifically focused on this group.

Reducing smoking during pregnancy has been a New Zealand and international priority for over a decade[16, 22] and closing the health inequality gaps are a key public health agenda,[22] adding to the rationale for reducing smoking during pregnancy among Māori women. The New Zealand tobacco control programme could usefully be informed by a study identifying barriers to smoking cessation for pregnant Māori women. Thus, this research aimed to determine:

- The attitudes of Māori pregnant smokers towards smoking during pregnancy;
- The factors influencing continued smoking during pregnancy; and
- Family (whānau) support to quit received by the women.

Method

This was an exploratory qualitative study using semi-structured face-to-face interviews. Purposive sampling was used to find a diverse range of women who varied across age, stage of pregnancy, number of pregnancies, socioeconomic level and place of residence. Random selection was, therefore, not used.

Pregnant Māori self-identified smokers, aged 16 and over, were invited to take part. Participants were recruited through primary health care services, for example, Māori midwives, Māori community health workers, Māori health clinics, the researcher's networks, a circulated invite and newspaper advertisement. Interviews were conducted during October 2002 to November 2003 with 60 women from Auckland, Wellington, Hamilton, Kawakawa and around the Hokianga.

The questionnaire included questions relating to pregnancy status, tobacco consumption, attitudes to quitting, beliefs about smoking during pregnancy and support to quit. The questionnaire contained both qualitative open-ended questions and quantitative agree-disagree questions. Responses were manually

recorded on the questionnaire in full view of the participant. Transcripts were not produced, thus women were not asked to check the written responses. Interviews took from 30–45 minutes.

Ethical approval for the study was given by the University of Auckland Human Participants Ethics Committee.

Where possible, questionnaire responses were quantified. Quantitative data was entered into Excel and standard frequencies were calculated for descriptive purposes. Free text responses were entered into Microsoft Word and manually sorted using the themes covered in the questionnaire. Thematic analysis within categories enabled coding sets to be developed, for example, for reasons for stopping smoking.

Te Whare Tapa Wha[23] was used as the primary organising framework for grouping the findings into sections. The demographics, pregnancy status and nicotine dependency factors were grouped under Te Taha Tinana (the physical or bodily aspect of health). Attitudes towards and beliefs about smoking while pregnant and motivation to stop smoking were included under Te Taha Hinengaro (the mental realm). The home and social environment and smoking and attitudes of others fitted into in to the realm of Te Taha Whānau (the family and social realm). No data emerged that fitted under Te Taha Wairua (the spiritual realm). The data was quantified in order to illustrate how common a particular response was and the qualitative narrative was used to describe or explain the findings.

Results

Participants' ranged in age from 17 to 43 years old. The average age was 26. Most of the women (88%) had a partner. Twenty-three percent of participants had no educational qualifications and only 38% had some employment. Over half (68%) of the participants lived in urban centres. They listed membership of from one to three iwi (tribe) each. Almost equal numbers of participants were in to the second (43%) or third (40%) trimester of their pregnancy and 38% of the women were having their first baby.

Te Taha Tinana: biological and physical aspects of smoking—The average stated number of cigarettes smoked per day was nine, ranging from 1 to 28 (Table 1a). Nineteen (32%) of the participants smoked their first cigarette within 5 minutes of waking (Table 1b).

Table 1. a) Number of cigarettes smoked per day; and b) time to first cigarette upon waking

a)

Cigs per day	N=60	%
<5	11	18%
5-9	26	43%
10-14	6	10%
15-19	9	15%
20-24	7	12%
25+	1	2%

b)

Time to first smoke	N=59	%
Within 5 mins	19	32%
6-30 mins	12	20%
31-60mins	4	7%
After 60mins	24	41%

The majority of participants (77%) were healthy and reported that they had not suffered any smoking-related illnesses in the previous 6 months. Even the women who reported having asthma, bronchitis or low or high blood pressure, reported mild or seasonal symptoms. As one woman said "that's the only time I go to a doctor usually—pregnancy."

Te Taha Hinengaro: beliefs and reasons for smoking and quitting—Of the reasons given for smoking 50% of participants said they smoked because of habit (Table 2), as illustrated by the following quote: "Just got to have something in my hands. It's not that I like it." The second most common reason for smoking was due to stress. "Stress and my partner and arguing and stress and my mother and stress." "Stops me from stressing out. Stops me from worrying about things."

Table 2. Reasons for smoking

Reason	N=60	%
Habit	30	50
Stress	18	30
Addiction	15	25
Calms/relaxes	14	23
Satisfaction/like it	10	17
Social/company	8	13
Boredom/something to do	7	12
Time out	2	3
Depression	1	2
Don't know	2	3

Participants cited multiple reasons motivating them to quit smoking (Table 3). The two most common cited reasons for contemplating quitting were for their baby's and own health. For example: "If I could give it up, it would do me world of good." Several previous quit attempts had been "for my health." For example, these women said, "I got sick," "smoker's cough and the effects." "I had the flu actually. I just couldn't smoke." However, only 12 women said they wanted to quit because of the pregnancy and only twelve women had tried to stop or succeeded at stopping smoking for their first pregnancy. One woman managed to stay smokefree until her baby was about 1 year old.

Table 3. Reasons for wanting to quit

Reason	N=37	%
For baby's health	29	78
Their own health	20	54
Cost	16	43
Pregnancy	12	32
Other children	7	19
Sport/fitness	5	13.5
It's time	4	11
Role model	4	11
Nausea	3	8
It's yuk/stinks	2	5
Longevity	1	3
Breastfeeding	1	3

Most of the participants (92%) had thought about quitting and many (78%) had tried to quit. The number of quit attempts ranged from 0 to "many times", with an average of two. Thirty-five percent had managed to give up smoking before, though some women counted periods as short as a few days as 'having given up'. Eleven, of the women who had previously quit stayed smokefree for 3 months or longer, while the other ten stayed smokefree from 1 week up to 3 months.

Attitudes towards smoking during pregnancy—Most of the women were concerned about their unborn child's health and 45% (27) worried "a lot". Most of the women agreed that if they stopped smoking while they were still pregnant it was likely their baby would be healthier. Many thought other people smoking around them had an effect on their unborn baby's health (Table 4).

Contradicting this result, many agreed or answered 'don't know' to the questions that the amount they smoked was too little to cause harm to their baby and there was no need to quit completely if they cut down. The statement "if I cut down on my smoking there is no need to quit completely" was used to rationalise continued smoking. One woman explained that she believed this "cos [because] they said even cutting down would be beneficial. Quitting would be better but cutting down better – every hour or two you don't smoke baby is getting more oxygen—that is why I cut out last one at night and first two in morning so baby has more time smokefree."

Of concern, 33% agreed that they may as well keep smoking themselves as they were exposed to so much smoke from others. One woman acknowledged that it was a thought that supported her to continue smoking even though she knew it wasn't true and another said "they say nowadays secondhand smoke worse than first hand."

Table 4. Belief statements about smoking during pregnancy

Statement	Agree	%	Disagree	%	Don't know	%
It's good to have a smaller baby	2	3.3	52	87	6	10
The amount I smoke is too little to cause harm to this baby inside me	9	15	43	72	8	13
If I stop smoking while I'm still pregnant, it is likely that this baby will be healthier	57	95	0	0	3	5
Smoking low tar (ultra mild) cigarettes is less harmful to my unborn baby	6	10	39	65	15	25
If I cut down on my smoking there is no need to quit completely	14	23	38	63	8	13
I am exposed to so much smoke from other people I might as well keep smoking myself	20	33	38	63	2	3
Other people smoking in the house has an effect on my unborn baby's health	53	88	4	7	3	5
Nicotine passes through breast milk	33	55	4	7	23	38

Te Taha Whānau: familial and social influences—All of the women lived with other smokers and nearly half (47%) of the women lived with a partner who smoked. Nearly half (48%) said their house was totally smokefree. Eleven participants (18%) lived in homes with no restrictions on smoking. Twenty participants (33%) lived in

households that allowed smoking inside; however, many of those households had made rooms' smokefree or had a designated smoking area.

Thirty seven (62%) participants said that the people they socialise most frequently with smoke (Table 5a) and only two participants mixed with mainly non-smokers. Most participants (93%) said it was easy to smoke in their social venues (Table 5a).

Table 5. Environments – a) Social and b) Work

a) Social environment		
Friends smoke:	N	%
Most do	37	62%
50/50	21	35%
Socialising venues		
Homes	48	80%
Pubs/Clubs	10	17%
Marae	9	15%
Club rooms	8	13%
Work	3	5%
Schools	2	3%
Other	2	3%
Easy to smoke there?	76	93%

b) Work environment		
	N	%
Colleagues smoke	31	52%
Easy to smoke at work	27	45%
Smoke with others	30	50%

Nearly all of the women who worked said it was easy to smoke at work and 30 smoked with others at work (Table 5b). Smoking at work was easy because as participants said they could "just go out whenever want to" or "there's a designated smoking area outside" and because a "majority of staff smoke".

Even participants who worked or were students at schools, an environment designated smokefree under legislation, still smoked while there. Similar to other workplaces, "practically everyone" smoked or they were "allowed to during breaks" and there was a "designated [smoking] area out the back" such as "a smoking shed."

Support to quit—19 women (32%) said their partner wanted them to stop smoking. One woman said her partner "keeps telling me: think of the baby" and another said, "the father tells me to give up." One woman said her "partner asked me to give up but he reckons I'm pretty good now 'cos I'm slowing down." The women's mothers were the next main group to advise cutting down or stopping smoking (22%), for example, "…even though she smokes she doesn't like me smoking." Six women felt like "everyone" was saying they should quit. Twelve (20%) did not recall any advice or encouragement to quit from anyone in their life.

Partners were the most frequently named support person (17). Some women's partners were "concerned for baby's health" and had got "pamphlets about secondhand smoke" and "tried to give up" themselves. However, one woman said her

partner was "a chain smoker—very hard to offer support. He goes outside to try not to trigger me off." Mothers were the next most frequently cited support people.[9] Two women added, "but, mum smokes." About six women said all their whānau would support them. One woman said "they say they'll go outside and smoke. The father, the household, they're going to when baby's born."

About six participants had a friend or friends who would support them. One woman believed she would get support from a "good friend" because she "was a smoker and she gave up." In contrast, about eight women didn't think they had anyone in their whānau or social circle who could support them to quit, because as they said, "they're all smokers."

Discussion

This study sought to understand why Māori women continue to smoke when pregnant. The main finding was that these pregnant women were healthy which removes one of the most widely cited reasons smokers give for quitting.[24] They lived in smoky environments, used smoking as a coping mechanism for stress, and had poor understanding of the risks associated with smoking during pregnancy.

Although several of the women had support from whānau to quit, this was weakened by the fact that many of their potential support people also smoked. They socialised mainly with smokers and were undeterred by smokefree environments. These findings are consistent with the results from international studies that found that pregnant women who smoke don't fully understand the harms of smoking, large proportions of their social circle smokes, and that they smoke to alleviate stress and cope with stressful life circumstances.[2,16,21] However, the findings contrast with the general population of smokers' reasons for smoking, which are enjoyment, stress-relief and weight-control.[25]

All of the pregnant women lived with at least one other smoker, which drastically undermines success at quitting.[19] This highlights the need to reduce smoking prevalence among partners of pregnant women. The promotion of smokefree pregnancies and smoking cessation assistance needs to be extended to the whole whānau. Educating the community surrounding pregnant women about the effect of their smoking on pregnant women could help. Whānau could be encouraged to support pregnant women to become smokefree by reducing or quitting their own smoking, making the house and car smokefree, and, not smoking around pregnant women.

Stopping for their baby's health was the number one reason motivating the women in this study to stop smoking. However, many believed that the effects of smoking during pregnancy on children are short-lived and that the child will overcome the damage. This finding supports previous studies that found that people who continue smoking have a weaker belief of the potential harms of smoking during pregnancy.[18] Uncertainty about or rejecting the potential for pregnancy-related harm, due to smoking, is likely to undermine motivation to quit.[17]

There was confusion around the relative dangers of smoking versus exposure to secondhand smoke (SHS). This is probably because new information is more salient and NZ media campaign coverage of SHS risks may have outweighed messages about

direct harm, such as, smoking causes lung cancer. This study suggests that some women have concluded that SHS is more dangerous. This is a myth that healthcare professionals could debunk by providing information about the relative risks of smoking versus exposure to smoke and by providing clear advice to stop smoking altogether.[26]

This study suggests that the strategies that were being used to inform Māori about the risks associated with smoking when pregnant were not effective or they were not effectively reaching Māori women. Since this study was done there have been increased efforts to deliver cessation support to the general population: by establishing the 'Better help for smokers to quit' health target[27]; The Quit Group's extended range of cessation support mechanisms for example, via text and web; subsidisation of a wider range of cessation pharmacotherapies; and the roll out of the ABC (Ask, give Brief advice to quit, and provide Cessation support or referral) to the primary healthcare sector.[26] This is expected to impact on population smoking prevalence rates, including Māori women of childbearing age. But, to date there is little indication that the prevalence of smoking among Māori women of childbearing age has reduced.[9,28]

One of the risks of the current programme is that it waits for pregnant Māori women to come in to contact with the health system. However, Māori and Pacific Island women have lower rates of registration with a midwife at 18 and 38 weeks pregnant and also attend fewer antenatal visits[29] which could mean that some women do not receive support to quit until late in pregnancy.

Limitations—The study has limited generalisability, as participants were not randomly selected and 60 participants is not a large number, although they were recruited using purposive sampling. Deception regarding tobacco consumption was not considered a limitation as only women willing to admit that they were smoking were likely to volunteer.

Future work—Research is needed to identify interventions that are more effective for this group of women, and based on the findings in this study, also reaches the wider family. Follow-up research is needed to assess the effectiveness of the current tobacco control programme for reducing smoking prevalence among Māori women of child-bearing age and particularly for reducing smoking when pregnant. The literature overall suggests that accurate knowledge about risks associated with smoking when pregnant is an important factor motivating quitting. It would be useful to test this, as health education interventions can be costly. Identifying and making other reasons for quitting more salient, such as using incentives,[30] may be necessary to achieve a greater reduction in smoking among pregnant Māori women of robust health.

Competing interests: None.

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Post-caesarean section surgical site infection: rate and risk factors

Marcus Ghuman, Deirdre Rohlandt, Grace Joshy, Ross Lawrenson

Abstract

Aim To identify the incidence of surgical site infection (SSI) post-caesarean section, and important contributory risk factors.

Method A retrospective analysis was conducted to identify cases with SSI, using as a population all the caesarean sections for the 6-month period from 16 March 2009–15 September 2009 performed at Waikato Hospital (n=526). Cases (n=25) were compared with randomly selected controls (n=50) to identify important risk factors.

Results In total, 25 of the 526 patients (5%) had a SSI post-caesarean section. Of these, 15 were revealed during the initial admission (3%), and the other 10 required hospital care post-discharge for treatment of infection (2%). The key risk factors for surgical site infection post-caesarean section identified were elevated BMI, longer duration of labour, and having an emergency procedure.

Conclusion This study has identified significant risk factors for surgical site infection post-caesarean section. Identification of these risk factors reminds obstetric staff that appropriate targeting of infection reducing strategies to women at high risk is needed.

Caesarean section (CS) is one of the most common surgical procedures performed in hospitals. It is classified as a high-risk operation in the "clean" category. In New Zealand, as in other developed countries, the rate of CS has continued to rise, currently comprising over 25% of hospital births.[1]

Surgical site infection (SSI) post-caesarean section increases maternal morbidity and costs and is thus an important problem. The benchmark SSI infection rate quoted in the RCOG green top guidelines is 6.4%;[2] however, rates of SSI post CS vary widely in different publications due to differences in the criteria used to diagnose infection and varying lengths of follow-up postoperatively.[3]

Risk factors contributing to SSI post CS are thought to include BMI, longer operation duration, age, blood loss, method of wound closure, and emergency procedures.[3–6]

Methods

This nested case-control study was conducted as a retrospective analysis using as a population all the caesarean sections for the 6 month period from 16 March 2009–15 September 2009 conducted at a single site—Waikato Hospital. Each of the patients identified in the study as having had a caesarean section was accompanied by a list of ICD9 codes.

Patients with possible surgical site infections post-caesarean section were identified by manually searching through the obstetric notes of patients who had the electronic diagnostic codes "infection of obstetric surgical wound", "wound infection following a procedure", and "disruption of a caesarean section wound". CDC (US Center for Disease Control) criteria were then used to confirm infections in these cases.

The case population with confirmed SSI was compared with two randomly selected (via random number generator) controls per case without SSI from the same wider 6-month population to identify any risk factors for SSI within the Waikato Hospital setting. Risk factors analysed include BMI, operation duration, age, blood loss, method of wound closure, use of prophylactic antibiotics, type of procedure, ethnicity, smoking, parity, duration of labour, and elapsed time since rupture of membranes (ROM),

Statistical analysis—Categorical data were presented as frequency (percentage) and continuous data were presented as mean ± SD. Categorical variables were compared using a Chi-squared test or Fisher's exact test as appropriate. Continuous data were compared using the Kruskal-Wallis test. All P-values reported were two tailed and a P-value <0.05 was considered significant. A logistic regression of significant variables was also performed. The statistical programme SAS Version 9.1 was used for statistical analysis.

Results

This study identified 526 sections—192 elective lower segment caesarean sections, 331 emergency lower segment caesarean sections, and 3 emergency classical caesarean sections. In total, 25 of the 526 patients (5%) in the 6-month period analysed had a surgical site infection post-caesarean section. Of these, 15 were revealed during admission (3%), and the other 10 required hospital care post-discharge for treatment of infection (2%). The characteristics of the 25 cases and 50 controls are recorded in table 1.

Table 1. Potential risk factors for post-caesarean section surgical site infection

Variables	Case (n=25)	Control (n=50)	P value
Type of C-section, n (%)			0.0243
Emergency	21 (84)	29 (58.0)	
Elective	4 (16)	21 (42.0)	
Age, mean ± SD	27.2 ± 6.8	30.0 ± 6.2	0.0892
Ethnicity, n (%)			1.0000
Non-Maori	18 (72)	37 (74)	
Maori	7 (28)	13 (26.0)	
BMI (kg/m2), mean ± SD	34.7 ± 5.2	28.2 ± 6.1	0.0002
Smoking status, n (%)			0.4635
Smoker	6 (24)	19 (38)	
Non-smoker	13 (52)	27 (54)	
Unknown	6 (24)	4 (8)	
Parity, mean ± SD	0.7 ± 0.8	1.2 ± 1.4	0.0998
Duration of labours (hrs), mean ± SD	16.5 ± 7.6	9.5 ± 5.1	0.0019
Elapsed time since ROM (hrs), mean ± SD	17.4 ± 14.4	11.2 ± 5.1	0.2195
Operating time (mins), mean ± SD	46.8 ± 17.9	46.5 ± 13.2	0.5932
Type of closure, n (%)			0.2417
Sutures	14 (56)	31 (62)	
Staples	8 (32)	9 (18)	
Unknown	3 (12)	10 (20)	
Estimated blood loss (mL), mean ± SD	729 ± 475	632 ± 275	0.6044

Some data are missing for BMI, Smoking, Duration of labours, Elapsed time since ROM, type of closure, estimated blood loss.

The key risk factors for surgical site infection post-caesarean section identified were elevated BMI, longer duration of labour, and having an emergency procedure. The

mean BMI for the case group was 34.7kg/m2, as compared to 28.2kg/m2 in the control group (p=0.0002). Mean duration of labour in the case group was 16.5 hours, as compared to 9.5 hours in the control group (p=0.0019), and the percentage of the case group having an emergency procedure was 84%, versus 58% in the control group (p=0.0243).

Whilst cases were on average 3 years younger, had 100mls greater blood loss, and were 14% more likely to have had staples used for wound closure, these findings did not reach statistical significance.

Antibiotic prophylaxis was used in all cases and controls

A multivariate logistic regression was performed on the risk factors 'type of procedure' and 'BMI'. This regression analysis adjusted for age and BMI for the risk factor type of procedure; and adjusted for age, operating time, duration of labour, and type of procedure for the risk factor BMI. This analysis confirmed type of procedure and BMI as being independent risk factors for SSI, even after adjusting for other potentially confounding factors (*see table 2*).

Table 2. Logistic regression of risk factors BMI and type of procedure

Variables	Case (n=25)	Control (n=50)	OR (95% CI)	P value
Emergency (vs elective) section, n(%)				0.0243
Emergency	21 (84)	29 (58.0)		
Elective	4 (16)	21 (42.0)		
Unadjusted			3.80 (1.14-12.66)	
Adjusted for age & BMI			4.22 (1.01-17.86)	
BMI (kg/m2), mean ± SD	34.7 ± 5.2	28.2 ± 6.1		0.0002
Unadjusted			1.21 (1.09-1.34)	
Adjusted for age			1.20 (1.08-1.33)	
Adjusted for age & operating time			1.20 (1.08-1.34)	
Adjusted for age & labour duration			1.31 (1.06-1.60)	
Adjusted for age & procedure type			1.22 (1.09-1.38)	

Discussion

This retrospective analysis suggests that the rate of surgical site infection post-caesarean section in Waikato hospital was approximately 5% which is similar to the in-hospital rate found in other studies. However, this figure recognises only those patients requiring inpatient admission and treatment. Those who received outpatient (or no) treatment for their infection are unable to be captured by the methodology used. Thus, the total infection rate is likely to be higher than that identified in this study, as infections captured in an in-hospital setting may represent as little as one-third of the total number of infections.[7]

Significant risk factors for infection identified include elevated BMI, longer duration of labour, and having an emergency (as compared to an elective) procedure.

The link between obesity and increased SSI risk is well established in the literature, and relates to increased subcutaneous tissue thickness (which is relatively avascular),

impaired immune function, increased wound area, need for larger incisions, and the poor penetration of prophylactic antibiotics in adipose tissue.[4,8]

That emergency procedures were a statistically significant risk factor for SSI is also unsurprising, has previously been documented in observational studies,[4] and most likely relates to rupture of the membranes prior to surgery,[9] the increased urgency of procedure, and reduced attention to infection preventing behaviours.

The relationship between duration of labour and SSI may be explained by increased "vulnerable time" where infection can be acquired, and due to the fact that as duration of labour increases, number of vaginal exams and likelihood of progression to an emergency procedure also rise.

Other risk factors which have been shown to be statistically significant in previous observational studies were not shown to be significant in this study. In the case group, there was a trend to younger age, greater blood loss, and use of staples, though these did not reach statistical significance.

This analysis is limited by its relatively small sample size, incomplete patient charts, performance at a single site, and potentially by the case finding methodology. The methodology used relies upon correct electronic coding, and so accordingly may potentially lack sensitivity. However, the 25 cases are "true" cases as confirmed by manual checking and application of CDC criteria to suspected cases, ensuring a high specificity for the case finding approach.

This study has identified significant risk factors for surgical site infection post-caesarean section. Identification of these risk factors reminds obstetric staff that appropriate targeting of infection reducing strategies to women at high risk is needed. Such strategies include, but are not limited to, antibiotic prophylaxis as routine, antiseptic skin preparation, adequate glycaemic control in diabetic patients, and the use of appropriate dressings.[10] Emerging strategies such as antibiotic coated sutures may also have a role.

Competing interests: None.

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Self-reported oral health care and access to oral health information among pregnant women in Wellington, New Zealand

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Abstract

Objectives The aims of this study were to gain an understanding of pregnant women's oral health care practices, access to information, and dental care usage in New Zealand, and to investigate whether these differed between sociodemographic groups.

Methods One researcher visited 69 antenatal classes in the Wellington region to explain the study. Women self-completed the questionnaire and returned it by post.

Results A total of 405 women (55% response rate) took part. 79.2% of participants identified as New Zealand European and most were of high income and education levels, 32% visited the dentist during pregnancy and more than 60% reported bleeding gums. Women with a household income under NZ$70,000 per year were significantly less likely to report access to oral health information (OR 0.27, 95%CI 0.10–0.76) and more likely to report the need to see a dentist (OR 2.55, 95%CI 1.08–5.99) compared to women with an income over NZ$100,000 per year.

Conclusions Visits to the dentist and access to oral health information were more common among New Zealand European women with higher education achievements and higher socioeconomic backgrounds with only a third of women went seeing a dentist during pregnancy. Improving the oral health of pregnant women will have follow-on benefits of improved oral health outcomes for their children.

Women normally experience physiological, psychological and lifestyle changes during pregnancy and some of those changes can affect their dental health.[1] The oral health of pregnant women has been receiving attention, both internationally and in New Zealand,[2] with growing evidence that poor oral health can have detrimental effects, not only for the women (for example, increasing risk of pre-eclampsia)[3] but also for the health of the fetus/baby.[4–6]

Periodontal disease combines a number of diseases of the periodontal tissue that can be broadly divided into gingivitis and periodontitis. Gingivitis is an inflammation of the soft tissue surrounding a tooth, which commonly manifests as bleeding gums. Periodontitis is characterised by inflammation of the supporting structures of teeth resulting in attachment and bone loss.[7] Periodontal disease is relatively common among pregnant women due to hormonal and vascular changes which occur during pregnancy leading to the promotion of an accentuated response to plaque.[4]

There has been extensive discussion about the potential of periodontal disease to affect pregnancy outcomes. Some studies suggest that periodontitis is a risk factor for preterm and low birth weight infants, even after adjusting for other risk factors such

as smoking, previous adverse pregnancies, race, age or socioeconomic status (SES).[4–6] However, a recent study on the effect of maternal periodontal disease treatment on reducing the incidence of preterm birth failed to confirm this connection.[8]

Studies show that preventive measures, including adequate diet and plaque control, for expectant mothers, can have a positive impact on both the woman's oral health and that of their child.[9–11] In addition, because mothers are normally responsible for the introduction of dietary and hygiene habits to the infant, pregnancy is an ideal time in which to promote and reinforce healthy messages which will have long-term benefits for the woman as well as their family.[12]

There is some international evidence of inequalities in oral health status and access to dental care for pregnant women of different ethnic and socio-economic groups.[13–16] In New Zealand, two national oral health surveys conducted in 1976 and 1988 showed a decrease in dental caries generally over this period, but this was not consistent across all population groups.[17,18]

Marked differences were reported in the levels of oral health of Māori compared to non-Māori, and also differences by SES with regard to access to oral health care services, according to the latest New Zealand Health survey conducted in 2006/2007.[19] None of these surveys presented data on pregnant women.

A recent qualitative study of Māori women, found that current oral health services are not meeting Māori needs and participants reported a number of dental problems during their pregnancies.[20] Improving oral health and decreasing disparities in health are goals of the New Zealand government. The Ministry of Health has highlighted pregnant women as a priority group.[21]

Currently, there is a lack of information in New Zealand about the oral health care of pregnant women. The aims of this study were to gain an understanding of women's oral health care practices, access to oral health information and use of dental care services both prior to and during pregnancy, and to investigate if these differed between sociodemographic groups.

Methods

Participants—Eligible participants were pregnant women, over 16 years of age, attending antenatal classes during a 6-month period (June-November 2008) in the Wellington region. There are approximately 3,500 babies born per year in the region and about 78% of first time mothers attend antenatal classes.[22]

Antenatal classes may be either government-funded programmes which are offered to women at no charge, or be taught by a range of private antenatal education providers at a cost of anything up to NZ$150 for a course of classes. Participants in the study were drawn from a range of available classes, both private and government funded. The private classes were run by Parents Centre, Wellington High School Adult Community Education Centre, Newlands and Onslow College Adult Community Education Centre and Tawa College Community Education.

The government funded classes were the breastfeeding classes at Wellington Hospital Women's Health Service and the Wellington Maternity Project (MATPRO). The composition of the classes provided by MATPRO in 2003 were 20.5% Māori, 17.5% Pacific, 8% Asian, 7% other/not stated, and 47% of European New Zealand ethnicity.[23] The women attending antenatal classes are typically in the last trimester of their pregnancy.

Data collection—The researcher arranged with the childbirth educator from each of the classes to attend one antenatal session in order to explain the study and leave women with an information sheet, questionnaires and self-addressed envelope for posting back the questionnaires which were self-

completed by the women at home. Completed questionnaires could also be left at a 'drop box' at the antenatal class venue if the woman preferred.

Demographic information collected included, ethnic group, education level, and household income, based on definitions taken from the New Zealand Census 2001.[24] Ethnicity was subsequently categorised as New Zealand European (which included New Zealand European and other European groups), and 'Others' group which, due to small numbers, included Māori and Pacific Islanders as well as Chinese and Indian ethnic groups.

Education was grouped as 'high school' level, 'tertiary', which includes any tertiary education program such as a certificate, diploma or incomplete degree and 'post-graduate'. Information on household income per year was collected in the follow categories: $1–5,000/$5,001–10,000/$10,001–15,000/$15,001–20,000/$20,001-$25,001/25,001–30,000/$30,001–40,000/$40,001–50,000/$50,001–70,000/$70,001–100,000 and $100,001+.

For the analyses, due to the majority of participants being in the highest income group, the income bands were reclassified into the following three groups: less than $70,000 (low income), $70,000 to 100,000 (medium income) and more than $100,000 (high income). The participants were asked their date of birth with the age bands created being based on the data: 16–25 years, 26–30 years, 31–35 years and 36+ years age group.

Questions relating to oral care practices, including use of floss and mouth care products, frequency of brushing and visits to a dentist (both prior to and during pregnancy), and the presence of dental problems during pregnancy were included, based on questions that had previously been validated in other international studies.[13–16,25–28] Additional information was sought on changes to eating habits during pregnancy.

Questions on sources/content of dental health information were developed specifically for use in the current study. Women were asked if they had received any information on dental health during their pregnancy, what the information was about (care of gums and teeth, dietary advice, use of fluorides, oral diseases and early childhood oral health) and who provided the information, such as a dentist, dental healthcare worker, Lead Maternity Carer (LMC) (a health professional who may be a midwife, general practitioner (GP) or obstetrician and is responsible for providing or organising a woman's maternity care including throughout the pregnancy, birth and the post-natal period), or other sources (media/internet/books).

The questionnaire was piloted and refined prior to the final version used for the survey. Ethical approval for this study was obtained from the Massey University Human Ethics Committee.

Analyses—All data was entered on Microsoft Access and analysed using STATA software package. Descriptive analysis, such as chi-squared tests and t-tests were used to investigate differences in knowledge/behaviour between the sociodemographic groups. Multivariable logistic regression was used to compare the prevalence of various risk factors between these groups, controlling for potential confounding variables, i.e. one or more of ethnicity, income, age and SES. To investigate the effect of confounding, the models were built adding in one variable at a time.

Results

Description of the sample—A total of 730 questionnaires were handed out to pregnant women at 69 antenatal classes and 405 questionnaires were completed, a response rate of 55.4%. New Zealand European made up 79.2% of the study population with the remaining 19.7% 'Others' ethnic group comprising 8.8% Māori, 1.9% Pacific and 8.6% Indian/ Chinese/other. Over half of the participants had a tertiary education (57.7%), and most of the sample studied had a high income (with NZ$100,001 or more annual income). The majority of women in the study were over 30 years of age (Table 1).

Dental visiting—About half of the women reported seeing their dentist at least once a year prior to pregnancy (Table 2). This was more common among New Zealand European, women with a higher education and income; and older women. A total of 23.2% of the women saw the dentist just when they had problems and this was more

common among ‘Others’, lower education and income; and younger women. However, just 32.3% of women reported seeing a dentist during their current pregnancy. Women with higher income/education level, those who were older; and New Zealand European were all more likely to have visited a dentist during their pregnancy.

Table 1. Demographics of the 405 pregnant women who completed the survey

Variables	N (%)
Age	
16–25	46 (11.3)
26–30	111 (27.4)
31–35	140 (34.4)
36+	108 (26.6)
Ethnicity	
New Zealand European	321 (79.2)
Māori	36 (8.8)
Pacific	8 (1.9)
Others	3.5 (8.6)
Not stated	5 (1.2)
Education	
High school	47 (11.6)
Tertiary	234 (57.7)
Postgraduate	118 (29.1)
Not stated	6 (1.4)
Household income ($NZ/year)	
<70,000	52 (12.8)
70,001–100,000	94 (23.2)
100,001–or more	214 (52.8)
Not stated	45 (11.1)

Table 2. Dental visits pre and during pregnancy

Variables	Normally see a dentist once/year N (%)	Normally see a dentist symptoms related N (%)	Have seen a dentist during pregnancy N (%)
Ethnicity			
NZ European	168 (52.2)	72 (22.4)	108 (33.6)
Others	33 (41.7)	22 (27.8)	18 (22.7)
Education			
Postgraduate	67 (56.7)	21 (17.8)	39 (33)
Tertiary	112 (47.8)	57 (24.3)	72 (30.7)
High School	22 (46.7)	16 (34)	15 (31.9)
Income ($NZ/year)			
100,000 or more	121 (56.5)	39 (18.2)	18 (40)
70–100,000	44 (46.7)	26 (27.6)	31 (32.9)
Less than 70,000	16 (30.7)	21 (40.3)	11 (21.1)

Age (years)			
16–25	15 (32.5)	21 (45.6)	12 (26)
26–30	59 (53.1)	32 (28.8)	33 (29.7)
31–35	70 (50)	23 (16.4)	39 (27.8)
36 +	62 (57.3)	18 (16.6)	47 (43.5)
All combined	206 (50.8)	94 (23.2)	131 (32.3)

Women were asked why they did not see a dentist (information not shown in table). The main reasons given were being unaware that they needed to see a dentist (37%), cost (18.7%) and believing it was not recommended to see a dentist when pregnant (14.5%). Nearly 5% of women expressed fear of dentists as being the primary reason for not seeing a dentist during pregnancy. Not seeing a dentist for economic reasons was more common among 'Other' women (27.8%), compared to New Zealand European women (16.5%); women with lower education (29.7%) compared to those with a higher education level (11.8%); those of lower income (42.3%) compared to a higher income level (11.2%); and younger (45.6%) compared to older (12%) women.

Oral health care—Table 3 presents information on the oral health care practices of women in the study. In general, women presented with good oral hygiene habits, with most brushing their teeth twice or more a day and approximately 20% flossing daily.

Forty-two percent of women reported increased sugar consumption during their pregnancy, which was more common among New Zealand European, young, medium income women; and those with up to high school education. Bleeding gums was the main problem reported during pregnancy (60%) by all women, followed by sensitive teeth (15%), toothaches (5.4%) and cavities (5.1%). There was no difference between sociodemographic groups for these outcomes.

Table 3. Oral health care practices and changes during pregnancy

Variables	Brush twice or more/day N (%)	Floss once/day N (%)	Use mouth rinse N (%)	Eating more sugar N (%)	Bleeding gums N (%)
Ethnicity					
NZ European	264 (82.5)	48 (15)	95 (29.6)	139 (43.3)	197 (61.3)
Others	64 (82)	17 (21.7)	21 (26.5)	33 (41.4)	48 (60.7)
Education					
Postgraduate	102 (86.4)	22 (18.6)	31 (26.2)	51 (43.2)	78 (66.1)
Tertiary	192 (82.7)	36 (15.5)	70 (29.9)	97 (41.1)	139 (59.4)
High school	33 (70.2)	7 (14.8)	15 (31.9)	24 (51)	27 (57.4)
Income ($NZ/year)					
100,000 or more	182 (85.4)	38 (17.8)	64 (29.9)	97 (45.3)	133 (62.1)
70–100,000	72 (77.4)	14 (15)	30 (31.9)	41 (43.6)	61 (64.8)
Less than 70,000	40 (76.9)	7 (13.4)	13 (25)	24 (46.1)	30 (57.6)
Age (years)					
16–25	37 (80.4)	9 (19.5)	14 (30.4)	15 (32.6)	26 (56.5)
26–30	87 (79.8)	11 (10)	25 (22.5)	47 (42.3)	63 (56.7)
31–35	115 (82.1)	24 (17.1)	46 (32.8)	61 (43.5)	93 (66.4)
36+	94 (87)	22 (20.3)	34 (31.7)	51 (47.2)	65 (60.1)
All combined	333 (82.6)	66 (16.3)	119 (29.4)	174 (42.9)	247 (60.9)

Oral health information—The majority of women reported receiving no oral health information during their pregnancy (53.3%). For the women who did access some information, the most common source was 'media' (23.4%), being mainly pregnancy books, folders, pamphlets and the internet. New Zealand European women, older women and those with a higher education and medium-high income level were more likely to receive information from dental health workers about dental hygiene than other groups. Women belonging to the 'Others' ethnic group, younger women and those with lower education were more likely to report that they received information from their LMC about diet (Table 4).

Table 4. Source and content of oral health information received during pregnancy

Variables	Info about dental hygiene N (%)	Info about diet N (%)	Info from dental workers N (%)	Info from LMCs[(a)] N (%)	Info from media N (%)
Ethnicity					
NZ European	68 (21.1)	44 (13.7)	49 (15.2)	36 (11.2)	85 (26.4)
Others	14 (17.7)	15 (18.9)	8 (10.1)	15 (18.9)	9 (11.3)
Education					
Postgraduate	29 (24.5)	17 (14.4)	19 (16.1)	11 (9.3)	39 (33)
Tertiary	45 (19.2)	31 (13.2)	32 (13.6)	27 (11.5)	51 (21.7)
High school	8 (17)	11 (23.4)	6 (12.7)	13 (27.6)	4 (8.5)
Income ($NZ/year)					
100,000 or more	44 (20.5)	33 (15.4)	29 (13.5)	30 (14)	47 (21.9)
70–100,000	23 (24.4)	7 (7.4)	15 (15.9)	8 (8.5)	34 (36.1)
Less than 70,000	6 (11.5)	9 (17.3)	7 (13.4)	6 (11.5)	8 (15.3)
Age					
16–25	9 (19.5)	9 (19.5)	5 (10.8)	6 (13)	7 (15.2)
26–30	22 (19.8)	16 (14.4)	15 (13.5)	14 (12.6)	21 (18.9)
31–35	21 (15)	17 (12.1)	14 (10)	15 (10.7)	44 (31.4)
36 +	30 (27.7)	17 (15.7)	23 (21.3)	16 (14.8)	23 (21.3)
All combined	82 (20.2)	59 (14.5)	57 (14)	51 (12.5)	95 (23.4)

(a) LMC: Lead Maternity Carer

Multivariable analysis—Table 5 shows the multivariable analysis (unadjusted and adjusted) for women who reported seeing a dentist or needing to see a dentist during pregnancy. Expectant mothers who reported visiting the dentist during pregnancy were more likely to be New Zealand European, older and have a higher education level and higher income, although few of these associations reached conventional levels of statistical significance.

The final model was adjusted for ethnicity, education, income and age. Each of the observed effects were marginally attenuated following adjustment, but in general, the effect of ethnicity was independent of other factors, and the effect of income was independent of education.

It is interesting to note that the older the woman, the more likely she was to have visited a dentist. Women belonging to 'Others' ethnicity group, with lower education and income were more likely to state that they needed to see a dentist than their peers.

Table 5. Odds ratio (OR) and 95%CI for women who reported seeing a dentist during pregnancy and for women reported needing to see a dentist during pregnancy by ethnicity, education, income, and age (adjusted for ethnicity, education, income and age)*

Variables	Visited dentist N (%)	Visited dentist OR(95%CI)	Visited dentist OR(95%CI)*	Need dentist N (%)	Need dentist OR(95%CI)	Need dentist OR(95%CI)*
Ethnicity						
NZ European	108 (33.6%)	1	1	48 (14.9%)	1	1
Others	18 (22.7%)	0.58 (0.32-1.03)	0.64 (0.33-1.24)	12 (15.1%)	1.01 (0.51-2.02)	1.17 (0.55-2.52)
Education						
Postgraduate	39 (33%)	1	1	16 (13.5%)	1	1
Tertiary	72 (30.7%)	0.9 (0.56-1.44)	1.01 (0.60-1.68)	36 (15.3%)	1.15 (0.61-2.18)	0.96 (0.48-1.89)
High school	15 (31.9%)	0.94 (0.46-1.95)	0.89 (0.39-2.01)	8 (17%)	1.30 (0.51-3.29)	1.05 (0.38-2.93)
Income ($NZ/year)						
100,000 or more	71 (33.1%)	1	1	27 (12.6%)	1	1
70–100,000	31 (32.9%)	0.99(0.59- 1.65)	1.01 (0.59-1.73)	15 (15.9%)	1.31 (0.66-2.60)	1.39 (0.68-2.81)
less than 70,000	11 (21.15%)	0.54 (0.26-1.11)	0.60 (0.26-1.36)	12 (23%)	2.07 (0.97-4.44)	2.55 (1.08-5.99)
Age (years)						
16–25	12 (26%)	1	1	8 (17.3%)	1	1
26–30	33 (29.7%)	1.19 (0.55-2.59)	1.13 (0.41-3.08)	15 (13.5%)	0.74 (0.29-1.89)	1.46 (0.43-4.87)
31–35	39 (27.8%)	1.09 (0.51-2.32)	1.16 (0.42-3.16)	20 (14.2%)	0.79 (0.32-1.94)	1.54 (0.46-5.16)
36+	47 (43.5%)	2.18 (1.02-4.66)	1.95 (0.71-5.31)	20 (18.5%)	1.07 (0.43-2.66)	2.25 (0.68-7.49)

Adjusted columns are flagged with*

Income showed a stronger effect following adjustment with low income women being over two and a half times (OR 2.55, 95%CI 1.08-5.99) more likely to report the need to see a dentist than high income women.

Additionally, the age adjusted results were strongly affected by income with older women being more than twice as likely (OR 2.25, 95%CI 0.68-7.49) and women of the intermediary age groups: 31-35 years (OR 1.54, 95%CI 0.46-5.16) and 26-30 years (OR 1.46, 95%CI 0.43-4.87) to report the need to see a dentist than women in the youngest age group (Table 5).

The multivariable analyses for women who reported accessing oral health information during pregnancy are presented in table 6. For the unadjusted analyses, women belonging to 'Others' ethnicity group (OR 0.45, 95% CI 0.27-0.77), women from the low income group (OR 0.41, 95% CI 0.21-0.81), were less likely to have accessed oral health information during pregnancy compared to New Zealand European and women from the high income group respectively.

Women between 26-30 years old (OR 2.32, 95%CI 1.13-4.79), and over 36 years (OR 3.54, 95%CI 1.67-7.51) were significantly more likely to have accessed oral health information than younger women. Having recently visited the dentist was associated with having accessed oral health information during pregnancy (OR 2.16, 95% CI 1.35-3.45).

In the adjusted model, all the effects were attenuated except for those associations for 'Others' (OR 0.38, 95% CI 0.15-0.91) and low income groups (OR 0.27, 95% CI 0.10-0.76) which remained statistically significant. Both older women (over 36 years old) and those who had visited a dentist less than one year ago were more likely to have accessed oral health information but these associations were not statistically significant.

Table 6. Odds ratio (OR) and 95% CI for access to oral health information by ethnicity, education, income, age, hygiene practices, and visits to the dentist (adjusted for ethnicity, education, income and age)*.

Variables	N (%)	OR (95% CI)	OR (95%CI)*
Ethnicity			
NZ European	160 (50.3)	1	1
Others	25 (31.6)	0.45 (0.27-0.77)	0.38 (0.15-0.91)
Education			
Postgraduate	62 (52.5)	1	1
Tertiary	102 (43.9)	0.7 (0.45-1.10)	0.99 (0.45-2.20)
High school	21 (45.6)	0.75 (0.38-1.50)	1.16 (0.31-4.30)
Income ($NZ/year)			
100,000 or more	98 (46.8)	1	1
70-100,000	54 (57.4)	1.52 (0.93-2.49)	1.91 (0.77-4.75)
less than 70,000	14 (26.9)	0.41 (0.21-0.81)	0.27 (0.10-0.76)
Age			
16-25 years	13 (28.2)	1	1
26-30 years	46 (41.8)	1.82 (0.86-3.84)	0.97 (0.19-4.88)
31-35 years	67 (47.8)	2.32 (1.13-4.79)	0.69 (0.14-3.42)
36+ years	60 (58.2)	3.54 (1.67-7.51)	1.71 (0.31-9.20)

Brush teeth			
Twice or more/day	160 (48.7)	1	1
Once a day	26 (38.8)	0.66 (0.38-1.13)	0.52 (0.20-1.34)
Floss teeth			
No	35 (35)	1	1
Yes	151 (50.8)	1.92 (1.20-3.07)	1.32 (0.54-3.22)
Last visit to the dentist			
2 years or more	42 (34.7)	1	1
1 year ago	38 (47.5)	1.70 (0.95-3.02)	2.06 (0.73-5.76)
Less than 1 year ago	106 (46.6)	2.16 (1.35-3.45)	2.27 (0.81-6.37)

Adjusted columns are flagged with*

Discussion

This study found that most of the women had good oral hygiene habits. However, a significant proportion of women had symptoms of periodontal disease, with over 60% reporting bleeding gums. A third of women had attended a dental appointment during pregnancy, and this was more frequent among New Zealand European women.

Women from lower income households were significantly more likely to report the need to see a dentist. About half of the women had not received any information about dental health during their pregnancy. Women who had access to oral health information were typically New Zealand European, older, with high income and education levels. However, given the response rate and the composition of the majority of the study population who were older, of higher income and education level and predominantly New Zealand European women, we are mindful that the study findings may not be representative of first-time mothers from the Wellington region.

Women's oral hygiene practices did not change during pregnancy. About 50% of women reported visits to the dentist of once a year or less, when not pregnant, while the other half reported seeing a dentist only when they had a problem. This is consistent with previous New Zealand studies that have reported about half of the sample population as routine users of the dental health system, while the other half normally see the dentist or any other healthcare worker, only if there is a problem.[29]

One study found that minority ethnic groups including Pacific, Māori and Asian populations were significantly more likely to visit an oral health care worker only when they had toothache, and were more likely to have had a tooth removed.[19]

Only a third (32%) of women had seen a dentist or other dental health care worker during pregnancy. This finding is similar to other studies for example, 30% in Australia,[16] a range of 25-50% in US studies,[13,25,26,30] and 32% in an UK study.[15]

In our study, women who went to the dentist during pregnancy were mostly New Zealand European with high income and education levels. International studies have found that older, married, white women, with higher household incomes, higher education levels and insurance cover, were more likely to go to the dentist during pregnancy.[25,26,30]

International data also confirms that, women who visited the dentist in the previous year were more likely to have access to oral health information.[13,30] Being aware of

the possible connection between oral health and pregnancy outcomes were also associated with an increased frequency of dental visits during pregnancy.[13]

Several reasons for not seeing a dentist were given in the current study. The most frequent reason given was that it was not considered necessary, followed by the high cost of visiting a dentist and the perception that visiting a dentist while pregnant was not recommended. The economic reasons for not seeing the dentist are expected, because in New Zealand adults rely essentially on private dental care. There are some services and benefits relating to dental care assistance for low income people, but they are basically for emergency procedures only. There is a need for preventive oral services for the adult population, specifically for pregnant women and that should be considered in future strategies and policies. However, better knowledge and awareness about the importance and benefits of utilising dental services during pregnancy is necessary in a global context.

Even when dental care for pregnant women is funded by the government, such as in the UK, the number of women who see a dentist during pregnancy in the studies reviewed was still small.[15]

The main oral health problems reported by women during pregnancy were bleeding gums (60%). Similar findings were found in an Australian study where 59.5% of women stated that they had had gums which hurt and/or had bled at some stage during the previous 12 months.

The study concluded that women with less education and lower socio-economic status had an increased risk of poor periodontal health and were less knowledgeable about oral health and dental health than women from higher educational and socio-economic backgrounds.[16] Bleeding gums is normally one of the first signs of gingivitis and can progress to periodontitis.

Both diseases are relatively common among pregnant women, but there is a need to increase awareness of gingival oral health as evidence shows that periodontal disease can be associated with birth outcomes such as low birth weight, preterm birth and pre-eclampsia.[3 6-8]

Overseas studies have reported that women from lower social classes, as well as women from ethnic minorities, have little or no exposure to information regarding the importance of preventive oral health practices during pregnancy and early childhood.[27] In the current study, women who sought out oral health information were typically New Zealand European, with high income and education, as might be expected since this demographic group are in a better position to negotiate their way through the health care system and access information thus creating an advantage over those who do not have the resources or are less experienced in dealing successfully with the health care system.

Additionally, healthy literacy is an area that has gained more importance recently and should be further developed particularly for less privileged pregnant women in New Zealand.[31]

There is a lack of integration between dentistry and other health professionals, including those specifically involved in providing maternity services. The vast majority of women in New Zealand receive antenatal care from a midwife or

obstetrician and will usually attend antenatal classes for at least a first time pregnancy. Thus, LMCs are in a strategic position to provide information to pregnant women regarding oral health.

Pregnant women are often receptive to information and very amendable to changing their lifestyle habits to benefit the baby. Women should be advised that it is safe to have routine dental treatment during pregnancy, and that frequent professional cleaning to remove plaque and irritants that contribute to dental problems is beneficial to potential both the women and foetus.

The main dietary advice in relation to oral health is to reduce sugar consumption and drink fluoridated water which can be easily incorporated and reinforced with other general diet recommendations provided to pregnant women. Diets rich in sugar also contribute to microorganism colonisation on the mother's mouth which can potentially be transmitted to the foetus and increase the risk of future dental decay in the child.[32] High levels of dental caries in childhood predict greater oral health disease levels in adulthood, even when other factors, such as hygiene and diet are taken into account.[21]

There are several limitations to the study. The study sample was limited to the number of women who participated in the selected antenatal classes in the Wellington region. The women were, in the majority, New Zealand European, around 30 years old, with high income and education.

Although this is not representative of the population of pregnant women in this region, these characteristics seem to be common among women that seek antenatal care/education during pregnancy. Studies show that privileged women are the group most likely to attend antenatal classes.[33] In addition, the practices of different population groups have to be considered.[34] For Pacific women, for example, their families attend to their antenatal care needs, and so may not necessarily attend formal antenatal classes. This could be reflected in the low number of Pacific people that took part in this research.

No data was collected from non-respondents, and the non-response could bias the reported study results. From the patterns identified in this study, it is likely that the need for oral health is greater than we report here. The non-response group (44.6%) would ideally require further investigation as these could differ in ethnicity and socio-economic distribution from the respondents. However, the non-response is unlikely to have affected the response associations between sociodemographic groups and oral health practices. Other New Zealand studies have shown that low adult SES has a significant effect on poor adult dental health and that there are oral health inequalities.[35,36]

Conclusions—Although more than half of the women who took part in the study reported bleeding gums, only a third of them had attended a dental appointment during pregnancy. The level of access to oral health information was higher among New Zealand European women from a high income household.

Women who visited the dentist during pregnancy were more likely to receive information on dental health. Women from low income households were significantly more likely to report the need to see a dentist. Improving access to oral health care

and information during pregnancy can lead to better oral health for women and better oral health outcomes for children.

Recommendations—This study identifies that attention to pregnant women's oral health in New Zealand is needed. There is a need to increase access to oral health services for pregnant women, especially for minority ethnic and low SES groups. Improving oral health could be achieved through public policies and strategies that integrate dental health workers and LMCs to assist women with their oral health during pregnancy, particularly through distribution of adequate information and encouragement of preventive measures.

Competing interests: None.

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Impact of the human papillomavirus (HPV) vaccine on genital wart diagnoses at Auckland Sexual Health Services

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Abstract

Aim To review cases of genital warts diagnosed at Auckland Sexual Health Service (ASHS) and to document any change following the introduction of the human papillomavirus (HPV) vaccination. The national HPV immunisation programme, using the quadrivalent vaccine Gardasil, commenced on 1 September 2008. The publically funded programme provides for the ongoing vaccination of girls in year 8 with an initial catch-up programme for young women born after 1 January 1990 until the end of 2010. Monitoring rates of diagnosis of genital warts should provide the earliest clinical indicator of a population response to the vaccine.

Method The proportion of new clients attending ASHS who were diagnosed with genital warts from 1 January 2007 to 31 December 2008 was compared to the proportion diagnosed from 1 January 2009 to 30 June 2010.

Results 40,793 new clients attended the ASHS between 2007 and June 2010 and genital warts were diagnosed in 3125 (7.7%). Genital warts were diagnosed in 9.2% of new clients in 2007 decreasing to 6.6% for the first 6 months of 2010. Analysis of the subgroup of clients under the age of 20 years, found genital warts in males decreased from 11.5% in 2007 to 6.9% in 2010 while in females the rates decreased from 13.7% to 5.1% over the same time period. In comparison, the rates decreased from 7.5% in 2007 to 5.9% in 2010 for females aged 20 years and over. Thus there was evidence of a significant difference, in the pre to post vaccination era, in the proportion of female clinic visits for genital warts in those aged less than 20 years and those aged 21 years or older (p=0.02) and further a borderline significant difference for males aged less than 20 years (p=0.05).

Conclusion A significant decline in the incidence of genital warts in the target population suggests an early response to the HPV vaccination programme with some evidence of an effect for males aged less than 20 years.

There are approximately 40 different genotypes of the Human Papilloma Virus (HPV) that can be found in the genital tract. The high risk oncogenic types 16 and 18 account for about 70% of all types found in cervical cancer.[1]

Types 6 and 11 are the cause of more than 90% of genital warts and co-infection with high risk types is common.[2] It is expected that a vaccine providing protection against types 16 and 18 will have the potential to reduce the impact of cervical cancer in New Zealand (NZ) and it has been called the single most important advance in the prevention of cervical cancer since the introduction of cervical cytology.[3]

Both the bivalent vaccine Cervarix® which protects against types 16 and 18 and the quadrivalent vaccine Gardasil® providing protection from HPV types 6, 11, 16 and 18

are licensed in NZ and were options for the NZ vaccination programme. Governments in Australia and the United Kingdom have opted to utilise the quadrivalent and bivalent vaccines, respectively, in their own HPV vaccination programmes, while the NZ Ministry of Health has selected the quadrivalent vaccination for use here in NZ.

Genital warts are the exophytic lesions of anogenital epithelium that develop following infection with genital HPV types, mostly 6 and 11.[2] Rates of infection are high following the initiation of sexual activity, even with the first ever sexual partner.[4]

The self-reported cumulative incidence of genital warts from members of the Dunedin Multidisciplinary Health and Development Study by age 21 years was 6.9 % for females and 4.7% for males.[5] A diagnosis of genital warts was associated with significantly higher levels of distress, anxiety and depression in a UK study.[6] Current treatments which utilise a range of local destructive methods or immunological therapy can cause significant discomfort and may necessitate frequent health provider visits over a prolonged period of time.

While rare (4 per 100,000), recurrent respiratory papillomatosis in infancy is a condition associated with high morbidity and results from vertical transmission of HPV types 6 and 11.[5,7,8] Potentially, with an ongoing vaccination programme that includes protection against HPV types 6 and 11, this could become a vaccine preventable disease.[7,8]

The impact of a quadrivalent HPV vaccination programme on incident HPV-related disease should be seen first in the changing rates of genital wart diagnoses rather than decreases in cervical cancer rates, as the time to development of genital warts after infection with HPV types 6/11 is a matter of months rather than years or even decades.[8] Thus, the incidence of genital warts could decrease quite rapidly following the introduction of a national immunisation programme if vaccination rates are high enough.[7]

Our aim was to determine if rates of diagnosis of genital warts had changed at Auckland Sexual Health Service (ASHS) following the introduction of the NZ national HPV immunisation programme.

Method

A retrospective review was undertaken examining the proportion of new clients attending the ASHS who were diagnosed with genital warts between 1st January 2007 and 30th June 2010. The ASHS is a regional service covering a large, urban, multicultural population. It covers three district health boards (DHBs) namely Auckland, Waitemata and Counties Manukau and operates four clinics across Auckland in north, south, west and central Auckland. Patients access these clinics by self referral or referral from other health providers and services are free of charge.

Genital warts are not a notifiable infection in NZ but clinicians at the ASHS routinely enter a diagnosis code for new clients or a new diagnosis in a patient seen previously by the service. Demographic data is routinely collected for all new clients.

The NZ HPV immunisation programme using the quadrivalent HPV vaccine was started on the 1st September 2008 with the school-based arm of the vaccination programme commencing in February 2009. The publically funded programme targets girls in year 8 of school (approximate ages 11–12 years) with an initial catch up programme until the end of 2010 for young women born on or after 1 January 1990, that is up to the age of 20 years.

The vaccine is offered free of charge through general practitioners and community immunisation groups in addition to the school-based programmes. There is no publically funded vaccination programme for boys although it is possible for males to purchase the vaccine privately, with the

manufacturers recommending use between the ages of 9 through to 15 years. Data on vaccination coverage was obtained from the HPV programme coordinator, Auckland District Health Board (ADHB).

The cumulative HPV vaccination coverage per DHB of young women from 1 September 2008 through to 30 June 2010 by year of birth:

- 1997 cohort: Auckland 20%, Counties Manukau 20%, Waitemata 17%.
- 1992–1996 cohort: Auckland 25%, Counties Manukau 32%, Waitemata 20%.
- 1990–1991 cohort: Auckland 38%, Counties Manukau 32%, Waitemata 33%.

The denominator for estimating percentage coverage is the estimated eligible population. Data from the first year of the school-based vaccination programme show that for the Auckland DHB alone, 51.7% of eligible students (enrolled in years 8, 12 and 13) were vaccinated by the end of the school year in 2009. Data from the other two DHBs for the school-based programme was not available.

Statistical analysis was performed with SAS (version 9.2) software. A Poisson regression was run including an age category, month of visit and a variable indicating whether the time was pre or post vaccine introduction in the model. The outcome was the number of first-visits diagnoses of genital warts within these subcategories with the log of the total number of first clinic visits in the sub category included as an offset.

To overcome the changing age of the women who would have been eligible for vaccination those aged between 20 and 21 years of age at the time of their visit were not included in the analysis, as some but not all of these women would have been eligible to receive the vaccine.

Although the vaccine was introduced on 1 September 2008 the time cut off point for pre and post vaccine was taken as the end of 2008 as few women could have had full protection for the vaccine prior to this time. This model was run separately for females and males to see if any change observed in females was reflected in male rates.

Results

Over the time period from 1 January 2007 to 30 June 2010, 40,793 new clients attended the ASHS and genital warts were diagnosed in 3125 (7.7%). The number of clients diagnosed with genital warts by year is shown in Table 1 and the risk ratios for genital wart diagnoses per quarter for two time periods, pre and post HPV immunisation programme with the time division being the end of 2008 is shown in Table 2.

Table 1. Number and percentage of first-visit clients diagnosed with genital warts by year and for the first six months of 2010

Variables	2007 Number (%)	2008 Number (%)	2009 Number (%)	2010 (6 months) Number (%)
All	917 (9.2)	897 (7.6)	876 (7.0)	435 (6.6)
Male	491 (9.6)	461 (7.7)	488 (7.8)	241 (7.7)
Female	426 (8.7)	436 (7.6)	388 (6.2)	194 (5.7)
Female >20 years	292 (7.5)	282 (6.2)	255 (5.4)	152 (5.9)
Female <20 years	134 (13.7)	154 (12.5)	133 (8.5)	42 (5.1)
Male >20 years	450 (9.5)	413 (7.5)	439 (7.6)	227 (7.7)
Male <20 years	41 (11.5)	48 (10.4	49 (10.2)	14 (6.9)
Number of clients	9988	11751	12493	6561

Table 2. Comparison of the change in risk ratios per quarter in the pre and post vaccine time periods between the two age groups: <20 and >21 years of age

Variables	Risk ratio Pre vaccine	Risk ratio Post vaccine	P value
Female <20 years	0.98 (0.93–1.02)	0.87 (0.82–0.93)	0.02
Female >21 years	0.95 (0.92–0.99)	0.98 (0.94–1.03)	
Male <20 years	1.02 (0.94–1.10)	0.91 (0.82–1.02)	0.05
Male >21 years	0.96 (0.93–0.98)	1.02 (0.99–1.06)	

The data in Table 1 illustrates a clear reduction in the percentage of first-visit female clients aged less than 20 years diagnosed with genital warts from pre to post vaccine time periods. There was a similar but smaller reduction in the percentage of males aged less than 20 years over the same time period.

There was a significant (p=0.02) reduction in the change in risk ratios per quarter pre and post vaccination for women aged less than 20 compared to those aged over 21 years, and there was a borderline significant (p=0.05) reduction for males in the same age groups. See Figures 1 and 2.

Figure 1. Proportion of genital wart diagnoses per first visit over time in months from 1 January 2007 for females

(Categories: 1 and 3 pre and post vaccine <20 years; 2 and 4 pre and post vaccine >21 years; *Proportions predicted from the Poisson model)

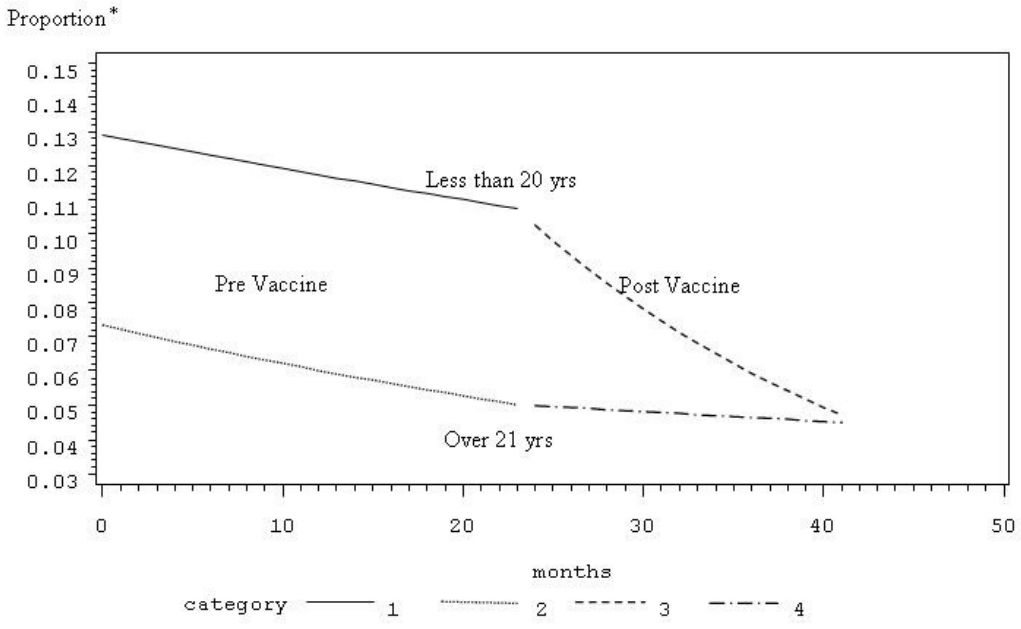
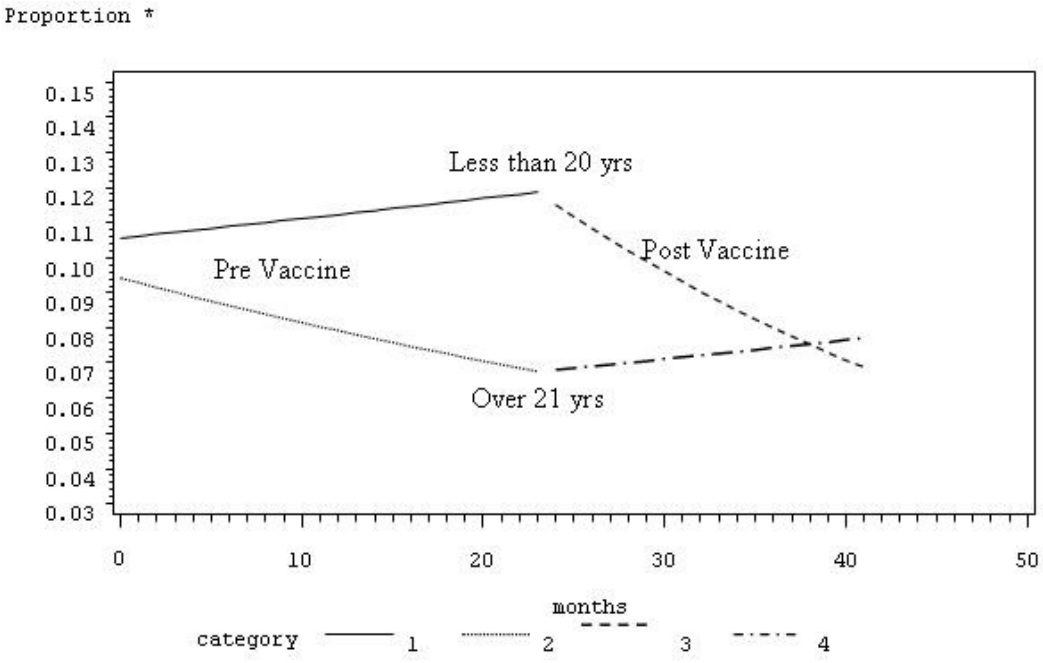


Figure 2. Proportion of genital wart diagnoses per first visit over time in months from 01/01/2007 for males
(Categories: 1 and 3 pre and post vaccine <20 years; 2 and 4 pre and post vaccine >21 years; *Proportions predicted from the Poisson model)



Discussion

These findings suggest an early response to the HPV immunisation programme, despite the relatively low levels of reported vaccine coverage and provide evidence for the vaccine being effective at a population level in NZ.

The 13% decrease per quarter (RR 0.87), in the proportion of genital warts diagnosed after the commencement of the HPV vaccination for women aged less than 20 years demonstrates a smaller reduction than that observed in Australia. Published data from the Melbourne Sexual Health Centre (MSHC) noted a 25.1% decrease per quarter (30.5% to 19.3%, $p<0.001$) in the proportion of women aged less than 28 years presenting with genital warts to their service, after the introduction of the their HPV vaccination programme.[9]

The Australian HPV publically funded immunisation programme started in April 2007, utilising the quadrivalent vaccine, providing immunisation to 12–13 year old girls in a school-based programme with an initial catch up programme for 13–18 year old young women and free primary care vaccination of women up to the age of 26 years.[10]

Looking at vaccine coverage rates in the school-based programmes of the two countries, in the State of Victoria from the start of the school programme in April

2007 through to the end of the school year in 2007 between 69% to 75% of enrolled school girls were vaccinated in years 7, 10, 11 and 12.[10]

Comparing this to data from the school-based vaccination programme in the Auckland DHB area during the school year in 2009, 51.7% of eligible students (in years 8,12 and 13) were vaccinated. The higher vaccination rate in the State of Victoria may help to explain the highly statistically significant decrease in genital warts seen at MSHC as compared to the more modest reduction seen at the ASHS.

The ASHS data also demonstrates a borderline statistically significant decrease in the proportion of genital warts diagnosed for young men aged less than 20 years. It is possible that some of this decrease is due to young men paying to have the vaccination privately. However the significant costs of this make it unlikely that vaccination would account for the majority of the effect. It is more likely that a decrease in the prevalence of infection for young women is impacting on the incidence in young men, suggesting that sexual coupling is tending to occur predominantly between similar aged cohorts. MSHC data noted a reduction in genital wart diagnosis in heterosexual but not homosexual men,[9]again supporting reduced sexual transmission of HPV as a result of female vaccination.

The current eligibility criteria for funded vaccination in NZ do not provide equitable cover for all people in NZ at increased risk of HPV-related disease. Men who have sex with men (MSM) are at significantly elevated risk of HPV-related anal cancer[11] and are unlikely to receive any substantial herd immunity benefit from the current vaccination programme in NZ. Extending the programme to all boys in year 8 at school is the strategy most likely to provide protection for MSM in NZ as selective vaccination would require young men to identify their sexuality to health care providers preferably before initiation of sexual activity.[12]

The study has several limitations. Firstly, over the time period of the study the number of first visits for young people aged less than 20 years at ASHS increased substantially. However, provided that the characteristics of this client population such as mean age have not changed significantly over the study period then this should not affect the individual risks of having acquired an HPV infection.

An important potential confounding factor to consider is the increased prescribing of topical imiquimod for genital wart treatment since late 2008 with PHARMAC permitting prescribing under special authority. It is possible that this resulted in more people receiving treatment for genital warts in primary care and therefore different referral patterns to ASHS from the community.

This study did not look for changing proportions of self referral versus community referral over the time period, although it is difficult to see how this would preferentially affect a younger client group. If anything it might be expected that genital warts diagnosis would decrease in the older group with more financial resources to seek treatment in primary care. Further the continuing decline in the proportion of clients with genital warts diagnosed from 2009 to 2010 is not explained by the use of imiquimod.

This study only examines data from one sexual health clinic, so it is possible that the results may not be able to be generalised to the whole population, although ASHS being an Auckland regional service does therefore provide a service for

approximately a third of the total NZ population. While genital warts is not a notifiable disease and is usually diagnosed without confirmatory pathology, sexual health clinics routinely collect data on diagnoses and can provide an appropriate site for genital wart surveillance.

The ASHS data suggests that the HPV immunisation programme is having a significant impact on the prevalence of genital warts in young women and to a lesser extent young men in NZ. This would support the continued use of the quadrivalent vaccine and consideration should be given to the funded use for boys to aid in the prevention of other non-cervical HPV-related diseases.

Competing interests: None.

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Terminations of pregnancy associated with isotretinoin use in New Zealand

Peter Moodie, Richard Jaine, Jason Arnold, Scott Metcalfe, Mike Bignall, Bruce Arroll

Abstract

Aims Oral isotretinoin is a highly-effective treatment for severe acne. It is also highly teratogenic. Recently, funded access was widened (from vocationally registered dermatologists only) to include vocationally trained general practitioners and nurse practitioners acting within their scope of practice. This decision has caused some debate. While it is hoped that it will increase access to those living in more deprived areas, there are concerns that there will be an increase in the number of affected pregnancies. This study aims to report on terminations of pregnancy occurring while using isotretinoin in New Zealand.

Method Using NHI numbers, termination of pregnancy admissions were matched to recent isotretinoin prescriptions.

Results This study has revealed that there appears to have been more unintended pregnancies related to isotretinoin use than previously thought. A total of 39 terminations of pregnancy related to isotretinoin use were identified in the year ending June 2008. This gave a crude termination of pregnancy rate of 73 per 10,000 females aged 10–44 years.

Conclusions While there are some limitations to this study, the results are consistent with recent international research suggesting previous pregnancy rates on isotretinoin have been underestimates. Widening funding of isotretinoin will likely increase the absolute numbers of pregnancies but also has the potential to increase relative numbers. As such, it will be vital that primary care is alert to the risks of isotretinoin use and gain experience in its day-to-day usage. Although access has been widened, all requests for funding will now be recorded on a national database (Special Authority database) to enable closer monitoring of isotretinoin usage.

Oral isotretinoin is a highly-effective treatment for severe refractory cystic and conglobate acne that has been available for over 20 years. It is also highly teratogenic. Given that the medication was difficult to use and the risk of teratogenicity, until recently, funded access in New Zealand has been available only for prescriptions written by vocationally registered dermatologists. Despite this funding restriction, other prescribers have always been allowed to issue prescriptions, albeit with a patient having to pay the full direct cost of isotretinoin along with pharmacy markups and dispensing fees. Several other countries, including the United Kingdom and Australia, have similar restrictions.

In April 2009, the agency that manages New Zealand's community pharmaceutical budget, PHARMAC (Pharmaceutical Management Agency), widened funded access to oral isotretinoin such that vocationally trained general practitioners and nurse

practitioners acting within their scope of practice were able to write fully subsidised scripts for their patients.

The main impetus behind this decision was to address the inequities of access present under the funding restriction: those living in more deprived areas and Māori and Pacific people were less likely to access isotretinoin.[1]

Those opposed to widening funding cited several concerns including:

- The lack of expertise by non-dermatologist prescribers in managing isotretinoin;
- The potential increase in pregnancy exposures; and
- Pressure on GPs to prescribe isotretinoin.[2]

In response to these concerns, PHARMAC stated that: GPs would receive training in managing isotretinoin; although there is the potential to increase absolute numbers of affected pregnancies, the proportion of affected pregnancies may not increase; and prescribing pressure may be present for any type of doctor.[2]

Isotretinoin is teratogenic at all therapeutic doses. Malformations—characteristically ear defects, central nervous system defects and/or cardiovascular defects—have been reported following a single dose of the pharmaceutical.[3] Malformation rates for pregnancies that end in birth range from 11% to 30%, with most estimates at the upper end of this range.[4–7]

Most research on the pregnancy rate of women on isotretinoin has been completed in North America. One of the early studies reported a pregnancy rate of 8.8 per 1000 person-years of treatment.[5] Other figures quote a pregnancy rate for women taking isotretinoin of 0.04% in 1989 dropping to 0.02% in 1999.[8] However, given the not insignificant limitations of some of this research (such as self-reported surveys and spontaneous reporting of pregnancies), these rates are expected to be underestimates.[7,9]

A more recent retrospective cohort study found a pregnancy rate of 32.7 per 1000 person-years of treatment: a rate four times greater than what has been previously published.[7] Elective termination of pregnancy rates vary greatly from 36% to 84%.[4–7]

In New Zealand, there is very little data about pregnancy rates while on isotretinoin. An informal voluntary survey undertaken by dermatologists in New Zealand identified approximately 60 at risk pregnancies over a 20-year period (personal communication, 2008).

There is a lack of New Zealand-specific data on this issue and the current international literature (mostly from North America) is unlikely to be generalisable to New Zealand given differences in prescribing restrictions, pharmaceutical costs, pregnancy prevention programmes and overall demographics. As such, this study aims to report on terminations of pregnancy occurring while using isotretinoin in New Zealand.

Methods

Isotretinoin prescription data—Once a funded prescription is dispensed in New Zealand the data is collected in a national repository and available for analysis. In addition to prescriber details, the

medication name, strength, quantity and dosage are recorded, along with an encrypted National Health Index (NHI) number where this is available.

The NHI number is a unique identifier for virtually everybody in New Zealand who has ever had contact with the health service. As previously reported[1] only 60% of isotretinoin prescriptions had an NHI attached (potentially due to the non-routine use of NHI numbers by private specialists).

Prescription data for isotretinoin for the period year ending June 2008 was accessed through PharmHouse. The PharmHouse database is a subset of the New Zealand Health Information Service (NZHIS) database that contains records of all the claims for medicines dispensed within New Zealand.

Termination of pregnancy data—All public hospitals report to the NZHIS on surgical procedures carried out which are recorded as "disease related groups" (DRGs). All terminations of pregnancy carried out in a public hospital are recorded in this way along with an NHI number.

All legal terminations of pregnancy must be reported to the New Zealand Abortion Supervisory Committee. Termination of pregnancy data was obtained for this study for year ending June 2008. Not all records in this database have an NHI number available. By example, in 2008 the Abortion Supervisory Committee identified 18,382 terminations of pregnancy. However, 1592 (or 8.7%) were performed at a private clinic in Auckland and these cases would not have been identified in the NZHIS database. Therefore, no NHI data was available for these women.

Matching datasets—With the available NHI numbers, an attempt was made to match termination of pregnancy admissions obtained with recent (i.e. within the last 6 months) isotretinoin prescriptions using NHI numbers. A prescription within the preceding 6 months was chosen as the period during which a possible link between isotretinoin use and wish to terminate pregnancy could most likely be made. This period takes into account prescription length, one month post medication period, time to awareness of pregnancy and time to organise termination.

Deprivation level—Individuals were assigned the deprivation level of their area of residence based on the New Zealand Deprivation Index (NZDep). The NZDep Index is a population level index based on nine variables recorded on the 2001 New Zealand census.[10]

Analysis—Simple descriptive analysis of isotretinoin prescriptions and terminations of pregnancy by deprivation level were completed. Total number of terminations of pregnancy for those who had been given a prescription of isotretinoin in the preceding 6 months are given.

Ethics—Ethics approval was not sought as this work fits the exception criteria for secondary use of data without consent according to the *Ethical Guidelines for Observational Studies: Observational Research, Audits and Related Activities (2006).*

Results

In the year ending June 2008, there were 27,056 funded isotretinoin prescriptions (approximately 3,000,000 capsules) dispensed. Over the same timeframe, there were 14,793 terminations of pregnancy identified from the databases.

Isotretinoin use was not evenly distributed across the deprivation quintiles (Figure 1). Those from the least deprived quintile are more than twice as likely to access isotretinoin compared with people from the most deprived quintile.

The opposite effect is present when terminations of pregnancy are analysed. There were three times as many terminations of pregnancy performed on individuals from the most deprived areas compared to those living in the least deprived areas (Figure 2).

Figure 1. Isotretinoin prescription rates by deprivation level, year ending June 2008

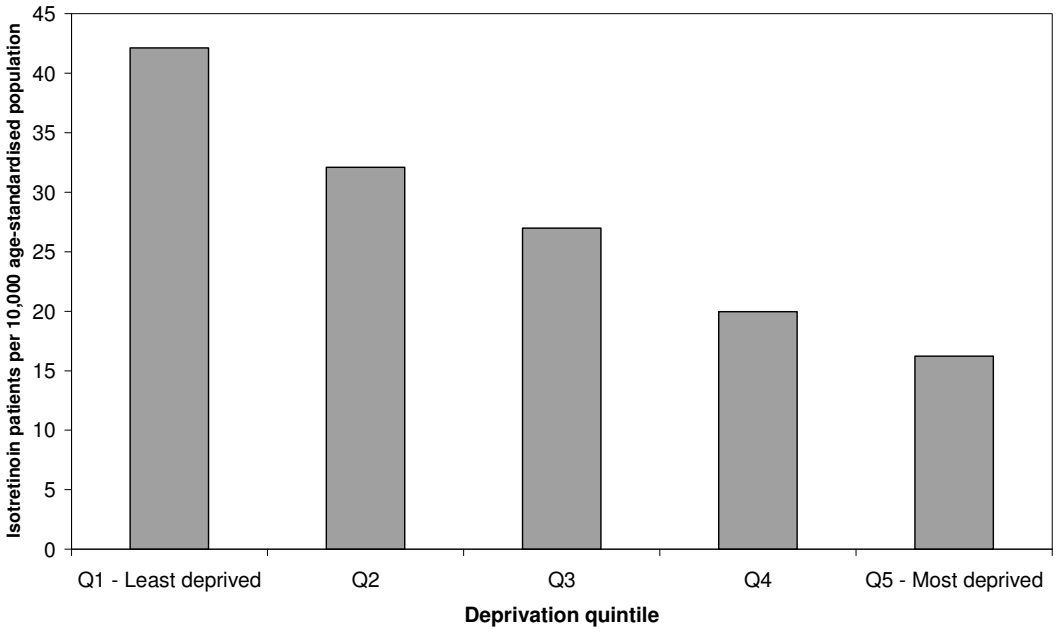
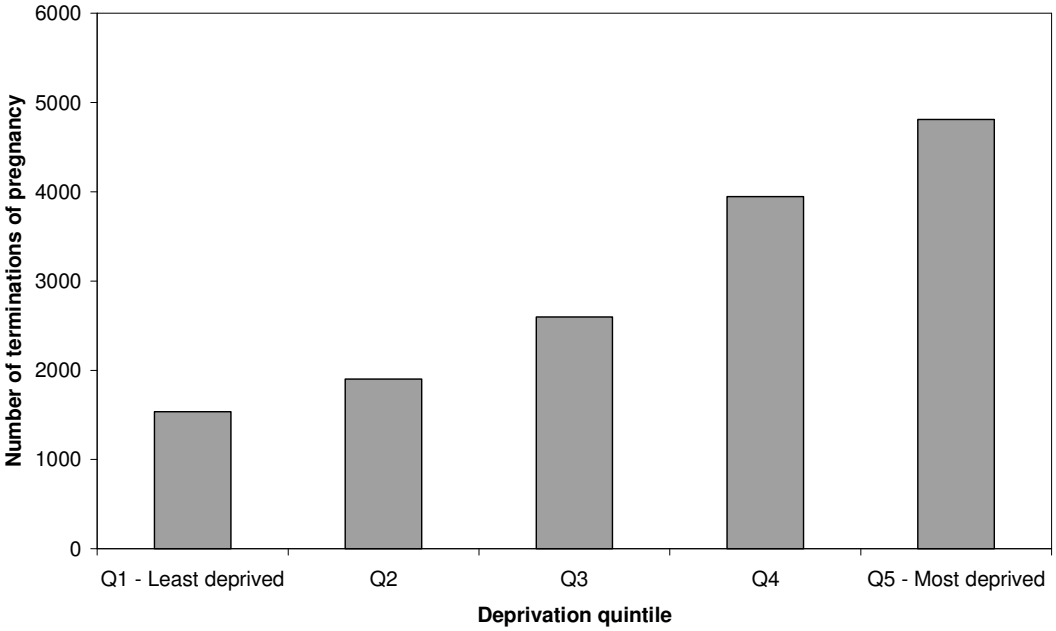
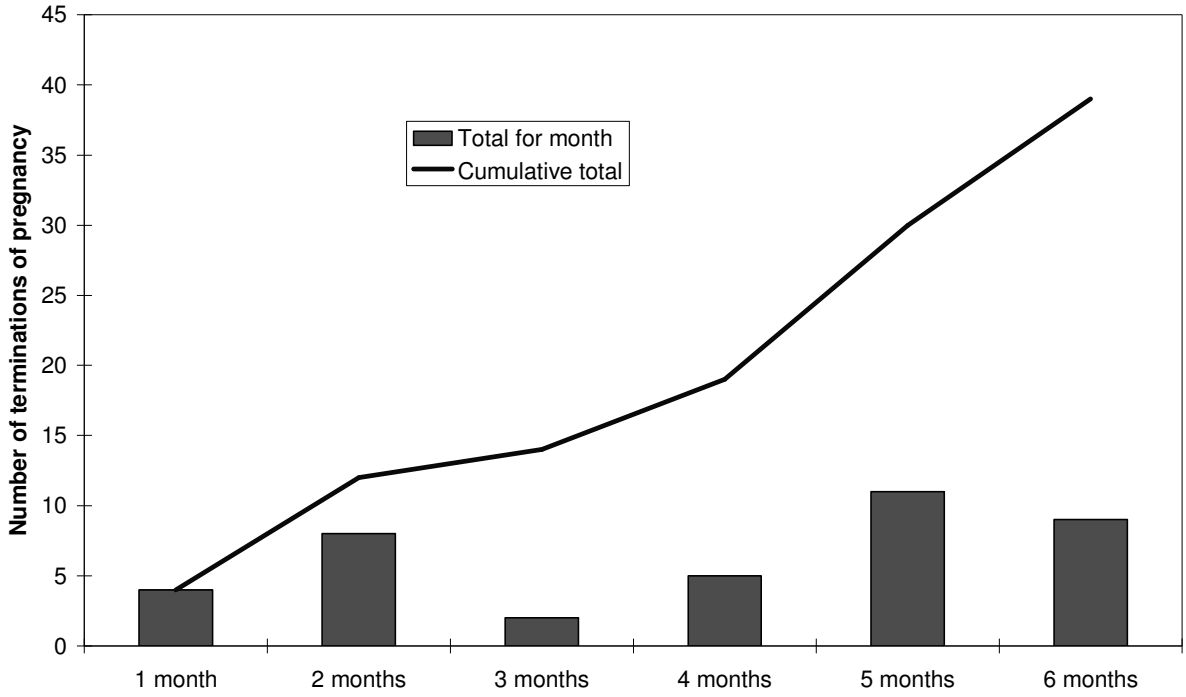


Figure 2. Total number of terminations of pregnancy by deprivation level, year ending June 2008



This study identified 39 patients who had a termination of pregnancy as well as an isotretinoin prescription within the preceding 6 months. This gives a crude termination of pregnancy rate of 73 per 10,000 females aged 10–44 years. The crude termination of pregnancy rate for the total population of females aged 10–44 years is 139 per 10,000. The monthly distribution is shown in Figure 3.

Figure 3. Monthly total and cumulative number of terminations of pregnancy by months following isotretinoin prescription, year ending June 2008



Discussion

This study has identified a far greater number of pregnancies related to isotretinoin use than was previously suspected. A total of 39 terminations of pregnancy were identified where a prescription of isotretinoin had been given in the previous 6 months.

While the termination of pregnancy rate for those taking isotretinoin was approximately half that for the total population, it is still higher than previously assumed. There had been concern that early estimates of pregnancy rates for people using isotretinoin had been significantly underestimated.[7,9]

The results of this study support this concern in the New Zealand setting and are consistent with recent international literature.[7] We suspect that, on an international scale, pregnancy rates while using isotretinoin are far higher than previously recognised.

There are some limitations to this analysis. Both datasets used were incomplete. Forty percent of the isotretinoin prescriptions did not have an NHI number attached, while almost 9% of the termination of pregnancy data did not have an NHI number. However, if the percentage of isotretinoin prescriptions or terminations of pregnancy with NHI numbers increased, it would be expected that there would have been a greater absolute number of terminations of pregnancy associated with isotretinoin use identified. Hence these results are almost certainly an underestimate of the number of at risk pregnancies. It is unknown how an increase in NHI recording would affect the termination of pregnancy rate.

A further limitation of this study is the use of isotretinoin prescriptions in the 6 months preceding a termination of pregnancy. Not all of these pregnancies would necessarily have been at risk and could have occurred later than a month after stopping therapy. It is also possible that terminations may have resulted for other reasons independent of known isotretinoin usage and associated risks of teratogenicity.

This study only examined terminations of pregnancy and does not attempt to identify other pregnancies, such as spontaneous abortions and pregnancies carried through to birth, that may have occurred while using isotretinoin. Given that previous international studies identify that elective terminations of pregnancy account for between 36% and 84% of all pregnancies related to isotretinoin use, this study is very likely an underestimate of the total number of pregnancies occurring while using isotretinoin. There was also no attempt to identify reasons for the terminations of pregnancy.

Given these results, what effect may the widening of funded access to isotretinoin have on the number of pregnancies occurring while using the pharmaceutical? It is expected that widening funding access will increase the total number of people using isotretinoin, particularly those living in the more deprived areas, and potentially Māori and Pacific people.[1]

Further analysis of the termination of pregnancy data showed that those in the most deprived areas were overrepresented in termination of pregnancy figures overall. This suggests that if access is widened such that those in the more deprived areas achieve greater access, there is also a greater risk not only in absolute numbers of pregnancies but also in relative numbers. This will be a very real challenge for primary care providers to ensure that contraception is managed well in this group. However the new decision support mechanism and the GP experience with birth control could potentially reduce the relative pregnancy numbers.

In attempting to effectively manage contraception in those using isotretinoin several countries have implemented risk management approaches.[5,11] These programmes have tended to differ in their complexity and approach used.[11] Unfortunately, there is limited evidence of the effectiveness of some risk management approaches in preventing pregnancies.[11,12]

In New Zealand, current recommendations for starting and maintaining a patient on isotretinoin include: obtaining a current sexual history; giving appropriate advice and information on contraception and the risks of isotretinoin; the use of two forms of contraception; and pregnancy tests prior to initiating and monthly at each prescription.

It will be important to audit or monitor prescribers and their adherence to these recommendations. This will help in assessing the effectiveness of these recommendations and whether further pregnancy prevention approaches would be required.

The funding for isotretinoin was initially restricted due to the potential difficulty in managing this highly teratogenic pharmaceutical. However, given the results of this study, it appears that restricting access may not have prevented unwanted pregnancies as much as had been anticipated. Although primary care has not had a great deal of experience in the management of patients using isotretinoin, they have a great deal of experience and understanding of the management of contraception.

Primary care clinicians are also well placed to have an excellent understanding of the overall clinical and social circumstances of their patient. Now that funding has been widened to primary care, it will be vital that they are alert to the risks of isotretinoin use and gain experience in its day-to-day usage, while appropriately applying their broad experience in contraception management and their understanding of patients' clinical circumstances. It will be equally important for dermatologists to act as a backup to primary care in this area. To add further support to primary care, PHARMAC has arranged for training seminars along with a number of publications on the matter.

Now that funding has been widened, it is vital to robustly monitor isotretinoin use. To this effect, PHARMAC requires that funded access to isotretinoin be recorded on a "Special Authority" database. This will guarantee that NHI numbers are recorded on prescriptions and allow prescribing data to be accurately correlated to New Zealand termination of pregnancy data. It will be important to regularly review this data to ensure that the widening of funded access does not have any unexpected negative effects on the health of the population.

As a final step it would seem sensible to require private termination of pregnancy clinics to supply not only termination of pregnancy numbers to the Abortion Supervisory Committee but also include NHI numbers. In this way accurate statistics can be kept for the whole country.

Competing interests: None, including no external funding sources.

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The role of humans in the importation of ticks to New Zealand: a threat to public health and biosecurity

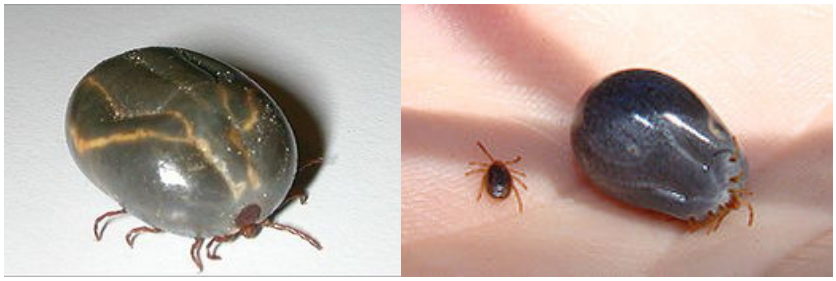
Allen C G Heath, Scott Hardwick

Abstract

Humans coming into New Zealand occasionally, and unwittingly, bring exotic ticks with them, either attached to their bodies or with luggage. Of the 172 available records for tick interception at New Zealand's border, half can be attributed to human agency. Here, together with an outline of tick biology and ecology, we present evidence of at least 17 species of ticks being brought in by humans, with Australia, North America and Asia the most frequent countries of origin. Risks posed by some of the nine species of ticks already in New Zealand are briefly examined. Sites of attachment of ticks and associated symptoms where these have been recorded are presented. Diseases transmitted by ticks and most likely to be encountered by travellers are briefly discussed together with the most practical method of tick removal. A plea is made for practitioners to increase their awareness of the risks to New Zealand's biosecurity and public health posed by ticks and to ensure that as many as possible of these unwelcome 'souvenirs' are collected and passed on for identification.

The world tick fauna comprises about 900 species of which New Zealand has 11 confirmed.[1] Four of these are endemic (kiwi tick, *Ixodes anatis*; tuatara tick, *Amblyomma* (formerly *Aponomma*) *sphenodonti* and the cormorant tick, *I. jacksoni*), as well as a new species of *Carios* from a native bat, and the others are either exotic (*Carios* (formerly *Ornithodoros*) *capensis*, *Haemaphysalis longicornis, Ixodes amersoni*) or shared with Australia (*Ixodes eudyptidis*), or distributed throughout the sub-Antarctic faunal region (*I. kerguelenensis, I. auritulus zealandicus*, and *I. uriae*). Only *H. longicornis* has been recorded from humans in New Zealand, with *C. capensis* capable but not reported doing so in this country.

Figure 1. Engorged female New Zealand cattle tick, *Haemaphysalis longicornis* (left); and (right) male (small tick) and engorged female paralysis ticks, *Ixodes holocyclus* (photos courtesy of Wikipedia under the Creative Commons Attribution-Share Alike 3.0 Unported license)



Ticks are of considerable economic importance as far as livestock are concerned[2] and stringent measures are employed to keep these exotic parasites out of New Zealand. Companion and other live animals imported into New Zealand are subject to import health standards that comprise pre-export treatment with an acaricide, as well as veterinary inspection and clearance. Companion animal imports from countries where rabies is endemic are also subject to quarantine.[3] Humans are not subject to such measures but worldwide, are an important pathway for exotic ticks.[4] By travelling extensively, New Zealanders increase their risk of being infested by ticks and catching tick-borne disease.

First we outline the biology, ecology and diseases associated with ticks and then we review details of all instances that we could find of exotic ticks found on travellers that had entered New Zealand, or which were associated with their belongings or activities, both to draw the attention of the medical profession to the magnitude of this problem, and to raise awareness of the risks posed to public health. The vector potential of ticks that occur in New Zealand is also discussed.

Tick biology

Ticks are arthropods that require blood to survive and reproduce. This characteristic and their often remarkable longevity make them ideal candidates for the transmission of many types of disease organisms. In addition, ticks can also cause a variety of medical conditions ranging from localised irritation to anaemia and, with some species, paralysis.[2]

The family Argasidae (soft ticks) do not engorge to the same extent as the family Ixodidae (hard ticks) merely taking small, frequent blood meals. In contrast, hard ticks remain attached to host for days and gradually imbibe and metabolise host blood during that time, swelling to their full capacity to retain a reservoir of blood in the last 24 hours or so of attachment. Hard ticks have been the only group encountered at the border so far, and details of their biology and ecology can be readily found.[2,5]

Sources of ticks

Ticks occur in all climatic regions on earth and humans encounter them during their occupations or recreational activities, especially if they brush against vegetation on which questing ticks gather, or if they sleep on open ground[4].

A thorough search of literature data bases produced published evidence of 390 species of ticks that infest both humans and companion animals around the world (ACG Heath, unpublished). Although 20 of these associations are considered rare, a considerable number of tick species remain about which to be vigilant.

The primary hosts of the ticks taken from humans include a large range of vertebrates, although companion animals, especially dogs should be considered as an important means of bringing ticks within the human environment. Close association with livestock and companion animals, as well as yards and kennels can increase the likelihood of ticks being acquired, but only rarely are ticks acquired directly from animals.

Ticks usually settle quickly to attach and feed once on a host, and very rarely detach and move during this time so are not usually acquired directly from an infested host. Ticks can also become associated with personal effects, such as clothing and furniture without the owners being aware, and are then introduced into new surroundings after a flight or voyage.

Public health risks from exotic tick species

Emerging and emergent tick-borne infections are becoming more common among humans as we move into and change landscapes and are brought into contact with arthropod vectors.[6] Mosquitoes are viewed as pre-eminent in transmitting viral infections in the South East Asian and Pacific regions[7] although ticks are the leading vectors worldwide. In all 19 rickettsioses, 2 ehrlichioses, anaplasmosis, and around 200 tick-borne arboviruses have been associated to date with ticks.[6,8]

Recent figures[9] showed that almost 50% of travellers returning to Europe and North America from the tropics experienced health problems. Tick-borne infections and specifically rickettsial diseases were mentioned as a possible cause of fever and rash but did not feature as highly as other diseases, such as malaria, dengue and enteric fever for example.

Arthropod-related skin diseases in travellers returning home ill accounted for 31% of all diagnoses in one worldwide study[10] and around 9% of diagnoses in a recent New Zealand study.[11] In another[12] arthropod bites were among the ten most frequently encountered diagnoses for common skin problems in returning travellers, although tick bites were not considered as common as those associated with sandflies (Phlebotominae, a subfamily of Psychodidae, or moth flies, not Simuliidae as in New Zealand), fleas and mosquitoes.

There are numerous tick-borne diseases that New Zealanders could encounter while overseas, but practically, those which occur in Australia, or in tick species most commonly associated with humans entering New Zealand, provide the most risk, with rickettsioses, borreliosis and viruses predominating. There are similar risks for visitors to Europe and Asia[13,14] although there are fewer New Zealand travellers to those regions than to Australia.[15] Notwithstanding, Rocky Mountain Spotted Fever especially cannot be ignored as a disease that travellers to the USA could encounter and of which they should be aware.

The principal tick-borne diseases including rickettsioses, Lyme Disease and those caused by viruses are described and discussed in numerous publications, e.g. [8,16–26].

Current travel advice for New Zealand travellers

New Zealanders are able to obtain specific recommendations for vaccination and prophylaxis for a variety of diseases that would be encountered overseas.[27,28]

Until recently advice[27] on tick-borne diseases was limited to tick-borne encephalitis (TBE) said to be transmitted by *Ixodes ricinus* encountered in the new Independent States of the former Soviet Union and Europe and Lyme Disease, transmitted by 'ticks from deer and wild rodents…[in] Atlantic coast, upper Midwest and western USA as well as parts of Europe and the new Independent States of the former Soviet Union'.

The rickettsial diseases of scrub typhus and Queensland tick typhus were also mentioned, being 'more likely to be acquired by travellers who come into contact with the tick vectors when travelling in …South-east Asia and eastern Australia'. Nowhere in this publication was comment made on the possibility that travellers could bring ticks back with them into New Zealand or that ticks in Western Europe also transmit diseases such as TBE and Lyme borreliosis. A book on the history of infectious diseases in the Pacific[29] did not mention any risks associated with ticks although mosquito and mite-borne diseases were discussed.

Current advice is available for the travelling public on the website (updated 5 March 2010) for the Ministry of Foreign Affairs and Trade.[28] There is no specific or general advice concerning ticks or tick-borne disease at this site.

These advisories tend to understate the risk to travellers of tick-borne disease, however perusal of any recent text books or reviews[6,8,13,16] shows the extent to which humans are potentially at risk to a suite of pathogens, principally those for erhlichiosis, rickettsiosis, babesiosis and numerous viruses.

Numbers and species of ticks intercepted at the border

Of the 172 reported instances of ticks encountered at the New Zealand border, or beyond to October 2010, humans were the direct route of entry for 66 (38.4%) of these, carrying the ticks on their persons (Table 1). In nearly all cases patients referred themselves to a GP where the tick was removed, although occasionally ticks were removed by the patient and then taken to a GP or clinic or sent direct to one of us.

Ticks were also found in personal effects (including a car) on 12 occasions and twice in rooms inhabited by humans. There were also seven instances of dogs that had never left New Zealand becoming infested with ticks which could only have been introduced by human agency, and one instance of personnel in a quarantine facility acquiring ticks brought in with wapiti (*Cervus elaphus nelsoni*) from Canada.

Taken collectively, these records associate humans with 86 tick introductions (50.0 % of all interceptions). In comparison, companion animals (dogs: 64 introductions, cats: four), were a marginally more frequent direct entry route for ticks (i.e. attached to their bodies), and accounted for 41.0% of all introductions[30–32] (ACG Heath & S Hardwick unpublished).

There were 17 identified species of ticks associated with humans plus 11 infestations where the ticks could be identified only to family or genus (Table 1). The most commonly encountered species on humans in New Zealand is the Australian paralysis tick, *Ixodes holocyclus* (found 31 times).

On two other occasions reported to us, New Zealanders acquired ticks in Australia, removed them there, but exhibited symptoms of tick bite on return home (Table 2). In addition two New Zealand lapidaries acquired ticks (not identified) while in Queensland in 2009, removed them, but suffered 'raised welts similar to mosquito bites' (R Knowles & T Walker, personal communication, 30 October 2010)

Country of origin and sources of ticks

The most frequent country of origin of ticks found at New Zealand's borders is Australia with 92/172 (53.5 % of all interceptions, humans and companion animals

etc. combined), followed by 21 records from Oceania/The Pacific (Fiji, American Samoa, Tonga, New Caledonia, Papua New Guinea, Solomon Islands, Vanuatu, Hawaii); 18 from North America (USA, Canada); 16 from Asia/SE Asia (China, Japan, Hong Kong, Singapore, Malaysia, Philippines, Thailand, Taiwan); 7 from Africa (South Africa, Zambia); 5 from Europe (Switzerland, Belgium, Netherlands); 4 from the Indian continent (Pakistan, Nepal); 4 from the United Kingdom; 2 from the Middle East (Israel, Dubai); and 3 records of unknown origin.

Records specifically from humans are shown in Table 1.

Table 1. Ticks taken directly from humans in New Zealand*

Tick species (number of records)	Country of origin	Disease associations**
Ixodes holocyclus (31)	Australia	*Rickettsia australis;* paralysis
Amblyomma triguttatum triguttatum (5)	Australia	*Coxiella burnetii*
Amblyomma (?) *loculosum* (1)	Australia	None reported
Amblyomma spp. (4)	Australia	
Ixodes tasmani (1)	Australia	*R. australis; R. honei*
Ixodes spp. (1)	Australia	
Haemaphysalis bancrofti (1)	Australia	None reported
Bothriocroton hydrosauri (1)	Australia	*R. honei*
Ixodidae (3)	Australia	
Rhipicephalus sanguineus (1)	PNG	*R.conorii; R. rickettsii* (RMSF); CCHF; paralysis
Dermacentor andersoni (1)	USA	RMSF; CTFV; Powassan virus; paralysis
Dermacentor occidentalis (1)	USA	RMSF
Dermacentor variabilis (2)	USA	*Ehrlichia ewingii;* RMSF; paralysis; enterovirus
Ixodes pacificus (1)	USA	*Rickettsia* sp. Lyme borreliosis
Amblyomma americanum (2)†	USA	Tularaemia; Ehrlichiosis; RMSF paralysis
Dermacentor albipictus (2)	USA & Canada	CTFV
Ixodes ricinus (1)	UK	*R. helvetica;Babesia microti (?divergens)*; Lyme borreliosis; European TBE; CCHF; paralysis
Ixodes ovatus (1)	Japan	*Anaplasma phagocytophilum, R. helvetica, E.*(near) *chaffeensis*
Ixodes sp. (*persulcatus* group) (1)	Hong Kong	Lyme borreliosis; TBE
Dermacentor silvarum (1)	China	*R. sibirica;* TBE
Ixodes acutitarsus (1)	Nepal	None reported
Ixodes spp. (2)	Nepal	

* See text for other human-assisted tick entry records.

** Affecting humans only; excluding diseases of other animals. See text for explanation of abbreviations.

† Note added in proof: Received too late for full incorporation in this paper is the first record of *Amblyomma cajennense* intercepted in New Zealand. The ticks came from a biologist, recently returned from the Amazon. The patient (M68) had 2 fully-fed nymphs on his scalp and back respectively. This species is a vector of RMSF. The patient reported no symptoms apart from localised irritation.

Every year around one million New Zealanders visit Australia, most eventually returning, and a further million travel further afield, principally to Fiji, UK, USA and China.[33] In turn, just over one million visitors arrive in New Zealand from Australia and a further 1.5 million come from elsewhere in the world principally from the UK (0.26 million), USA (0.2 million), China (0.1 million) and Japan (0.08 million).[33] Passenger numbers are estimated to increase by 3.5% annually, at least up to 2016.[34]

Many of those arriving have visited wilderness areas and animal parks where ticks abound, or have stayed in dwellings or visited kennels overseas where peridomestic ticks such as *Rhipicephalus sanguineus*, the brown dog-tick and other companion-animal ticks are often endemic. Although such areas are considered as 'high risk' it is important to note that ticks can also be present in any urban environments that vertebrate hosts frequent e.g. public and botanic gardens and walking paths.

The primary hosts of the ticks discussed here include a large range of vertebrates, both domestic and wild, with humans only occasionally attacked[4] but some, such as *I. holocyclus* and *A. t. triguttatum* are indiscriminate feeders and frequently encountered on other than their usual hosts.[35,36]

Sites of tick attachment

In 40 of 68 cases in this study (including two instances of ticks acquired outside of New Zealand), the site of attachment of ticks on patients was recorded, being principally on the head (scalp and pinna) on 15 occasions, trunk (back, 'body' chest, shoulder, armpit) nine, extremities (knee, leg, thigh) eight, and lower body (lower back, abdomen, buttocks, scrotum) five, and the 'whole body' (one). In the remaining two cases, ticks were found crawling on clothing of the patient.

These distribution figures are very close in proportion to those reported for a 28 case series in Australia.[37] Ticks have a tendency to migrate upwards over the body[38] which explains their frequent choice of attachment site. There have also been instances of ticks being found in bodily creases and orifices[39] so if symptoms of paralysis are present and a tick is not immediately obvious, care should be taken in searching for it (see Figures 2 & 3).

In a few instances, ticks were perceived by the GP as a mole, wart or cyst, a misidentification which often occurs even in countries where tick infestation is common.[40] Careful later examination usually, but not always, provides the correct diagnosis.

Figure 2. Tick attached and looking somewhat like a mole (photo in public domain, courtesy of Lyme Disease Foundation Inc.)

Figure 3. Tick in hairline (arrow). Note swollen lymph node on neck below (photo courtesy of Wikipedia Creative Commons Attribution 3.0 Unported license)

What symptoms should practitioners look out for?

Information on the tick-borne diseases and their symptoms can be found in greater detail at the web sites for Centers for Disease Control and Prevention, Department of Health and Human Services, USA; followed by the disease of interest.[41]

Briefly, the diseases present a range of symptoms which include, for spotted fever group rickettsioses, e.g. Rocky Mountain Spotted Fever (RMSF): fever, malaise, headache, muscular pains, conjunctival infection, followed by an eschar, lymphadenopathy and finally a red maculopapular rash on the forearms extending to most of the body, including palms and soles. With Q fever, symptoms are influenza-like. Lyme disease symptoms include fever, headache, fatigue and a characteristic, radiating skin rash, erythema migrans. The joints, heart and nervous system can become involved if infections are left untreated.

Tick-borne encephalitis (TBE) and Crimea-Congo haemorrhagic fever (CCHF) both present with headache, fever, muscle aches and vomiting, while TBE can have symptoms of meningitis or encephalitis and/or motor abnormalities. CCHF victims may have a flushed face, red throat and petechiae on the palate. As the illness progresses, large areas of severe bruising and nosebleeds can be seen. Viruses such as Colorado Tick Fever Virus (CTFV) produce an acute febrile illness[8].

Paralysis and other sequelae of tick infestation

The Australian paralysis or bush tick, *I. holocyclus* is one of around 70 species of ticks that are capable of producing an ascending motor paralysis due to a neurotoxin that they introduce into the host while feeding.[42] Localised paralysis can also occur.[39]

The clinical and neurophysiological findings in a suite of cases of *I. holocyclus* paralysis in children have been described.[43] It was noted that the paralysis can worsen following removal of the tick (a contrast to paralysis caused by North American ticks for example) and respiratory support may be needed, otherwise death is possible, as was often the case in the early 20th century.[40] Anaphylaxis following *I. holocyclus* bite is less frequently reported, but it may be more common and potentially more life threatening than tick paralysis.[44]

Table 2. Case notes for tick infestations from humans. Except where otherwise indicated, all ticks found post-border in New Zealand

Species	Country of origin	Patient details	Site of attachment & symptoms
Amblyomma triguttatum triguttatum	Australia	F	Popliteal crease; swollen popliteal fossa.[45]
Amblyomma triguttatum triguttatum	Australia	F	'Body'; flu-like symptoms; negative for rickettsia (paired sera & PCR); positive for influenza virus (whole blood PCR)
Amblyomma sp.§	Australia	F 72*	Scalp; unwell, ache, lymphadenopathy; prescribed antibiotics; one gland now hard
Rhipicephalus sanguineus	PNG	F 9	Scalp; lump on head.[46]

Ixodes holocyclus	Australia	F	'Skin'; headaches
Ixodes holocyclus	Australia	M 25	Inner thigh; mild local irritation
Ixodes holocyclus	Australia	M	Bite mark
Ixodes holocyclus	Australia	M	Scrotum; thigh and knee swollen
Ixodes holocyclus	Australia	M	Scalp; lump on head
Ixodes holocyclus	Australia	F	Headache, head hot, 'as if had been hit'.
Ixodes holocyclus	Australia	F 63*	Whole body; itch, maculopapular rash; 1:512 titre to *Rickettsia australis*
Ixodes sp.	Nepal	F 57	Scalp; lymphadenopathy

*Ticks acquired and removed in Australia

§ Probably *A. loculosum* as it was acquired on a Great Barrier Reef island where that species and its bird hosts abound and where humans frequently encounter the tick.[47] Both Aride and Soldado viruses have been isolated from *A. loculosum.*[48]

Case history

One of these case histories deserves closer attention. It concerns a New Zealand female biologist, engaged upon field work in southern New South Wales, who developed an erythematous maculopapular rash (Figure 4) consequent upon coming into contact with a clump of questing larvae of *I. holocyclus.*

The rash appeared 2 to 4 days after the ticks dropped off (following treatment with a lotion used against scabies mites) and the patient had returned to New Zealand.

The lesions were itchy, but this had ceased about the time blistering appeared a few days later (Figure 5). Because of the rash one of us (ACGH) suggested that a presumptive diagnosis of Queensland tick typhus was warranted and her GP arranged for a blood sample to be sent for an Indirect Fluorescent Antibody Test by an Australian laboratory.

A titre of 1:512 for *Rickettsia australis* was found and considered 'significant' but because no acute phase serum was available, confirmation of *R. australis* infection (by a four-fold increase in titre between acute and convalescent phase serum) was not possible.

It can not necessarily be presumed that the rash in this case was entirely due to rickettsiosis, because there are reports of allergic response to larvae of *I. holocyclus* which produce intense itching and wheals.[49] In fact the symptoms in this case are more akin to those for 'scrub itch'[40], an allergic dermatitis caused by chigger mites (Trombiculidae) but also recognised as a consequence of infestation with larvae of *I. holocyclus* and possibly *H. longicornis*.[50]

Attachment of a few larvae of *I. holocyclus* to a non-sensitised host provokes little or no response[51], but hypersensitivity develops after repeated infestation.[52] There was no recall of a history of tick bite in this patient. It is of interest that tick bites were not identified[12] as a cause of pruritic papules among common skin problems in returning travellers, although an eschar or ulcer following a tick bite was noted as part of the typical presentation, and rickettsial infection was cited among possible sequelae.

In addition to a rash, *R. australis* (and other rickettsial infections) can produce symptoms of chronic pain, fatigue and depression[53], none of which were present in this case.

Figure 4. Erythema as a consequence of exposure to many larvae of *Ixodes holocyclus* (photo, the authors)

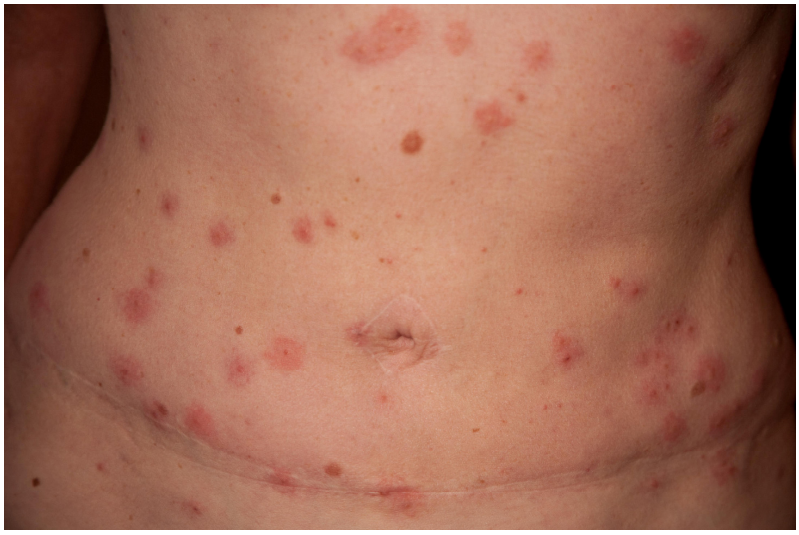
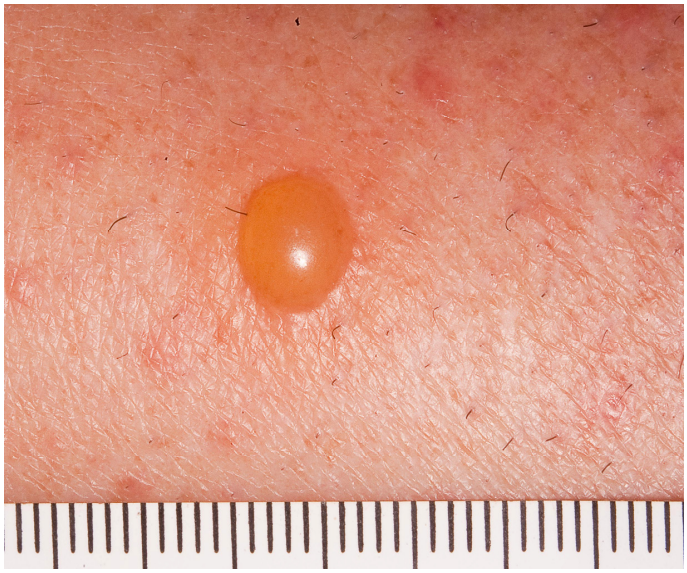


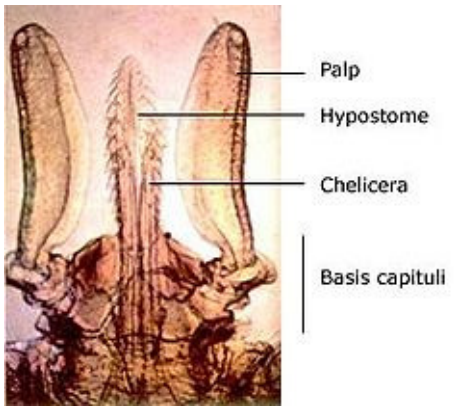
Figure 5. One of a number of fluid filled blebs following contact with many larvae of *Ixodes holocyclus* (photo, the authors)



Tick removal

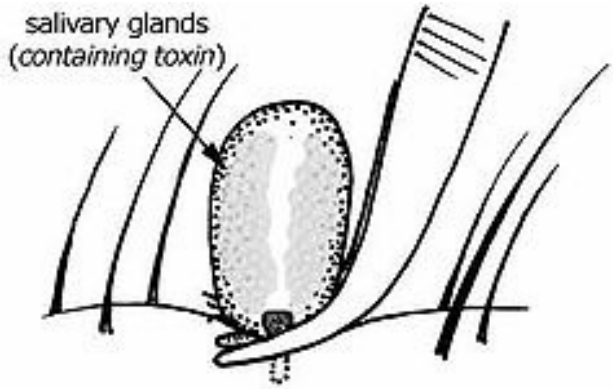
The hypostome with which the tick pierces the host skin, has backwardly projecting teeth (Figure 6) and these, together with cement secreted at the site of the wound, anchor the parasite in place while it feeds. These factors can make tick removal difficult, and often attempts will leave the mouthparts (hypostome) embedded in the patient's skin. This can result in a foreign body response or infection, and a scar remains, although this possibility is not always of concern[51].

Figure 6. Mouthparts of paralysis tick (photo courtesy of Wikipedia Creative Commons Attribution 3.0 Unported license)



Removal of ticks should be done carefully and various devices have been assessed[54], but forceps about 12-15 cm long with a curved end and cross-serrations on the gripping surface are suitable.[55] Apply the forceps to the tick mouthparts as close to the skin of the host as possible, avoiding grasping the distended body of the tick, and apply steady traction (do not twist) perpendicular to the skin (Figure 7). This will readily remove ticks with short mouthparts but those with longer parts and that also use a cement to anchor themselves may require a more prolonged and patient effort.Squeezing the tick can increase the risk of envenomation or introduction of disease organisms.

Figure 7. Showing procedure for removal of a tick (diagram courtesy of Wikipedia Creative Commons Attribution 3.0 Unported license)



Any tick collected in this way from a human patient can be sent (without preservative, and in a crush-proof container) to the addresses of either ACGH or SH, together with as much information as possible, including date of collection, the last known country visited by the patient, age and sex, site of attachment of the tick, and any symptoms recognised. Any practitioner who wishes can request collection tubes for this purpose from us by letter or email.

Limited anecdotal information (R Emberson, personal communication, 14 April 2010; ACG Heath & S Hardwick, unpublished) suggests that in an unknown number of cases, ticks when found may be removed and disposed of without any further notification to a GP or acarologist. It is possible that general practitioners may also do this. This suggests a degree of under-reporting which is of considerable concern as it obscures the true scale of the tick problem.

Public health risks from established tick species

It is not only exotic ticks that pose a risk to humans in New Zealand, because, to date, three arboviruses have been isolated from local ticks; Johnston Atoll virus and a Hughes group virus (Soldado)[8]; both from the soft tick *C. capensis* and Saumarez Reef virus from the hard tick *I. eudyptidis*.[56] Saumarez Reef virus is a suspected human pathogen related to West Nile and Russian Spring Summer Encephalitis viruses which are both human pathogens[48], and has been isolated from *C. capensis* in Australia.[13] Soldado virus, a member of the Bunyaviridae, is a potential public health problem, but principally among people working with seabirds or among their colonies.

Carios capensis is a cosmopolitan sea bird tick that probably became established in New Zealand many years ago, through visits from migratory birds from the Pacific islands. This species has been reported on humans causing severe reactions.[48,57] Other members of the Bunyaviridae that have been isolated from *C. capensis* are Aranas Bay and Upolu viruses, and the unassigned Hirota and Midway viruses have all been

isolated from this species[8].There are no records of *C. capensis* from humans in New Zealand.

The seabird tick, *I. uriae* has a disjunctive distribution on the New Zealand mainland in seabird colonies, being more common in the sub-Antarctic islands and also the Antarctic.[1] This tick is a prolific vector having 68 viruses associated with it worldwide [8] although no virus was found in several hundred New Zealand *I. uriae* tested.[56,58]

In Australia, 3 virus species in the Rheoviridae, Bunyaviridae and Flaviviridae[8] have been isolated from *I. uriae*. This tick also has an enzootic cycle of *Borrelia burgdorferi,* and there is a report of erythema migrans in a human bitten by *I. uriae.*[4] *Ixodes uriae* from Campbell Island, in NZ sub-Antarctic waters, have been shown to harbour DNA of *B. garinii.* [24]

The so-called New Zealand cattle tick, *H. longicornis* is occasionally reported from humans in New Zealand [59] (ACG Heath unpublished), and although it has actual and presumptive vector potential for a range of diseases, with some that would be of concern to public health[22], there are no reports of such in New Zealand.

Could exotic ticks establish in New Zealand?

One engorged, fertilised, female tick can produce at least 2000 viable eggs and there is evidence (ACG Heath, unpublished) that fertile eggs from at least two species of exotic ticks (*I. ricinus, D. albipictus* and possibly *R. sanguineus*) can complete development and produce viable larvae in New Zealand's climate.

Further, it has been estimated (ACG Heath, unpublished) that around 150 exotic species have the capability to survive and establish in New Zealand based on their geographic distribution and host range. This does not necessarily include *I. holocyclus* which, although it is confined to the eastern seaboard of Australia, has strict temperature and humidity requirements that may preclude it establishing in other than the more northerly parts of New Zealand.[60] There are a number of species of ticks in the area of China and Japan which could establish here because they include *H. longicornis* in both their geographic and host ranges.

Conclusions

We are acutely aware that many more instances than are recorded here of tick infestation and associated symptoms are likely to have been experienced by returning New Zealanders and tourists, and seen by general practitioners. Thus, our data are, we suspect, merely indicative of a larger problem and this report is intended to encourage practitioners to develop a heightened awareness of the risks that travellers face from souvenir ticks, as well as the potential such parasites have for breaching New Zealand's biosecurity defences.

This post-border passive surveillance is an important adjunct to the incursion prevention measures already in place at our border. Furthermore, in the interests of obtaining good epidemiological data, practitioners are urged to ensure that any tick they encounter is sent to an appropriate authority for identification, together with collection details.

Competing interests: None

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Improving termination of pregnancy services in New Zealand

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Abstract

The aim of this article is to review evidence of the access and timeliness of termination of pregnancy (TOP) services to date in New Zealand and to provide clinic level and policy recommendations for service improvement. Compared to other countries, New Zealand successfully provides access to TOP services regardless of ability to pay, yet still lags behind other OECD countries in timeliness of services. There are clear differences in the organisational structure of clinics around the country, the most striking difference being between the private and public sectors. Streamlining referral pathways, expanding the availability of medical TOPs, and improving the organisational structure of clinics would all contribute to improving the timeliness of services and therefore the quality of care received by women. Improvements in the timeliness of TOP services in New Zealand are needed and achievable, even without legislative changes.

Termination of pregnancy (TOP) is a common surgical procedure and is one of the safest when conducted by trained professionals. The rate of complications for this procedure is extremely low when conducted under optimal conditions, but increases with gestational age.

Pregnancy terminations conducted during the first trimester, particularly before the 10th week, have a greatly reduced risk of complications compared to the second trimester.[1–4] In addition, medical practitioners and nursing staff are usually more willing to participate in pregnancy termination services the earlier in gestation they are conducted.[5] For these reasons, it is important to ensure that pregnancy termination services are provided in a timely manner. For women, lengthy delays or complicated referral pathways can add stress to an already emotionally difficult situation,[6] and this in turn can have an impact on emotional outcomes.

Despite the recognised importance of ensuring that pregnancy terminations are conducted in early gestation, New Zealand lags behind countries such as the United Kingdom, Australia and the United States in providing early terminations. In 2008, 73% of pregnancy termination procedures in the UK were conducted under 10 weeks gestation.[7] In Western Australia in 2004, 71% of procedures had taken place before the ninth week of gestation and 86.6% had occurred by the tenth week.[8]

In the US in 2006, 68.1% of women had their termination before the ninth week of pregnancy, and 78.5% had terminated by the tenth week.[9] In contrast, New Zealand statistics indicate that in 2007 only 40.5% of terminations had been conducted by the ninth week of pregnancy, and 60.5% had been conducted by the tenth week of pregnancy.[10] This unfavourable comparison spurred on a series of studies on TOP services in New Zealand to assess timeliness as an indicator of quality of services.

In 2009, a study found that on average women waited 25 days from the time of first contact with a health provider to the time of pregnancy termination.[6] Furthermore, this same study showed that 53% of women participating in the study thought the time they waited for a pregnancy termination was too long.

Further analysis of the data collected in this study revealed that women who attended a publicly funded clinic faced longer delays than women who attended a private clinic, and those who had multiple visits with a primary care physicians before being referred to a pregnancy termination clinic had lengthier delays than women with a single referral visit. Lastly, clinics offering medical termination of pregnancy and single day services experienced shorter delays to procedure.[11]

The aim of this paper is to consider how these findings, together with the experiences of other countries, might inform the development of TOP services and policies in New Zealand.

Policy and processes in New Zealand

The terms for pregnancy termination service provision in New Zealand are delineated by the Crimes Act (1961) and the Contraception, Sterilisation and Abortion Act (1977).[12,13]

Pregnancies that present a serious danger to the life of a woman or a serious danger to the physical or mental health of a woman, pregnancies resulting from incest or sexual relations with a guardian, pregnancies in women of mental sub normality, and pregnancies presenting fetal abnormality may all be legally terminated.

All District Health Boards (DHBs) in New Zealand are required to provide publicly funded TOP services, but some choose to subcontract these services to other DHBs. Previous research has shown that this subcontracting leads to some women having to travel large distances to obtain services.[14]

In order to access TOP services women must first go to a primary care provider such as a General Practitioner (GP) or a Family Planning clinic. The primary health provider can provide an initial assessment, including confirmation of the pregnancy.

If the woman requests TOP services, the primary care provider then orders diagnostic tests which usually include antenatal blood screening for blood type and several illnesses, a uterine scan to date the pregnancy and vaginal swabs to assess for sexually transmitted infections.

A referral from a primary care provider is considered a legal requirement for lawful service provision, given that this process is outlined in the Contraception, Sterilisation and Abortion Act. Once a referral has been received by the TOP service two certifying consultants must separately agree that the woman's circumstances fit the legal criteria. Usually the second certifying consultant is also the operating doctor.

The Abortion Supervisory Committee (ASC) appoints certifying consultants on yearly appointments. Most certifications are conducted in TOP services, but in some regions many primary care providers are also certifying consultants and can provide that service. In 2010 there were 193 certifying consultants around the country.[15]

All women seeking a pregnancy termination must be offered counselling, but legally are not required to actually see a counsellor. However, most of the clinics have

incorporated counselling as part of their services, and therefore all women are seen by a counsellor or social worker regardless of whether they wish to see one or not.

Northland is unique in that they do not have the counsellor incorporated with other clinical visits. Therefore women in Northland must travel to different sites to receive counselling, be certified, and finally to have the procedure.

Over ninety percent of TOPs around the country are conducted in public clinics. The remainder are carried out in the only private clinic in New Zealand, located in Auckland. Women who are willing and able to pay out of pocket are able to access TOP services from this private clinic, as do women who are not residents and are not entitled to publicly funded services. Non-resident women living in other regions of the country are required to pay out of pocket for services in local public clinics.

While the law still requires private patients to have a referral from a GP, these women can effectively self-refer because the private clinic employs its own GPs who can provide the referral. The three largest urban centres—Auckland, Wellington and Christchurch—have the largest patient flow and have a specialised clinic operating full time, regularly receiving referrals from other DHBs where services are not locally available. The remaining TOP services are conducted in weekly or fortnightly clinics offered at day surgery units which also provide other outpatient surgery services.

Currently statistics on the types of TOP procedures conducted are not published, but a clinical audit of nine clinics around New Zealand in 2009 showed that only 2.2% of all patients seen in a 3-month period underwent a medical TOP.[6]

To date, six out of the thirteen clinics that provide the great majority of TOPs during the first trimester offer the possibility of a medical TOP (medical termination of pregnancy is conducted using a combination of two drugs: misoprostol and mifepristone which stimulate the uterus to expel the products of conception similarly to a miscarriage), but most clinics have a limited number of openings for this service per week or per fortnight. Medical TOPs in New Zealand are only conducted in pregnancies under 9 weeks gestation. Therefore, based on official statistics, only around 40% of women would be able to choose between procedures if the clinic they are referred to provides the choice.

In 2009, the Abortion Supervisory Committee commissioned a working group to develop national standards of care for women requesting induced abortion in New Zealand.[16] This document delineates standards addressing service structure, waiting times, counselling and assessments. However this document does not specify recommendations for timely referral from primary care.

International comparisons

In the process of critically reviewing a health service it is often useful to understand how similar services in other countries function. Given the difference in timeliness of services between New Zealand and other OECD countries, the question arises of what could possibly account for more timely services in other countries.

The United Kingdom (UK) offers perhaps the closest comparison of health service structure to New Zealand. TOPs sought through the National Health Service (NHS) are free of charge but require women to visit a primary care provider such as a GP

first in order to be referred to specialised TOP services. However unlike New Zealand, women who are willing to pay for a private service may access a private TOP clinic without a GP referral. In 2006 99.3% of TOPs in Scotland took place in NHS hospitals.

In contrast England and Wales rely heavily on independent clinics under contract by the NHS (53% of TOPs), and only 38% of TOPs took place in NHS hospitals, with the remaining 9% being privately funded.[7]

In the UK, in order for a woman to access a TOP, two physicians must agree in good faith and sign a document stating that the woman fulfils one or more of five grounds outlined by the law, including risk to the physical or mental health of the pregnant woman or any other living children.[17] As in New Zealand, the majority of terminations are done due to risk to the mental health of the pregnant woman. Clinical guidelines were developed in the UK in 2000 to guide service provision with the objective of ensuring high quality services.[18]

These guidelines suggest that in order to expedite the process of referral to TOP services, the primary care provider should provide the first signature. If the primary care provider does not provide the signature, the TOP clinic provides both signatures. Unlike New Zealand, medical practitioners do not need to be certified to sign the legal agreement for the TOP.[19]

In contrast, Canada is one of only a few countries in the world with no legal restrictions on TOP. Despite the lack of restrictions on TOP, service provision varies significantly between provinces. Although TOPs are publicly funded, some provinces have established limitations on reimbursements for TOPs carried out in clinics rather than hospitals. Furthermore, accessibility of services outside the main urban centres is limited. Policies surrounding referral pathways and TOP service care pathways are institutionally based and not legally outlined.[20]

As is the case in Canada, Australia also lacks a single national structure for TOP services. Each state or territory has its own legislation, the most restrictive of which is Queensland, where pregnancy termination is a crime under the Queensland Act. Despite this, pregnancy termination is generally regarded as lawful if performed to prevent serious danger to the woman's physical or mental health.

As recently as 2009 criminal charges have been brought to women who had undergone pregnancy terminations, which has lead to physicians restricting their TOP practices for fear of further prosecutions.[21] With the exception of Southern Australia, most TOP services in Australia are offered in private clinics. A Medicare (federal government universal health insurance scheme) rebate is available to all women accessing TOP services, whether they be publicly or privately provided, but the rebate is insufficient to cover the full cost of the service. In Queensland, for example, the out-of-pocket costs for the first trimester TOP are between $350–$830 depending on location.[22]

The United States has a federal law legalising TOP, but state level restrictions and regulations exist including mandatory waiting period and parental notification.[9] Thirty-four states currently enforce parental consent or notification laws for minors seeking a TOP. The Supreme Court ruled that minors must have an alternative to

parental involvement, such as the ability to seek a court order authorising the procedure.[9]

Public funding is the exception; most TOPs are paid for with private money. Four out of seventeen states that use public funds to pay for TOPs for low income women do so voluntarily. The rest use public funds under a court order.[23] About 20% of TOP patients report using Medicaid to pay for TOPs.[9] As is common in most health services in the USA, self referral is the norm.

All countries presented here have different structures for delivering TOP services. The UK, like New Zealand, funds all TOP services for eligible women while access to services in Canada and Australia is more dependent on geographic location. Australia and the US rely on private clinics with partial public funding. All countries face some barriers to access, but little is known of the organisation of services.

How can services be improved in New Zealand?

A strength of the New Zealand arrangements for TOP services is that the same legal structure applies to the whole country. This contributes positively to increasing equity, as, in contrast to countries such as Australia and the USA, whether or not a woman can access a legal pregnancy termination does not depend upon in which region of the country she lives. It also does not depend upon her willingness and ability to pay, as TOP is regarded as a core or essential procedure which is publicly funded. However, the extent to which women who must travel for services have their expenses reimbursed is unclear.

The recent introduction of national standards in New Zealand should also improve equity by ironing out some of the differences in the modes of service across providers.[16] Having said this, TOP services in the first trimester are provided later on average in New Zealand than in other countries. The timeliness of services also varies depending upon the referral pathway, the type of procedure, and the organisational structure of each clinic. If differences in timeliness can be addressed, this would improve equity of access to the service.

Referral pathway—Nowadays, modern pregnancy tests are widely available over the counter from pharmacies and supermarkets. Therefore unlike many health conditions, it is relatively easy for women to self-diagnose their own pregnancy. Although medical practitioners will rightly argue that they have an ongoing relationship with their patients and a referral from primary care for TOP services is not only a legal requirement but is also entirely appropriate in terms of patient care, we question just how clinically necessary it is to have women enter the care pathway through primary care.

For women who reach a decision to terminate soon after they confirm they are pregnant, if they were able to self refer, the entry point to the care pathway could be the TOP clinic itself. Given that many clinics require two appointments within their service structure, diagnostic tests could be obtained between the first and the second appointments. Restructuring services to allow self-referral to TOP clinics would require legislative change. Yet, if the current legislation were to remain, further efforts are necessary to ensure that primary care physicians can reduce the time between when women first enter their practice for an unplanned pregnancy and the

time they are able to book an appointment with a termination clinic (currently averaging 10 days).

Type of procedure—Medical TOPs are less invasive and can be conducted much earlier than surgical TOPs. If access to medical TOPs could be expanded, women in the early stages of pregnancy would not have to wait for surgical timeframes. Family Planning has already applied to the Abortion Supervisory Committee for a licence to provide medical terminations in Waikato as a pilot programme. If this programme was expanded and medical terminations were available in Family Planning clinics throughout the country, women would be able to access services in an additional nine towns and cities around the country than is currently available.

Organisational structure of clinics—As mentioned previously, research conducted in New Zealand found that women attending clinics that offer medical TOPs and those who provide complete TOP services in a single day, eliminating the need for multiple visits to the TOP clinic, experience significantly less delay. As an example, the single private TOP clinic in New Zealand provides services at significantly earlier gestational dates than the public clinics.

There are a number of aspects of their organisational arrangements that contribute to providing a more timely service. Timeliness would be improved significantly if some, or all, of these features could be built into the public clinics.

First, women can effectively self refer to the clinic, and if they are unable or unwilling to go to their own GP for a referral, a primary care provider is available on site to provide this service. Second, this clinic has a standing agreement with a radiographer in close proximity and so women can get a scan appointment relatively quickly.

For women having a surgical termination, they offer a single day service including counselling, clinical assessment and certification. Except for those accessing medical termination, multiple visits to the clinic are not required. Finally, this clinic has a specific policy stating that women should not wait for more than 5 working days for an appointment, and in times of high demand they will schedule additional clinics to support patient flow. This written policy is monitored and booking times are used as a quality indicator.

In contrast, research has shown that women must wait an average of 10 days between the day that their appointment was booked and their first appointment with the TOP clinic. The process of certification, normally carried out within the TOP clinics for the great majority of women, does not seem to be the greatest factor affecting delays in the service.[6]

Conclusions

New Zealand has succeeded in providing safe, high quality TOP services to women who fulfil the legal criteria for terminating a pregnancy. Unlike Australia and the USA the service is provided free of charge for citizens and residents, plus the same regulations apply across the whole country. However, these important gains in equity of access to services—as compared with other countries—should not involve a trade off in the quality of services. Timeliness of services is an important aspect of the patients' experience of the service, and evidence points to concerning gaps in this area. Therefore improvements in the timeliness of service provision are still needed.

Legislative change allowing women to self refer to services would eliminate GPs as gatekeepers of the service and would therefore reduce the number of steps required to access TOPs. Yet, even without legislative reform, the timeliness of TOP services could be greatly improved by changing the way in which these services are organised, including extending access to medical TOPs.

Competing interests: None.

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Sirenomelia

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Abstract:

Sirenomelia is a rare malformation of caudal part of embryo. It is characterised by complete or partial fusion of the legs into a single lower limb. Abnormalities of the kidneys, large intestines and genitalia are common. Sirenomelia cases have only one umbilical artery and one vein. Upper body birth defects are rare and include abnormalities of heart, lungs, arms, spine and brain. Here we report a case of sirenomelia with uncommon upper body birth defects involving right forearm and hand, and the rib cage. Vascular steal phenomenon cannot explain the upper body birth defects.

Case report

A 22-year-old primigravida with nonconsanguineous marriage without any prior ultrasonographic screening of pregnancy status presented with obstructed labour at 34 weeks of gestation.

She had a normal antenatal course except poor progression of abdominal girth. There was no history of medication in the early pregnancy. She was nondiabetic. Her past medical history and family history were unremarkable. Caesarian section was done. A 1500 gm, stillborn baby of undetermined sex was born. Head circumference was 26 cm.

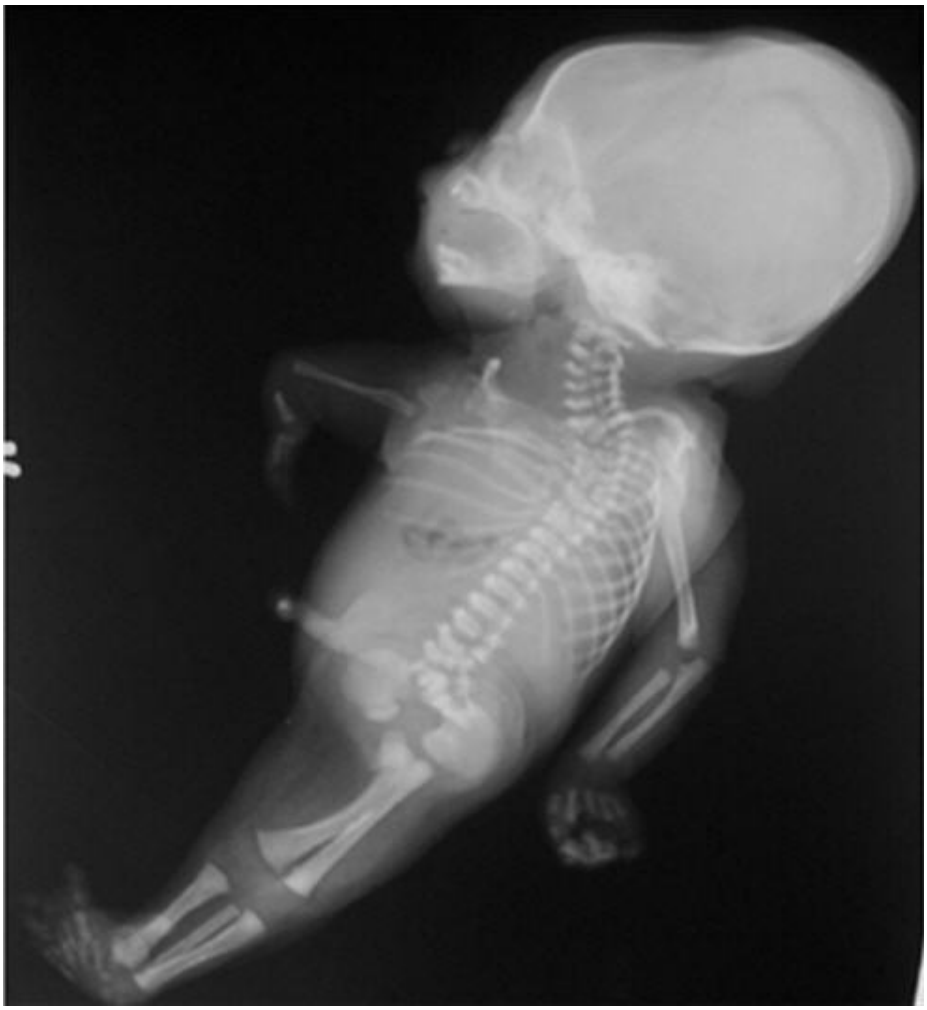
The infant had flattened facies, fused lower extremities, single umbilical artery, absent anal orifice and absent external genitalia (Figures 1–3). Right forearm was short with fused fingers. The fetus was diagnosed to be a case of sirenomelia.

Postmortem radiograph showed hypoplastic pelvis, fused femurs at the proximal end, two tibias and one fibula. In right forearm a small radius/ ulna and a piece of small bone were present with absence of carpal, metacarpal and phalangeal bones. Rib cage on right side was poorly developed with fewer numbers of ribs (Figure 4).

Autopsy revealed bilateral renal agenesis, absent ureters, urinary bladder and urethra, absent internal genitalia, colorectal agenesis with blind ended caecum, caudal tapering of abdominal aorta below the origin of only umbilical artery and right lung hypoplasia.

Figures 1–3. Photographs showing a stillborn baby with single lower limb with imperforate anus, absent genitalia, flat face, and short right forearm with fused fingers (the authors obtained consent from the baby's mother for publication of these images)

Figure 4. Radiograph showing single lower limb with two femurs fused at proximal end, two tibias and one fibula. In right forearm there is a small radius or ulna with absence of carpal, metacarpal and phalangeal bones. Rib cage on right side was poorly developed with fewer numbers of ribs



Discussion

Sirenomelia, also known as Mermaid Syndrome, is a lethal birth defect of the lower body characterised by apparent fusion of the legs into a single lower limb. Infants resemble the siren of Greek mythology. Other birth defects are always present in sirenomelia. The most common abnormalities are of kidneys, large intestines and genitalia. Exact cause of sirenomelia is not known. It is non-hereditary. Some undetermined teratogenic agents may be responsible for it.

Failure of caudal mesoderm blastogenesis, mechanical compression by amniotic bands or oligohydramnios, and unknown genetic mechanism have also been postulated as causes of sirenomelia. There are some associations with in-vitro fertilisation, twin pregnancies and diabetic mothers. It was also thought to be an extreme case of caudal regression syndrome. Defect in primitive streak had been proposed as a causative factor.[1] Attention have been drawn to the overlap in phenotypic features of sirenomelia and VATER.[2,3] Vascular steal phenomenon is a proposed mechanism causing relative ischaemia below a persistent vitelline artery that diverts blood from the abdominal aorta and caudal structures to the placenta.[4]

Spectrum of sirenomelia varies from simple cutaneous fusion of lower limbs to absence of all bones (except fused femur). Pelvic bones may also be absent, fused or poorly formed. Back of the knee and foot (if present) may face forward due to rotation. Urogenital abnormalities are common including renal agenesis, absence of bladder and urethra, and absent or poorly formed internal and external genitalia. Blind ending colon and imperforate anus may also present. Only one umbilical artery is present.

Oligohydramnios is frequent in mother, which can interfere with development of lungs of the fetus and cause a flattened face from compression against the mother's abdomen. Upper body birth defects are very rare and include abnormalities in heart, lungs, arms, spine and brain. The present case of sirenomelia also had uncommon upper body birth defects involving right forearm and hand, and the rib cage.

Single umbilical artery in sirenomelia is thought to arise from primitive vitelline arteries of embryo and has direct continuation with abdominal aorta. This vitelline umbilical artery steals blood and nutrition from the lower body and diverts it to the placenta.[4] As a result, urogenital and gastrointestinal systems and lower extremities do not form properly. Though vascular steal theory can explain the lower body defects, it can not explain upper body birth defects including cardiac, cranial and radial malformations.[5,6]

Single umbilical artery occurs in about 1% of all live-born infants but association of other birth defects is relatively low.[7–10] Persutte and Hobbins described congenital malformations associated with single umbilical artery into three groups:

- Malformations identified with prenatal ultrasound;
- Difficult to be diagnosed prenatally;
- Unlikely to be diagnosed prenatally.

They concluded that nearly two-thirds of all congenital malformations associated with single umbilical artery could be missed on a prenatal ultrasound examination.[11]

Antenatal diagnosis of sirenomelia is done by ultrasonography. Oligohydramnios can prevent a clear view of the fetus by ultrasound. Observation of lower extremity fusion and bilateral renal agenesis are helpful for diagnosis of sirenomelia. Blood vessel anomalies can be detected by colour-flow imaging. Serum marker for antenatal diagnosis of sirenomelia is currently not available.

Sirenomelia is fatal. Babies are stillborn, or live-born with survival for few minutes to few days. Babies born alive with functioning kidneys may survive with appropriate surgical management.[12,13]

Antenatal ultrasonography is important for detecting fetal anomalies. Diagnosis of sirenomelia was missed in our case because of lack of antenatal check-ups including ultrasonography. Diagnosis by first trimester is helpful for planning early termination of pregnancy and minimises the trauma of termination at advanced gestation.

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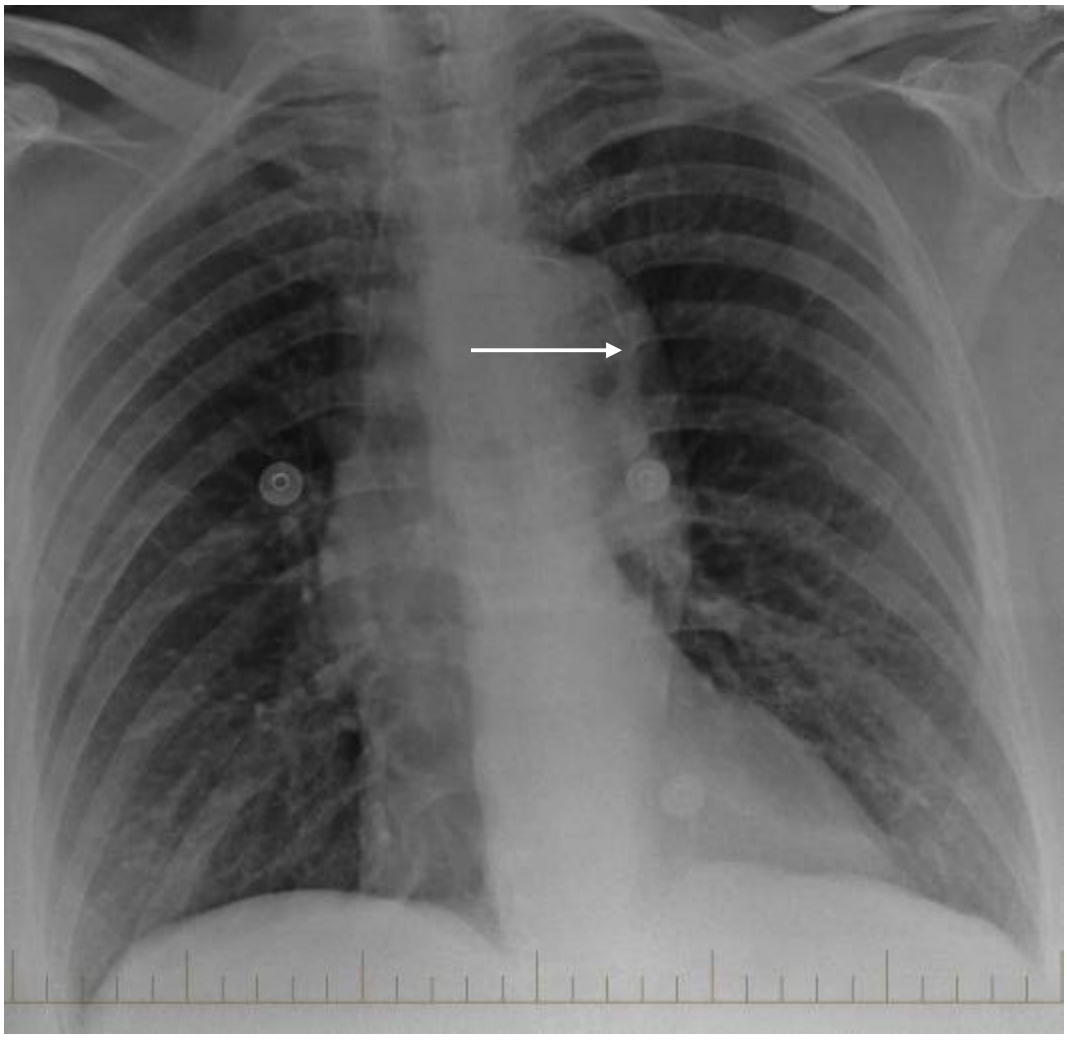
Intimal intimation

Manar Khashram, Rosemary Wyber

Clinical

A 71-year-old woman with a long history of hypertension presented to the emergency department with sudden onset of chest pain radiating to the back. Initial investigations included a chest radiograph (Figure 1).

Figure 1. AP chest radiograph on admission (arrow indicates intimal calcification)

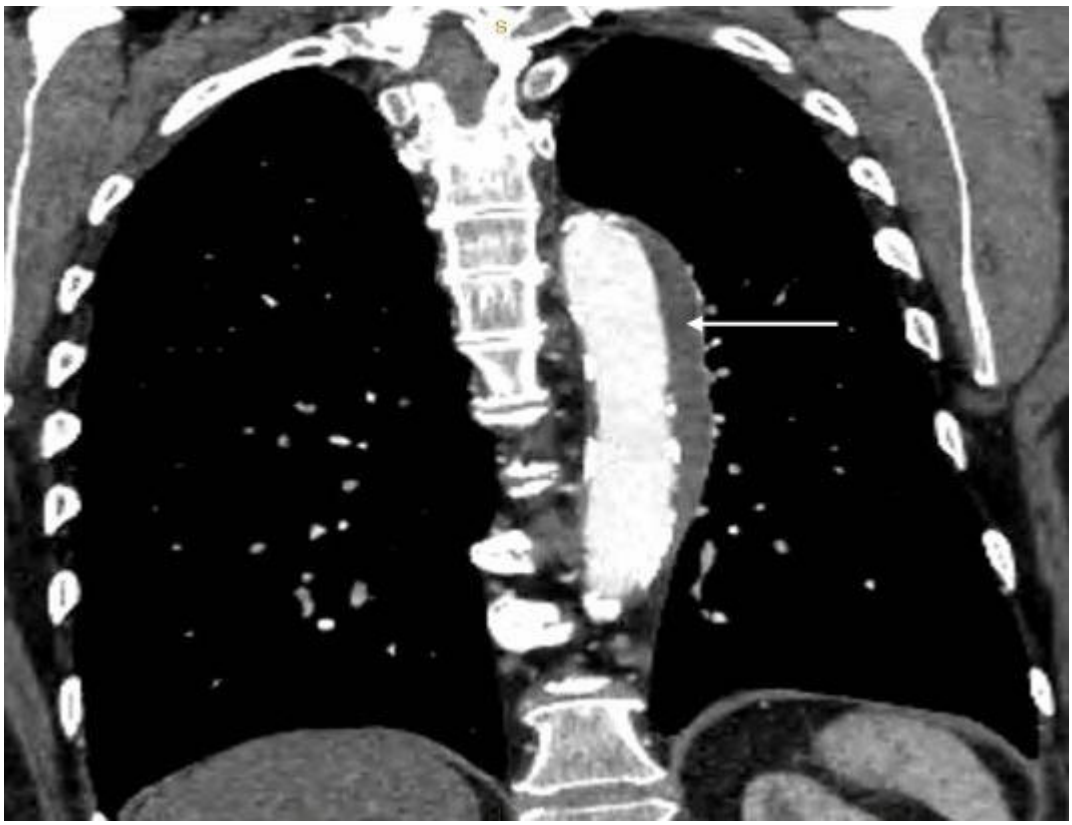


What is the diagnosis?

Answer

Displaced intimal calcification of the thoracic aorta consistent with *intramural haematoma* (Figure 2)**.**

Figure 2. CTA showing mural thickening consistent with intramural haematoma (arrow)



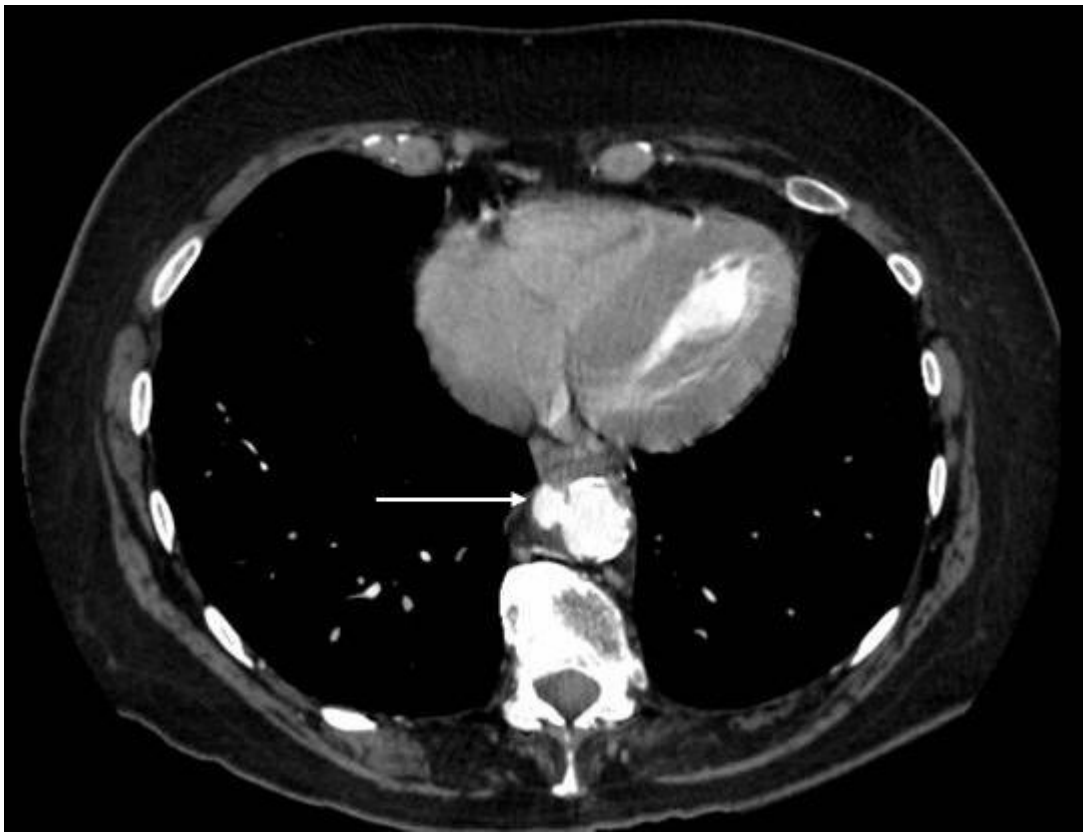
Comment

A CT angiogram (CTA) demonstrated an intramural haematoma with the lead point being a penetrating atheromatous ulcer in the descending aorta (Figure 3). Definitive endovascular management was performed and the ulcer lesion was excluded with a thoracic stent.

Intramural haematoma is a life threatening condition that requires early recognition and prompt treatment. It is a variant of classic aortic dissection in which the false lumen is represented by a haematoma in the aortic wall. The progress and management is similar to classical aortic dissection.

Due to advances in imaging technology and better understanding of acute aortic pathologies the term acute aortic syndrome has been introduced. It consists of classic aortic dissection, penetrating atheromatous ulcer and intramural haematoma.[1]

Figure 3. CTA showing a penetrating atheromatous ulcer (arrow)



Chest X-rays are a routine initial investigation for patients presenting with chest pain. Abnormal findings seen in aortic dissection and pooled sensitivities include widening of mediastinum (64%), abnormal aortic contour (71%), pleural effusion (16%) and displaced intimal calcification (9%).[2]

Although the presented sign is uncommon, clinicians need to be aware of aortic dissection chest X-rays signs to prompt initiation of advanced diagnostic imaging such as CT angiogram or transoesophageal echocardiography.

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A paradigm shift in recreational drug use: the challenge of legal highs in New Zealand

Over recent months there has been a wave of public concern over the unrestricted sale of Kronic in New Zealand. Kronic is one of at least 80 synthetic cannabis products identified by the Ministry of Health comprised of vegetable matter infused with different synthetic cannabinomimetic substances.[1]

Some compounds (i.e. CP 47,497) have already been deemed illegal in New Zealand under the Misuse of Drugs Act 1975 (MODA) drug analogue provisions as they are considered similar in chemical structure to THC.[1] The most common compounds currently used in New Zealand are JWH-018 and JWH-073.[1] Many countries have prohibited JWH compounds including Australia, the United Kingdom, France and Germany.[1]

The health effects of synthetic cannabis include cardiovascular problems, panic attacks and loss of consciousness, and some users have required hospitalisation and artificial ventilation.[2] Very little is known about the toxicity of these compounds and their long term cumulative effects.[2,3] There is no research on the prevalence of use and related harms in New Zealand.[1]

Those who can recall the New Zealand experience with the legal market for benzylpiperazine (BZP) party pills in the mid 2000s[4] may be feeling a level of frustration that the same people are again making considerable profits from the sale of largely unknown substances.[5]

Synthetic cannabis products have been sold from a range of convenience stores for a number of years without restrictions. In the case of BZP, age restrictions and the eventual prohibition took years to enact, giving sufficient time for a small number of entrepreneurs to accumulate considerable financial returns. Many countries worldwide have reported the emergence of new psychoactive substances for recreational use.[6] In Europe, there were 40 notifications of new drugs in 2010, up from 24 in 2009 and 13 in 2008.[7]

In May of this year I attended the First International Meeting of 'new drugs' (i.e. so called legal highs) organised by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). In the closing address of the meeting it was concluded that we are witnessing a 'paradigm shift in drug use' driven by globalisation and advances in information technology.[3]

Controlling these new substances presents considerable challenges due to the ease with which new uncontrolled compounds can be created and modified, the difficulty of regulating internet marketing and sales, the willingness of suppliers to misrepresent the purpose of substances (e.g. mephedrone sold as 'bath salts'), the financial expense of forensic chemical analysis of products and the slowness of the legislative process.[3,8]

The effectiveness of drug control statutes can be greatly enhanced by introducing drug analogue provisions which cover all drug types that are 'structurally similar' to a scheduled drug, as has been done with MODA, although such blanket controls can sometimes capture entirely harmless substances.[9]

There was considerable interest at the EMCDDA meeting in the proposed New Zealand 'restricted substances' regime. The 'restricted substances' regime was established in 2005 and essentially allows drug types deemed by the Expert Advisory Committee on Drugs (EACD) to be 'less than moderately harmful' be continued to be legally sold subject to certain regulatory conditions, such as age, advertising and place of sale restriction.[9]

Over the past three years, the EACD has recommended that two drugs (i.e. salvia divinorum and 1,3 dimethylamylamine (DMAA)) be placed in the restricted substances category.[10,11] The JWH synthetic cannabis compounds appear to be also destined for the restricted substances category. It is planned to make the restricted substances category operational in the next few months launching a regulatory framework which will cover a whole new sector of legal highs.

The introduction of the restricted substances category raises a number of concerns. Firstly, the wider debate about the wisdom of a legal highs sector is yet to be had in New Zealand. The restricted substances category will introduce a whole new group of legal intoxicants to join alcohol and tobacco. These are the same two legal drugs which we still continue to struggle to control, particularly in regard to adolescent use (despite age restrictions), and that impose considerable health and social costs in New Zealand. A previous study of New Zealand's experiment with legal BZP party pills found 49% of males aged 20-24 years had used BZP party pills in the past year in 2006.

The establishment of the restricted substances category will be seen by many entrepreneurs as an opportunity to get a piece of a new lucrative market which may rival alcohol and tobacco. Secondly, many technical reviews of these new drugs acknowledge they are relatively new compounds and there is limited scientific research on their toxicity.[2] A simple precautionary principle would seem to indicate we should prohibit their sale until sufficient research evidence evaluating their health risks is available. Thirdly, advocates of the legal highs industry commonly argue the value of legal highs is they provide a safer alternative to illegal drugs.[1] It is just as plausible that legal highs actually introduce adolescents to the use of more harmful illegal drugs. For example, two-thirds of those who used BZP in 2006 were also using other illegal drugs. Fourthly, there is some evidence that prohibition of these substances is actually a pretty effective response.

The last year use of BZP in New Zealand declined from 15% in 2006 to 3% in 2009 following the ban of BZP in April 2008.[12] The principle attraction of BZP appeared to be that it was legal, cheap and easily available, and the prohibition effectively undermined these advantages.

I have advocated for the development of an alternative regulatory framework for legal highs based on a 'reverse onus of proof' principle where instead of the regulator chasing the seller of new substances (often allowing years of profits) the seller would have to provide advance evidence of the safety of their product and their ability to sell

substances responsibly before any product could be sold.[9] However I think the more important issue that needs to be more widely debated in New Zealand is do we even want this new sector of legal intoxicants?

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Seroprevelance study of pandemic strain influenza A H1N1 (pH1N1) in Wellington children: the usefulness of testing children in a hospital setting

During the first wave of the H1N1 pandemic in the winter of 2009 Wellington Hospital experienced high hospitalisation rates with pH1N1 infections when compared to elsewhere in New Zealand.[1,2] This suggested a high degree of circulation of the virus in the community but it was important to assess influenza seroprevalence in children to prepare for a potential second wave expected in the winter of 2010. This study was designed to inform clinical decision-making with regard to contingency planning, and we also wished to trial a method of recruitment targeting children already requiring blood tests in a hospital setting.

Children having blood tests taken for any clinical indication (both acutely and in the outpatient department) at Wellington Children's Hospital were tested opportunistically for influenza antibodies. This approach was taken due to the difficulty in obtaining blood for testing in younger children, who seldom have blood taken in general practice. With the parent's consent, blood was taken for H1N1 serology in addition to other clinically indicated blood tests. Serum was analysed at the Institute of Environmental Science and Research laboratory using a standard haemagglutination inhibition assay. Titres of ≥1:40 were considered to indicate immunity.[3] The study was terminated when it became apparent that a second wave of pH1N1 hospitalisations had begun.

Of approximately 680 children aged 0-16y undergoing routine blood testing between 16th April and 30th June 2010, 100 children were enrolled in the study. Two children were excluded due to insufficient residual blood for testing and 16 reported prior pH1N1 immunisation. Of the remaining 82 patients, 47 (57%, 95% confidence interval 47-67%) demonstrated immunity to pH1N1—a prevalence higher than many comparative studies.[4–6]

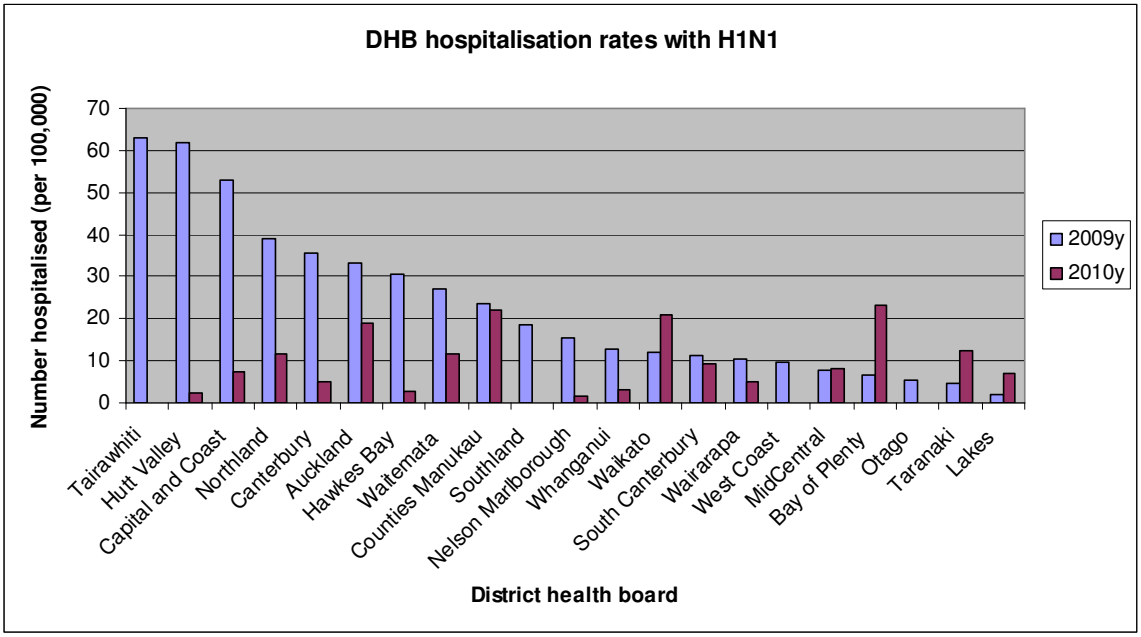
Low numbers prevented the detection of any statistically significant differences in seroprevalence by ethnicity, age, number in the household, history of prior influenza immunisation and parental report of an influenza-like illness in the winter of 2009. There was a trend towards higher positive rates in Pacific Island (71%) and New Zealand Maori (67%) than New Zealand European children (53%), which mirrored Wellington hospitalisation data1. None of the study patients with symptoms of febrile respiratory illness tested positive for influenza by PCR.

Undertaking research that requires blood tests in younger children is difficult, but is made easier if the child is already undergoing a blood test. Testing only children who were already having bloods taken was an attempt to address ethical and consent issues, as well as to recruit participants rapidly and provide data for healthcare planning. In retrospect the relatively low recruitment rate might have been improved by a greater level of engagement with the clinical staff involved in assessment and

phlebotomy. The study provided timely results and was relatively inexpensive, with the only significant cost being the serological testing.

The preliminary results of this study confirmed our suspicion that the Wellington child population had been extensively exposed to the first wave of pHINI, and suggested that paediatric hospital services were less likely to be so hard hit in 2010. Fewer Wellington children were in fact hospitalised with pH1N1 in the second wave that occurred in the winter of 2010 (after the study was concluded) when compared to areas of New Zealand that were relatively spared in the first wave (Figure 1). As predicted the areas with high hospitalisation rates in 2009 generally had lower rates in 2010.

Figure 1. Comparison of New Zealand District Health Board hospitalisations, 2009 vs 2010



A nationwide New Zealand seroprevalence study conducted between November 2009 and March 2010 recruited volunteers from general practitioner patient registers. Using the same laboratory assay, the national study found overall community seroprevalence of 26.7%, with rates in children 5–19y of 46.7%, and 1-4y of 34.3%. Given that the surveillance data were so variable throughout the country, it is reasonable to expect a higher local level of immunity in harder hit areas, as our study found.

In conclusion, the findings of this study confirm that the likely explanation for the high paediatric admission rate in the Wellington region with pH1N1 in the winter of 2009 was the high rate of the virus circulating in the community. The method of enrolment provided relevant, low cost and timely data, and is likely to be useful in the future.

Acknowledgement: Thanks to Sue Huang, Institute of Environmental Science and Research, for serology testing.

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Ethics: Approval was gained from both the Central Regional Ethics committee of the New Zealand Ministry of Health (CEN/10/02/06) and Capital & Coast DHB Research Advisory Group Maori (RAG-M 2010/84).

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Are healthy people being manipulated into becoming chiropractic clients?

A number of concerns around chiropractic practice have been raised recently.[1] Another concern is the use of unproven diagnostic techniques which can produce false diagnoses for which patients are told that they require often lengthy courses of treatment. Such practices have been described recently by a former president of the Chiropractors Registration Board of Victoria (in Australia), who said that some chiropractors misuse equipment such as thermography, and "*phrases such as ...'attract new patients' and 'keep your patients longer in care', are common enticements for chiropractors to attend technique and practice management seminars.*"[2]

An example of the use of an unproven diagnostic technique to generate new clients was brought to my attention recently. A healthy active 28-year-old male saw a display in a shopping mall in a New Zealand city promoting a chiropractor clinic. The display stated that they offered advice regarding a number of conditions including poor posture. Although he did not have musculoskeletal problems, as his job involved sitting for long periods, he decided to have his posture checked.

One of the staff scanned his neck with a thermography device and it was explained to him that hot areas represented in red were areas of abnormal stress. The staff member appeared shocked by the scan results and the young male became increasingly concerned when he himself saw that some readings appeared to go 'off the scale'. The staff member said that the reading was really high in certain areas of the neck and suggested making an appointment with one of their chiropractors. He was given a form to complete and bring to the consultation which included a signed consent to "any radiographic examination that the doctor deems necessary". After receiving advice from a medically-trained doctor, he cancelled his appointment.

Although the report described above refers to a single episode, there is good reason to believe that such practices are widespread, based on chiropractic websites and advertisements and the comments quoted above. This raises a number of medical and ethical concerns related to chiropractic practice.

Firstly, thermography is not a valid diagnostic technique. The American Medical Association has concluded that *"...in view of the lack of sufficient proof of effectiveness . . . the use of thermography for diagnostic purposes cannot be recommended*"[3] and the American Academy of Neurology has stated that thermography has not been proven useful as a screening test for patients with back or neck pain.[4]

Secondly, there is no good research evidence to support the use of chiropractic neck manipulation for any medical reason.[5] In particular, there is no evidence to support its use in people with no known neck problems, but who have certain readings as recorded by thermography.

Thirdly, chiropractic manipulation of the neck is strongly associated with severe adverse effects including stroke and is associated with numerous deaths.[6,7] It is not known in this case if the man would have been informed of the possible risks, but it is unlikely given that the New Zealand Chiropractic Association argues that no such link exists,[8] and the clinic's website describes these safety concerns as “junk science”.

Therefore this case describes the use of an unproven diagnostic technique, leading to an incorrect diagnosis of a musculoskeletal problem in an asymptomatic individual resulting in worry, unnecessary cost, and in all likelihood, unnecessary X-rays and a prolonged course of a treatment that is not only unnecessary but also could lead to life-threatening adverse effects.

Patients rightly assume that any diagnoses made by healthcare professionals, particularly those who call themselves doctors, are accurate and that any recommended treatments are supported by clinical research evidence, have a positive benefit/risk profile, and are, above all, necessary. The motive behind this practice appears to be to generate clients from healthy individuals.

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Colchicine prescribing in patients with gout

We wish to comment on the recent Medsafe Prescriber Update regarding colchicine (Colchicine: Beware of toxicity and interaction, March 2011). We acknowledge the importance of careful dosing of colchicine for acute gout, as outlined in the New Zealand Rheumatology Association position statement on the use of colchicine.[1] However, this agent (used at appropriate doses) remains a very important drug for management of acute gout in Aotearoa New Zealand.

This is particularly the case for patients with co-morbidities such as diabetes, renal impairment and peptic ulcer disease, where alternatives such as non steroidal anti-inflammatory drugs and prednisone may cause significant toxicity. Colchicine at low dose has been shown to be effective and safe in a recent clinical trial of acute gout.[2] We also note that a recent study of colchicine prescribing in South Auckland has shown that excessive colchicine dosing is extremely uncommon.[3] We are concerned that the recommendation that "colchicine....must be used with extreme care" is excessively alarmist, and may discourage practitioners from prescribing this very useful drug for acute gout.

Low dose colchicine also has a central role in gout prophylaxis; to prevent flares of gout when patients start urate-lowering therapy such as allopurinol. The use of low dose daily colchicine prophylaxis for at least three months following initiation of allopurinol is supported by clinical trial data and is endorsed by the European League Against Rheumatism and the British Society for Rheumatology.[4–6] Numerous studies in Aotearoa New Zealand have shown that allopurinol is under-prescribed in patients with gout, leading to ongoing poor disease control and risk of joint damage and disability.[7–9] A major reason for this is the exacerbation of gout flares that occur when starting allopurinol. These flares are significantly reduced by co-prescription with low dose colchicine.[4,10]

Therefore, we are concerned that the Medsafe Prescriber Update will discourage use of low dose colchicine for gout prophylaxis, which in turn will lead to lower uptake of allopurinol, with the attendant consequences of work absences, increased health disparity, joint damage, renal impairment and increased risk of cardiovascular disease and premature death.

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THE NEW ZEALAND MEDICAL JOURNAL
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The "Twin Study" and the misunderstanding of epidemiology that clouds occupational associations and low back disorder

The role of occupational exposures in the incidence of low back pain (LBP) has always aroused much discussion. Historical texts such as *The Diseases of Occupations*[1] and *Industrial Maladies*[2] report associations that were later discounted and then re-accepted as epidemiological techniques are explored and refined.

Most practitioners involved in the occupational field have relied on the 1997 NIOSH publication *Musculoskeletal Disorders and Workplace Factors (p97–141)*. This was a review of epidemiological studies that reported "strong evidence" of an association between "work related lifting and forceful movements" and low back musculoskeletal disorder (LBD) and a further association with "whole body vibration" exposures. "Evidence" was also reported between "heavy physical work" and "work related postures" and low back disorder.

The advice given to employers in at risk industries, and to individual employees with significant back pain, has been complicated by recent decisions of the Accident Compensation Corporation (ACC) which have effectively denied any association between work activities and the development of LBD. Instead the hypothesis that has been offered is that this condition is genetically based, and would have occurred regardless of their occupational exposures. This hypothesis is based almost exclusively on the Twin Spine Study,[3] and the ACC Review process finds the contrary scientific evidence unconvincing.

The Twin Spine Study was a series of studies of the determinants of lumbar disc degeneration in 147 monozygotic and 153 dizygotic exposure-discordant male twin pairs drawn from the population-based Finnish Twin Cohort The investigators estimated that 61% of the variance in disc degeneration in the T12-L4 region was explained by familial aggregation, while only 16% was explained by age and occupational physical loading together, and concluded that "*disc degeneration appeared to be determined in great part by genetic influences*".

While these twin studies have been influential, the interpretation that most disc degeneration is primarily genetic is based on a misunderstanding

Variation is not the same as causation, and heritability is not the same as genetic determination.[4] In twin studies heritability estimates are based on comparisons of the variation in disease across twin pairs, but the percentage of population variation in a disease due to a particular exposure or trait is often confused with the proportion of disease explained by this exposure or trait.

The Twin Spine Study attempts to partition the population variability observed into separate components that add up to (at most) 100%. However when we consider *causation* rather than *variation* there is no requirement for the attributable fractions for each risk factor (genetic and environmental) to sum to 100%.

One example is phenylketonuria (PKU).[5] PKU results from a single genetic variant that leads to deficient metabolism of the amino acid phenylalanine (and its heritability is essentially 100%), but the disease only occurs when both the genetic variant *and* the environmental exposure (i.e. dietary phenylalanine) are present. The *causation*, therefore, is both 100% genetic (as 100% of cases could be prevented by removing the mutation) *and* 100% environmental (as 100% of cases could be prevented by reducing phenylalanine in the diet).

For example, in a population where everyone smoked one pack of cigarettes a day, smoking would not account for any of the population variation in lung cancer incidence, since smoking rates were the same everywhere. The population variation would appear to be explained by genetic variation—i.e. individual susceptibility to tobacco smoke. However, 95% of lung cancer cases would be caused by smoking, and would be prevented by preventing smoking.

Moreover, most common human diseases are far more complex than PKU and result from multiple genetic and environmental risk factors. Each factor makes a separate contribution to the disease process, and there are also complex gene-environment interactions (e.g. between smoking and genes that affect susceptibility to tobacco smoke).

Subtle differences in genetic factors cause people to respond differently to the same environmental exposure, and genetic variations influence a person's susceptibility to environmental factors. It follows that genetic risk for disease is modifiable in an environment-specific manner, and that while an individual may inherit a predisposition for a disease they will never develop the disease unless exposed to the appropriate environmental trigger(s).[6]

The finding of the Twin Spine Study that 61% of the *variance* in disc degeneration is explained by familial aggregation does not mean that 61% of chronic low back pain is *caused* by genetic influences.

In fact this does not tell us anything about what percentage of cases are caused by genetic factors, or what percentage are caused by environmental factors (and could be prevented by removing these environmental causes). In misinterpreting this study, ACC is confusing two completely different sets of numbers—the % of population variation that is explained by variation in the environment, and the % of cases that are caused by environmental factors.

There is ample evidence, including that from occupational epidemiological studies conducted in heterogeneous populations, of interactions between a range of factors (mechanical, traumatic, nutritional and genetic) playing a role in the disease process that results in lumbar disc degeneration and chronic low back pain.[7,8]

LBD, like all occupationally acquired medical conditions arises as a consequence of a multifactorial mosaic of influences. This single review by Battie et al of their own work utilising dated MRI scanning findings does not invalidate over a century of clinical observation and multiple quality epidemiological findings.

LBD is no different in this mixture of genetic and environmental influences from other occupational conditions such as allergic asthma, the sensitivity to noise induced hearing loss and angiosarcoma secondary to poly vinyl chloride exposure.

Ignoring the link between occupational tasks and subsequent clinical conditions will also break the cycle of occupational task / environment analysis and subsequent process, tool or environmental improvement leading inexorably in the medium term to increased rates of occupational conditions, worker misery and compensation demands.

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Spigelian hernia secondary to trauma in an adult patient

A 36-year-old female patient sustained blunt abdominal trauma after a mountain bike crash, when the end of a wooden stump hit her abdomen. She had a 4cm diameter bruise, and tenderness in the left upper quadrant. Previously she had had an umbilical hernia repair and lower uterine segment Caesarean section (LUSCS).

A CT scan (see Figure 1) demonstrated a small left-sided defect between the lateral edge of the left rectus abdominis muscle and the linea semilunaris. Soft tissue contusion overlying the hernia and a probable haematoma of the Psoas were noted along with a small amount of free fluid.

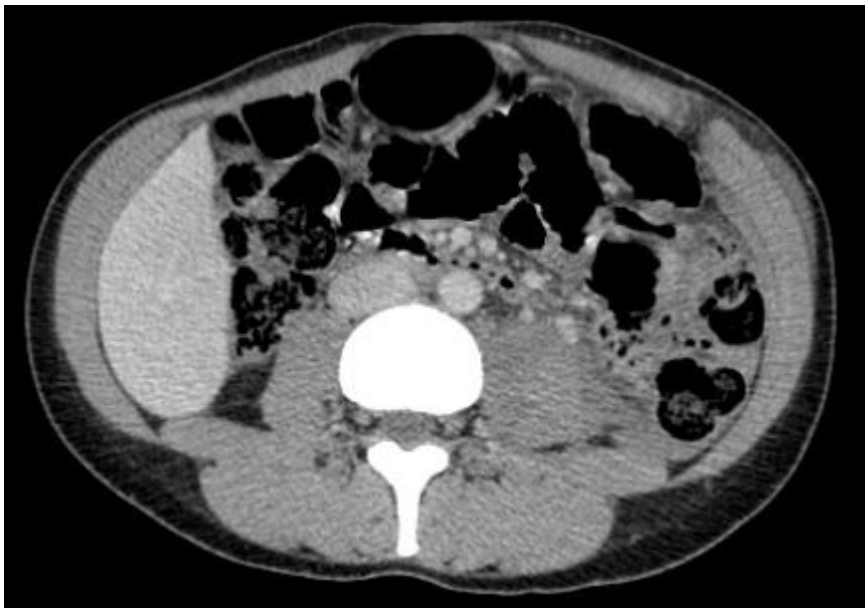
By the next day a lump consistent with a Spigelian hernia was apparent in the area of injury just lateral to the left rectus abdominis. An abdominal binder was prescribed and the patient was discharged with minimal pain after 2 days.

At follow-up 3 months post-injury her hernia had reduced in size clinically and was asymptomatic. By 6 months post-injury there was no residual defect or lump.

Spigelian hernias after abdominal wall trauma have been reported before in children.[1] Losanoff[2] described 13 paediatric patients who had hernias similar to Spigelian hernias that were related to trauma, but whether the same applies to adults has not been established.

The significance of our case is that it provides some evidence that blunt trauma to the abdomen may play and aetiological role in the development of at least some Spigelian hernias in adults as well.

Figure 1. CT scan



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The obesity pandemic, the diabetes 'tsunami', and the lack of adequate sports grounds for children in Auckland, New Zealand

New Zealand (like the rest of the OECD) is facing an increasing obesity epidemic. One of the underlying issues is the increasing number of people who are sedentary, and do not engage in physical activity.[1] According to the Public Health Association of New Zealand, "physical inactivity is third only to smoking and diet as a modifiable risk factor for poor health".[2] The New Zealand Ministry of Health has previously recognized that fostering physical activity particularly among children is an issue of priority, in view of our increasing obesity rates.[3] To this regard playing sports is likely to be the most feasible way to achieve long-term lifestyle changes, which will help us circumvent the obesity pandemic we are struggling with. However, while there is widespread recognition that it is fundamental that we encourage children to turn exercise into a normal part of their daily lives, in reality, is it possible for our children to play regular field sports throughout the year?

It is a well known and unfortunate fact that human physiology has evolved to store energy so efficiently, that with our increasingly sedate lifestyle and easily available calories, there is a resultant obesity pandemic. In the USA for example, 34% of the adult population are obese and another 34% overweight.[4] In the past three decades, the prevalence of overweight among US children has doubled among those aged 6–11 years, and tripled among 12–17 year-olds.[5] In New Zealand, a recent cross-sectional study of 2756 adults in Auckland showed that approximately 67% of Europeans and 96% of Pacific Islanders were overweight or obese.[6] Among children, data from the previous decade highlights the extent of obesity among primary school children, as 14% of those 5–11 years old were obese.[7] Nearly 30% of children in the region where overweight or obese, but this rate was approximately 50% among Pacific Island children.

Numerous health issues are associated with obesity, and the consequent global burden of obesity on health resources (both financial and workforce) is immense. For example, the annual health expenditure in the USA as a result of Type 2 diabetes mellitus (T2DM) is about US$ 194 billion, with a further US$ 105 billion in costs due to lost productivity.[8,9] It is estimated that these figures will skyrocket to US$ 500 billion and US$ 350 billion, respectively, per annum in approximately 20 years.[8,9]

To contextualise the current diabetes-associated economic losses in the USA, the catastrophic Japanese tsunami has been estimated to cost Japan US$ 309 billion in damages.[10] Therefore, one could say the USA is being hit by a diabetes tsunami every year! Fortunately, figures for New Zealand are much smaller, but nonetheless, government-funded health-care costs associated with T2DM alone were estimated at NZ$ 540 million for the 2006–7 year, and this figure is predicted to rise to NZ$ 1.78 billion by 2021 (to 15% of the health budget).[11]

T2DM is a worsening problem worldwide. While 20 years ago T2DM was rare among adults in the second and third decades of life, young adults now constitute a significant proportion (up to 30%) of newly presenting diabetics.[12] It is therefore fundamental that measures are adopted to halt this worrying trend. Lifestyle modification through increasing physical activity is a key method to prevent the development of obesity and subsequent T2DM.[13]

In the case of New Zealand, this country has a proud and keen sporting heritage. Team sports have long been a weekend family ritual, from Cape Reinga to Bluff. Collectively, field sports (e.g. rugby, football, hockey, netball etc) account for the major winter sports codes New Zealand children are enrolled in. As a result, field sports have been an effective way to engage New Zealand children in physical activity over the winter months, despite an often inclement weather. However, due to inadequate investment in sport grounds maintenance and drainage, there are frequent game cancelations, and this weekend tradition is being continually undermined. As football (soccer) has more children enrolled than any other winter code in New Zealand, we use this sport as an example.

Approximately 25,000 children 17 years of age or younger are estimated to play club football during winter in the Auckland region. Eastern Suburbs AFC (ESAFC) for example, is the second largest football club in the Auckland region and one of the largest in New Zealand, having 1600 kids aged 5–16 enrolled for the winter season. In view of our involvement with youth teams we can attest that one never hears a child complain of the cold or the rain when playing football, even if they are only taking part in a training session. Unfortunately, despite all their eagerness, playing football in New Zealand during winter is not as easy as it seems.

The core of New Zealand's football season runs from May to August, when Auckland experiences high rainfall and reduced exposure to sunlight. There is an average of 406 mm of rainfall and 395 sunshine hours over the winter months, in contrast to 231 mm and 610 hours, respectively, during summer.[14,15] As a result, sports grounds are exposed to considerably more rain water and reduced evaporation during the football season. With so many sports grounds in poor condition, these are often closed with the justification that they need to be preserved (Figure 1), and cancellations of football matches are a regular occurrence.

Notably these closures do not occur evenly throughout the region, and there is considerable inconsistency across codes. Although data are not collected on secondary school field closures, anecdotally this appears to be a rare event throughout winter. In contrast, 50% of 10th grade Tamaki League matches (for 9–10 year-olds) were cancelled due to ground closures between late June and mid-August 2010. The situation appears to have worsened in 2011, and one 11th grade rep team in Auckland City has been unable to play over 7 consecutive weekends in the June–July period. Cancellations are even more frequent during week days (to 'preserve' the grounds), so that there is a major lack of fields available for practices. As one can imagine, there is considerable frustration among families in the region. Although at first this problem appears to be a local issue of little societal relevance, it has actually much wider ramifications for New Zealand.

The ESAFC junior grounds at Madill's Farm (Kohimarama, Auckland) for example, are utilised by approximately 900 boys and girls from its junior leagues every

Saturday morning. The Auckland City Council invested in some ground improvements, particularly better drainage and sand carpeting, so that some pitches remain in good condition even after heavy rainfall. Although there is still much that could be done to further improve those grounds, cancellations are now less frequent, whereas in previous years these kids often had to stay home due to waterlogged grounds.

Figure 1. One of the most common sights on sports grounds in Auckland during winter (photo by Chris Ruffell)

Investment in improvements of sports grounds reap financial and health benefits for society as whole. For every child taking part in the matches themselves, there are on average at least one sibling and one parent present at the grounds. As a result, whenever the grounds are open and matches go ahead, there are far and wide impacts on the level of physical activity on the community as a whole. If one extrapolates this to the approximately 25,000 children playing football in the Auckland region, a single Saturday of football without cancellations is responsible for tens of thousands of people being active outdoors in a winter morning.

Creating in children the passion for such team sports at an early age may set them up for a life of regular physical activity. However, this cannot be achieved with the widespread frustration that ground closures and match cancellations are causing.

Importantly, this issue is likely to be applicable to the rest of New Zealand, where over 70,000 children 17 years of age or younger play club football in winter.

In order to prevent the increasing rates of obesity in children and adults, as well as protect the Saturday morning sports tradition generations of New Zealanders grew up on, environmental investment is critical. This issue has been officially recognized, and a 2007 Health Committee report to the New Zealand government stressed that more opportunities for children to regularly engage in physical activity are required[11]. There are national health campaigns encouraging engagement in physical activity, but it is in some ways ironic that we are told to 'push play' while we watch television. It could be suggested that investment in sports grounds that allows children to use them could be money better spent.

It appears that the Auckland City Council administers 550 summer and winter sports grounds in the greater Auckland area. Thus, a possible solution to improve these facilities may be a funding partnership between central government and councils to upgrade our sports grounds. Compared to the hundreds of millions of dollars the New Zealand government has to spend every year on health care costs related to obesity and diabetes, a more focused spending creating year-round access to sports fields seems a more sensible strategy to curb the childhood obesity epidemic. In addition, a change in attitude may be necessary, as the grounds should not be treated as pristine landscaped showpieces, but as venues for children to play sports and be physically active.

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The treatment of functional diseases of the stomach: part 2

(By Dr. W. M. McDonald, Dunedin)

Excerpt of an article that appeared in NZMJ May 1912;9(42):117–24. Continued from part 1 at http://journal.nzma.org.nz/journal/124-1338/4778/

Acute hypersecretion and acute hyperchlorhydria call only for a passing reference, The attacks closely resemble those of acute gastritis with vomiting, pain and thirst, but the vomited matter turns bitmus red, and, unlike the vomit in gastritis which is free from acid, consists entirely of acid juice. Chronic hyperchlorhydria is diagnosed by an examination of the gastric contents, when, after a test breakfast, they are found to have a total acidity, on filtration with decinormal soda solution, of 80, 100 or even higher, instead of 40 or 50, and on examination with alizarin and dimethal amido-azobenzol the increase is found to be clue entirely to HCl. Discs of egg albumen are rapidly digested and a blue or purple reaction is given with Lugol's solution (I. in K.I.) showing defective carbohydrate digestion.

The symptoms consist of a dull pain in the epigastrium coming on an hour or an hour and a half after meals and rather more diffused than the pain of ulcer. Flatulence, nausea and vomiting may also be present with acid risings into the mouth. The epigastrium is somewhat tender but the tenderness is not localised as it is in ulcer, and there is no cutaneous hyperaesthesia, hyperaemia or exaggeration of the epigastric reflex. The symptoms come on early after a bulky meal of starchy food and late after a heavy proteid meal.

The treatment consists firstly in eliminating the cause if possible and regulating the habits of the patient as regards diet, exercise, alcohol and tobacco. The teeth should be examined, all cavities treated and all deficiencies supplied by suitable dentures. It is quite common for people with no back teeth at all to assure one that there is nothing wrong with his teeth. Constipation also requires attending to—especially concealed constipation which is revealed by the indican test.

With regard to drugs there is no question that pride of place must be given to belladonna. There are very few cases which are not benefited by belladonna—of course, belladonna will not cure a diseased appendix or a duodenal ulcer. Nor will it have much effect in those cases of hyperchlorhydria which occur along with gastroptosis in weakly individuals of bad family history, with long narrow thoraces and hopelessly neurotic tendencies. But where the condition is due, as it so frequently is, to evil habits of one kind and another if the habits are corrected, the diet regulated and belladonna in suitable doses is enhibited, then it is only in rare cases that marked improvement does not follow.

The belladonna may be given in doses of 7 to 10 minims of the tincture after those meals that are usually followed by pain, after breakfast and lunch in some cases, after lunch and dinner in others. If the pain is chiefly nocturnal (although that usually indicates hypersecretion) a pill containing 1-100 gr. of atropin and ½gr. green extract of belladonna nay be given at bedtime.

Symptoms of poisoning sometimes occur but the drug need not be discontinued for a slight rash of dryness of the fauces which can be relieved by the sucking of lozenges. If there is much irritability of the mucosa, gr. 5 or gr. 15 of bismuth subnitrate may be added. If the flatulence is very troublesome menthol dissolved in spirits of chloroform will give relief.

Where the pain is very severe, chloral hydrate, tinct ferri perchlor, or tinct opii may be used. It is better to avoid the use of antacids altogether as the patient will always abuse them, and it is positively harmful to order the ordinary tonic drugs such as gentian, mix vomica, calisaya, etc., as they simply excite the further secretion of hyperacid juice.

The diet is of course all important. In a bad case where there has been a good deal of pain and vomiting it is just as well to begin with a few days' rest in bed on very low-diet and to keep an ice bag on the epigastrium. In milder cases it is sufficient to order a simple dietary. Bulky carbohydrate foods should he avoided as they excite the gastric secretion without giving it any work to do. That is why cases of hyperchlorhydria do so badly on a milk pudding diet which is so frequently ordered for them.

The diet should consist of a good proportion of proteid, but it should be light as easily digestible. All substances likely to irritate the mimosa should be avoided, such as pickles, hot sauces, condiments, mustard, curries, coarse vegetables, salads, raw fruits, seed jams, scones, pastry, soups, potatoes, coarse fibred meats, as beef or pork, and all twice cooked or highly seasoned meat dishes.

The patient should live chiefly on fish, chicken, rabbit, tripe, sweetbread, underdone mutton, cauliflower, spinach, asparagus, cream, fat bacon, butter, well cooked rice, eggs, custards, stewed fruits, and dried bread (rather than toast), Veal and soft-boiled ham have a very high acid binding quality and are recommended by Riegal, but they should be used in moderation. There should be only three meals daily, dinner preferably in the middle. of the day and no supper. When the pain comes on the patient may take half a raw egg beaten with a. little sugar. Riegel and other German authorities recommend six meals daily but I am convinced that it is a mistake to excite the gastric secretion so frequently and further the overloading of the stomach tends to produce atony of the muscle.

The best drink to take at meal times is water or, if flatulence is not a very prominent symptom, some alkaline mineral water. Tea and alcohol are best avoided altogether, but if one must defer to an acquired bad habit, a cup of weak China tea may be allowed in the afternoon and a little light wine or very weak whisky and soda with meals.

An occasional pill of mercury and colocynth should be taken and some phosphate or sulphate of soda in the morning. Some exercise should be taken every day and worry and overwork avoided, as far as possible. These patients usually get rid of their symptoms altogether when they go away for a change, and so numerous short holidays should be taken. I do not wish to quote a long list of cases but I would like to mention one or two taken at random from my case books to show how the presence of hyperchlorhydria may be overlooked, and to show further the benefit of treatment.

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Who invented and used this curious bistoury?

H Bramwell Cook

Who invented and used this curious bistoury? What was it used for? Why did a lady of high standing consent to be the first person to be subjected to its use? 'I believe I am entitled to say that there are few operations in surgery so perfectly simple in their performance, and so entirely in their results, as division of the …' (see answer below).

Figure 1. The bistoury, with its ebony handle, has a spring that keeps it closed

Figure 2. A screw (arrowed) limits the extent to which the knife (with its external cutting edge) can be opened

Answer

Simpson's metrotome, also known as Simpson's hysterotome

James Young Simpson (1811–1870) became Professor of Midwifery at Edinburgh University and was physician to Queen Victoria. Simpson considered the various causes of dysmenorrhoea to be: ovarian; neuralgic; congestive and inflammatory; gouty and rheumatic; organic; membranous; and obstructive.[1] He believed that 'the sufferings in obstructive dysmenorrhoea to arise from the uterus being driven into contractions, like those of abortion, to expel its own retained menstrual secretions.'[2]

For a long time Simpson used intrauterine bougies as the chief or only agents for the cure of mechanical dysmenorrhoea, passing in one of a larger size every three or four days. However, the length of time required to obtain a 'cure', two months or more, was a disadvantage. Then, one day, a lady of high rank came to Simpson, not prepared to commit herself to such a lengthy period.[1]

> But all of this you can effect at once, rapidly and certainly, by making incisions of sufficient depth into both sides of the cervix uteri. To make such incisions, you require to introduce this instrument or metrotome as far as the os internum, where the incision begins—at first quite shallow, and then make it deeper as the instrument is withdrawn, till at the os externum the cervix is cut across in all its thickness. An incision of this nature into both sides of the cervix makes it canal wide and pyramidal in form, so as easily to admit the finger; and in healing leaves the orifice more like that of a uterus from which an impregnate ovum has been expelled.
>
> The first patient on whom I performed the operation, in 1843, was a lady of high rank, who had been married for several years, without having had a family, and who used to suffer at each menstrual period from most excruciating pains. She had heard about the dilatation, and had got up the whole subject—anatomy and all—and came to Edinburgh with a view of obtaining relief by that means. I explained that the process would occupy a considerable period—two months or more, when she at once she said that the time was too long, and that unless she could be cured by some speedier method she would not submit to be treated at all.
>
> I then told I had often thought of dividing the cervix in such cases, and that I had never yet put it in practice, I believed it would be both a speedy and a most effectual means of procuring relief. She readily comprehended what was meant, and seeing the feasibility of the proposal, at once said that I must perform the operation on her as the first patient. I made the incisions as I have told you, but with a very imperfect instrument, and the patient was perfectly well, and about four months afterwards she had become pregnant.
>
> I was afraid that the cicatrix might prevent some obstruction to parturition, and so was Sir Charles Laycock, who was to attend her in confinement in London. I was waiting very anxiously to know what effect the operation might have had on the labour, when a letter from Sir Charles relieved me from my anxieties, for he told me that the labour had to only gone favourably, but had even been remarkably easy for a first confinement. Since that period I have performed the operation in a very great number of cases. Last week, for

example, I had recourse to it in not fewer than five cases. In fact it has come with me to be the usual mode of treatment for all cases of dysmenorrhoea depending on contraction of the os or cervix uteri.

The instrument which I use is a sort of bistoury…The canal may contract to some degree afterwards when the wounds heal, and to prevent this I have sometimes made use of sponge-tents or intra-uterine bougies. But the introduction of these instruments in such cases causes pain and irritation of the raw lips of the wound; and you will find that by opening up the wound every two or three days for a time with the finger, you can effectually prevent all union by the first intention, and in this way provide against the chances of a recurrence of the stricture; or you may touch the corners of the wound with a piece of nitrate of silver with a like good result.

Hemorrhage [sic] may sometimes follow division of the cervix…but I have never seen it occur to any very alarming extent. Inflammation may sometimes be set up and spread to the surrounding loose cellular tissue…Attended with such rare and slight risks, the operation is very safe one, and there is only this further to be observed in connection with it, that unless all the fibres are fully divided, there is sometimes a chance of the wound healing too rapidly, and the stricture being reproduced.

But altogether, I believe I am entitled to say that there are few operations in surgery so perfectly simple in their performance, and so entirely in their results, as division of the cervix uteri in cases of obstructive dysmenorrhoea and sterility.

Simpson's metrotome, or hysterotome, made by Mr Young, cutler, is shown on page 118[1] and on page 266.[2]

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

Oxford University investing in arms companies

We like to think of ancient English institutions such as Oxford University in benign terms—places of wisdom and benificence. But it has recently been divulged through the UK Freedom of Information Act that between 2008 and 2010 Oxford's endowment and capital funds were investing on average £4.5 million of their assets (through third-party funds) in BAE Systems, Raytheon, Lockheed Martin, and other UK and US arms manufactures. Taking a closer look—Oxford's holding in Lockheed Martin. In April 2010 the University held £1.4 million worth of shares in this US-based company that makes the Hellfire missile.

Lockheed Martin also make cluster munitions, which operate by releasing hundreds of bomblets over a wide dispersal area, and are illegal under UK law (like landmines, they are deemed to be indiscriminate weapons, incapable of distinguishing between military targets and civilians). Not too much dreaming spires in these horrible matters.

Lancet 2011;377:1900–1.

Mid-life and late-life raised blood pressure and dementia

Hypertension and dementia are common in the elderly and this report from Japan probes the possibility that hypertension may be causally related to the development of dementia. Their study involved 668 community-dwelling subjects (266 men and 402 women) who were not demented at the outset. Their cerebral and cardiovascular health was documented over a 17-year period, with particular emphasis on hypertension in mid-life (57 ± 4yrs) and subsequently. 76 subjects developed vascular dementia and 123 developed Alzheimer disease. Both mid-life and late-life hypertension were significantly associated with the development of vascular dementia but there was no association between hypertension and Alzheimer disease.

An important finding was that the association with mid-life hypetension was especially strong regardless of late-life hypertension. The therapeutic implication is clear. Although vascular dementia is more prevalent in Japan than elsewhere it would seem that the findings would be universally applicable.

Hypertension 2011;58(1):22–8.

Which long-acting bronchodilator is best for chronic obstructive airways disease (COPD) in older patients?

A recent abstract (NZMJ 15/4/11) reported on a study which reported that tiotropium was superior to salmeterol in preventing exacerbations of COPD. The 7000 patients were at least 40 years of age, but we note that their average age was 74 years.

This current report concerns over 46,000 patients who were 66 years or older (mean age 77 yrs). It also attempts to evaluate whether long-acting β-agonists (such as salmeterol) were better or worse than long-acting anticholinergic (tiotropium) in the

management of COPD. They report that the mortality rates were higher in those prescribed long-acting anticholinergics. Some conflict in these results—possibly explained by different end-points—exacerbations in the earlier abstract and mortality rate in the current abstract. Patient ages were similar. Another important point is that the 7000 patient study was a prospective trial and the >4600 patients report is a retrospective cohort study.

Ann Intern Med 2011;154:583–92.

Is nesiritide useful for the treatment of acute decompensated heart failure?

Nesiritide, a recombinant β-type natriuretic peptide (BNP) with vasodilatory properties, was approved in the USA in 2001 for use in patients with acute heart failure on the basis of pulmonary wedge pressure studies which were associated with a subjective decrease in patient dyspnoea. Although it has been widely used in the USA there has been criticism that it is not efficacious and may actually be harmful. This international randomised study involved 7141 patients who had either nesiritide or placebo in addition to their usual heart failure treatments.

The conclusion reached was that nesiritide was not associated with an increase or a decrease in the rate of death and rehospitalization and had a small, nonsignificant effect on dyspnoea when used in combination with other therapies. Consequently they conclude that it cannot be recommended. A cynical editorial writer points out that he recommended that it should not have been approved as far back as 2005. Fortunately nesiritide has not featured in NZ.

N Engl J Med 2011;365:32–43 & 81–2.

More about dabigatran for stroke prophylaxis in atrial fibrillation (AF)—is it cost-effective?

It seems likely that dabigatran will be used frequently in this context in view of the problems with warfarin and the recent Pharmac decisions. Consequently a review of cost-effectiveness is topical. This study from the USA used a decision-analysis model to compare the cost and quality-adjusted survival of various antithrombotic regimens. The rate of stroke risk and the potential for significant haemorrhage was also factored in their analysis.

Their conclusions were that dabigatran 150mg (twice daily) was cost-effective in AF populations at high risk of haemorrhage or high risk of stroke unless international normalized ratio control with warfarin was excellent. Warfarin was cost-effective in moderate-risk AF populations unless international normalized ratio control was poor.

Neither dabigatran 110mg nor dual therapy (aspirin and clopidogrel) was cost-effective. Thinning blood has never been easy.

Circulation 2011;123:2562–70.

THE NEW ZEALAND MEDICAL JOURNAL
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Jack Murray Costello

27 January 1930 – 26 December 2010

Jack Murray Costello was born in Gisborne and after primary school attended the Thames High School where he was Dux in 1947.

In 1948 Jack enrolled at the Auckland University College as a medical intermediate student after being advised to spread the course over 2 years due to the high competition in gaining entry to the Otago University Medical School.

Jack readily achieved the required high marks and commenced at Otago as a second-year student in medicine in 1950.

In 1954 Jack was capped MBChB with distinction in medicine. Jack did year 2 residency at Waikato Hospital followed by a period as paediatric registrar in Dunedin before proceeding to the UK where he completed his training as a paediatrician at Queen Elizabeth Hospital for Children and University College Hospital in London.

Jack then returned to NZ to a paediatric appointment at the Auckland Hospital serving as consultant and associate professor. With the rapid expansion of medical services in South Auckland Jack was requested to establish a paediatric unit at Middlemore Hospital. This he did and then following a brief period back at Auckland Hospital he retired in 1992.

Jack was an outstanding clinician gifted academically and a leader in his particular field. Jack was particularly interested in the growth of children and he furthered his study in this and other areas during a sabbatical leave in 1978.

The most lasting memorial to Jack will undoubtedly be his identification of a very rare genetic condition on which he published extensively and which is now recognised as the *Costello Syndrome*.

Jack was a very quiet, sincere and caring man with particular rapport with children.

During his training years Jack married Barbara Louch and with their two children, Deborah and Grant, the family lived for nearly 40 years in the home they loved in Kohimarama.

Jack will be sadly missed but always remembered by a large number of grateful parents and by his many friends and colleagues.

Dr Colin Hooker (retired) wrote this obituary.

THE NEW ZEALAND MEDICAL JOURNAL
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A Guide to Evidence-based Integrative and Complementary Medicine

V Kotsirilos, L Vitetta, and A Sali. Published by Churchill Livingstone Australia, 2011. ISBN 9780729539081. Contains 956 pages. Price AU$88.20

This book delivers just what the title promises. For each of 34 common medical conditions it summarises the evidence for effectiveness of a series of non-pharmacological therapies, assessing the evidence as Level 1 to V using standard evidence-based medicine criteria.

Conditions include anxiety, asthma, several cancers, diabetes, epilepsy, fibromyalgia, headaches, hypertension, infections, multiple sclerosis, osteoporosis and rheumatoid arthritis. There is an extensive appendix listing food sources of macronutrients, micronutrients, phytonutrients and chemicals. Of wider interest is an appendix that details nutrient and herb interactions with a wide range of medically prescribed drugs, listed in drug order. 'Complementary medicine' describes a broad range of therapies that may or may not have much in common, and are therefore each considered separately in this book.

The authors prefer the term 'integrative medicine' by which they mean a style of practice in which the practitioner and patient choose the appropriate medicine or therapy for their condition, where the choice is made from a wider range of options than are used in 'conventional' medical practice.

One common classification system of natural, complementary and alternative medicine divides them into five categories: alternative medical systems (e.g. homeopathy, naturopathy, traditional Chinese, Ayurveda); mind-body interventions (e.g. counselling, patient support groups, prayer, art, dance, music); biologically based therapies (e.g. herbs, foods, vitamins); manipulative and body-based methods (e.g. chiropractic or osteopathic manipulation); and energy therapies (e.g. therapeutic touch, magnetic fields).

By addressing each therapy and each condition individually, and using standard evidence-based medicine 'level of evidence' criteria, the authors are open to promoting specific therapies for specific conditions while recommending that other therapies be abandoned. Furthermore, in their evidence summaries and their 'clinical tips for patients' summaries they pay considerable attention to lifestyle factors including sleep, sunshine, physical activity, stress reduction, breathing, fun, smoking and alcohol.

The book is produced to a high quality by a prominent academic publishing house, supplemented by web access to additional material including 'clinical tips' handouts for patients and downloadable slides of figures and illustrations.

The authors reasonably claim that conventional practitioners have a legal and ethical obligation to know of the potential harms from interaction between the pharmaceuticals they prescribe and (widely used) complementary medicines, and also to inform their patients of evidence-based effective complementary therapies.

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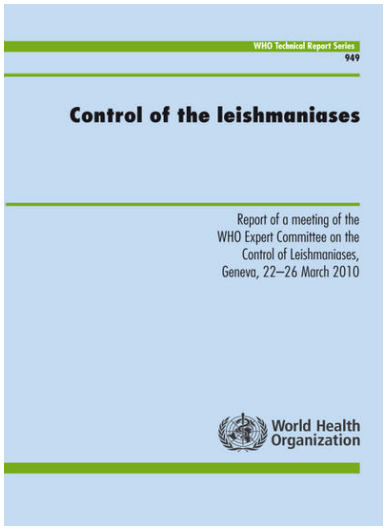
THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Control of the Leishmaniases: Report of a Meeting of the WHO Expert Committee on the Control of Leishmaniases. WHO Technical Report Series, No. 949

Published by World Health Organization (Geneva, Switzerland), 2010. ISBN-13 9789241209496. Contains 199 pages. Price US$30.00

Leishmaniasis rarely arises in clinical practice in New Zealand but there is a trickle of refugees from Afghanistan and travellers from South America or the Mediterranean region who present for diagnosis and treatment.



Because it seldom seen, it is regarded here as a curiosity for the infectious diseases cognoscenti, but from a global perspective Leishmania occurs among the poorest of the poor and has shown a troublesome ability to spread and cause epidemics.

Visceral Leishmaniasis almost disappeared from the Ganges-Brahmaputra basin with the malaria eradication programme of the 1950s but has returned since then, and civil war has led to epidemics in the Sudan causing thousands of deaths.

The latter epidemic has spread to Ethiopia and coinfection with HIV has led to progressive spread into other regions.

In South America several species have adapted to deforestation by finding new vectors and reservoir hosts leading to increasing numbers of cutaneous and mucocutaneous cases in the region. Because of the persistence of Leshmaniasis, WHO convened an Expert Committee on the Control of Leishmaniases in March 2010, to review our understanding of this disease and point the way forward. This book is the result of these deliberations.

The most important conclusion is that control is feasible with our current tools but there is a crucial lack of finding, commitment and collaboration. This is not surprising but a depressingly familiar story, as the basic biology, treatment and control measures have been understood for close to 100 years. Indeed trivalent antimonials were introduced for treatment in 1912.

Despite this there have been significant advances made in the last 20 years since WHO last produced a technical report on Leishmania, ranging from new rapid diagnostic tests for visceral leishmaniasis, DNA bases typing systems to new drugs which are expertly and objectively reviewed. As a technical report it is an admirable low cost, practical, how to, strategy document by the world leaders in the field. There are no photographs but some maps of geographic distribution of disease and occasional line drawings are included.

This report is essential for anyone interested in international health and valuable for microbiologists and clinicians dealing with clinical disease.

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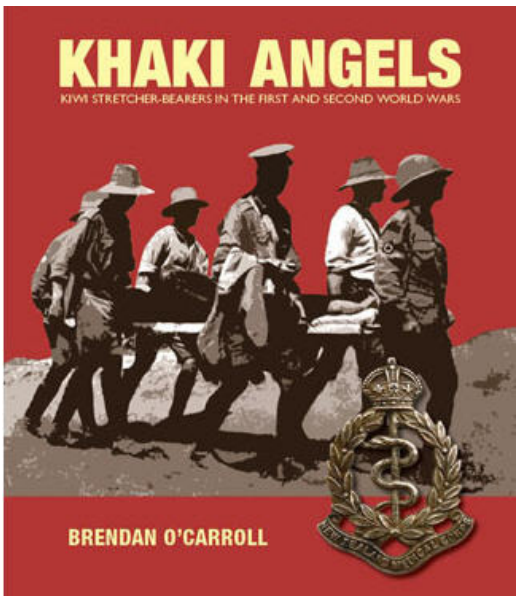
THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Khaki Angels: Kiwi stretcher-bearers in the First and Second World Wars

Brendan O'Carroll, Published by Ngaio Press, Oct 2009. ISBN 9780958285544. Contains 208 pages. Price NZ$54.95 + postage

Flags flying, bands playing, wonderful camaraderie and the anticipation of great adventure in places most would only have read or dreamt about were the anticipated attractions for many young men at the outset of the world wars, but the long grim reality was ugly, brutal and obscene. *"Anyone who has ever looked into the glazed eyes of a soldier dying on the battlefield will think hard before starting a war."*



This book is about first-aid trained stretcher bearers, the unsung heroes attached to the field ambulances who went into the action carrying only a stretcher, a bag of field dressings, scissors and simple medicines, and who saw equally to the needs of both friend and foe.

With text, photographs, cartoons, diagrams and copies of telegrams, letters and documents, this book is a remarkable account of the horrors of war, while inspiring respect and admiration for the bearers who were at even greater risk of becoming casualties themselves.

The illustrations are outstanding and an initial review of these encouraged a detailed read of the well written text with its information about the weapons and wounds of the Great War and World War II, frontline conditions, individual campaigns and battles, and diaries and letters home revealing the soldiers' disillusionment with wars and their organisation.

Khaki Angels will enlighten a wide range of readers, and for war historians, Brendan O'Carroll has preserved an important record.

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