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# Six things you need to know about pain

**A MAP to mental health:** the process of creating a collaborative advance preferences instrument

Creaky voice or extreme vocal fry in young women

The first analytic evidence for socio-economic gradients in 1918 pandemic influenza mortality rates for New Zealand

Update from the New Zealand Familial GI Cancer Service 2018

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## Neonatal conjunctivitis in the New Zealand Midland region

Samuel Newlands, John Dickson, John Pearson, Chris Mansell, Graham Wilson

Neonatal conjunctivitis refers to any conjunctivitis (red and sticky eyes) occurring in the first 28 days of life; it is a specific entity distinct from conjunctivitis in older infants because it is often the result of infection transmitted from the mother to the infant during delivery. These include the sexually transmitted infections *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Nucleic acid amplification testing (NAAT) (or PCR) is a special technique to amplify the DNA of an organism instead of growing it; it is a much more accurate test for *Chlamydia*. The NZDep2013 is a deprivation score linked to an individual's domicile (residence). It ranges from 1 to 10, where 1 represents the areas with the least deprived scores and 10 the areas with the most deprived scores. This score is independent of ethnicity.

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## A MAP to mental health: the process of creating a collaborative advance preferences instrument

Jessie Lenagh-Glue, Anthony O'Brien, John Dawson, Katey Thom, Johnnie Potiki, Heather Casey, Paul Glue

Advanced Directives are documents that mental healthcare consumers can create, to list treatment and support preferences when they become unwell. Advanced Directives are seldom created in New Zealand as service consumers report these are often ignored by clinicians. We developed a document and a process for creating an advanced directive, based on surveys with service consumers and clinicians. We have called this a MAP (Mental-health Advance Preferences statement). Both groups reported strong overall support for advance directives, particularly around items concerning personal support at difficult times. There was a strong difference of opinion between clinicians and consumers on whether the Mental Health Act powers should be able to override the consumer's instructions. Using peer support workers as facilitators may be an important step in successful completion of an advance directive.

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## Hepatitis B virus-related hepatocellular carcinoma presenting at an advanced stage: is it preventable?

Thomas Mules, Ed Gane, Oonagh Lithgow, Adam Bartlett, John McCall

This study evaluated which factors are associated with late presentation of hepatitis B (HBV) related hepatocellular carcinoma (HCC) by retrospectively reviewing all cases of HBV-related HCC diagnosed with late-stage/incurable HCC in New Zealand between 2003 and 2017. This study found that the incidence of patients presenting with incurable HBV-related HCC is increasing, HBV-related HCC disproportionately affects minority ethnic groups, diagnosis of HCC before the diagnosis of the underlying HBV is associated with poor survival (median 90 days), and optimal HCC surveillance significantly improves patient survival. This study has highlighted the need for improved rates of HBV diagnosis, better follow-up of those infected, and the importance of optimal HCC surveillance. In New Zealand, HBV-related HCC disproportionately affects minority ethnic groups, and given the increasing incidence, provides a potential domain to reduce health inequities.

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## Creaky voice or extreme vocal fry in young women

Jeremy Hornibrook, Tika Ormond, Margaret Maclagan

Vocal fry or creaky voice is a lowered rough voice sound that is volitional and is becoming a common vocal style in some New Zealand young women. Voice laboratory studies conclude that as marriage partners, men prefer women with higher voices. Paradoxically, both men and women rate lower voices in women as sounding more authoritative. Online surveys reveal negative public perceptions of vocal fry in young women. Middle-class young women lead language change in new word expressions and speech sound changes. Their increasing prevalence of extreme vocal fry may be an equivalent voice phenomenon or fashion.

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# Six things you need to know about pain

Nicola Swain, Louise C Parr-Brownlie, Bronwyn Lennox Thompson, Ben Darlow, Ramakrishnan Mani, David Baxter

**P**ain is a big problem in New Zealand. It is going to get worse as the populations ages. Pain is the number one reason people will visit their GP. Many clinicians are not sure what needs treating and how best to treat it.

## 1. Pain is always real

Pain is a psychological event that is described in terms of actual or potential tissue damage. More importantly, pain is what the patient says it is—while expression of an individual's pain is affected by their experience and a range of other associated factors, including specific context and affective state, pain is always real.<sup>1</sup>

Pain science and research, along with clinical and subjective experience, testify to the highly variable link between reported pain and actual tissue damage. There are often significant differences between patients' pain reports and perceptions of their health providers.<sup>2</sup> Despite this, patients continue to be characterised as 'malingering' or 'attention seeking', and pejorative pronouncements are made about drug seeking or illness behaviours. To query whether a particular patient's pain is real is a nonsense. There are no objective tests for pain; it is a subjective experience, and its complexity can make assessment challenging, even when using accepted measures.<sup>3</sup> Pain is ultimately all about what we experience: looking for a proximate stimulus to validate its cause may be redundant, and exacerbate the clinical situation.

## 2. Persistent pain and acute pain need to be treated differently

Most of our personal understanding of pain is based on useful, short-term (acute) pain. Pain in this situation has a purpose: alerting us to something harmful, or potentially harmful happening to our body. In persistent (chronic) pain, the experience rarely serves a purpose and becomes a problem in itself. There have been calls for

persistent pain to be considered a disease in itself.<sup>4</sup>

Acute pain management involves treating the cause, and using analgesia to alleviate distress and promote function. A vital aspect of acute pain management is to prevent ongoing pain and disability. Persistent pain provides more challenges because the underlying mechanisms are not well understood, while the impact on daily life can be profound. Analgesic options do not always effectively treat persistent pain.<sup>5</sup> Doubts about the validity of the pain (stigma), the effect of repeated treatment failures and (often) income loss mean that treatment is neither simple nor unidimensional.

It is important to look beyond the diagnosis to the person's main concerns when providing persistent pain management. Treatments must address both pain intensity and the effects on participating in life; doing so improves quality of life and reduces costs in both economic and human terms.<sup>6</sup>

## 3. Persistent pain is extremely common and increasing

Persistent pain, defined as pain that persists for at least six months, is extremely common and affects 20.2% of the New Zealand population.<sup>7</sup> The prevalence of persistent pain is rising in New Zealand and worldwide, at least in part because pain is more common in the elderly.<sup>7</sup> Persistent pain causes the greatest loss of work productivity, accounts for 5% of all health loss and can affect all aspects of the person's life. Depression, anxiety, poor quality and quantity of sleep, impaired movements, impaired concentration, social restrictions and relationship difficulties are common comorbidities of persistent pain.<sup>8</sup> Poverty is a risk factor for persistent pain and also inversely predicts treatment outcomes.<sup>7,9</sup> The cumulative effect of persistent pain can be brutal, with the severe persistent pain life bearing little resemblance to the pain-free state.

Recognition of the high prevalence of pain has led to calls to build treatment and prevention of persistent pain into health financing and policy.<sup>9</sup> There are only two tertiary pain centres in New Zealand (Christchurch and Auckland) and this may not reflect need. Community level services are available for ACC patients but generally not available or funded by DHBs for people not receiving ACC. This means access to “better, sooner, and more convenient” pain management is scarce, particularly for people with limited personal resources. It also places an enormous burden on general practitioners, with flow-on effects throughout the health system, including emergency departments and in-patient admissions.

#### 4. Biomedical treatment has limited effectiveness

Although pain is always real, discrete structural or pathoanatomical causes are often elusive or illusory. Imaging findings once thought to be diagnostic of the ‘source of the pain’ and used to guide interventional management have been found to be common in asymptomatic individuals.<sup>10</sup> A biomedical approach that treats persistent pain by physical interventions has not reduced the burden of pain. Although surgery can be a valid treatment option for some people living with persistent pain (such as severe hip osteoarthritis), many surgical interventions often do not provide benefit to people with persistent pain commensurate with the high cost and high risk associated with these procedures. People who receive surgery for conditions associated with persistent pain frequently do not experience greater health gains than those who receive placebo procedures or well-structured conservative interventions.<sup>11</sup> It is more appropriate to manage persistent musculoskeletal pain as a long-term health condition.<sup>12</sup> High-value care for people with persistent pain includes developing shared understanding and an agreed management plan that comprises building autonomy and optimising physical activity, sleep, nutrition, stress and social participation.<sup>12</sup> To reduce the growing burden of persistent pain on people, the healthcare system and society we need to focus on providing these high-value management approaches in favour of high cost but ultimately low-value interventions.

#### 5. There are ethnicity and gender differences in perceptions and experience of pain

Persistent pain differentially affects ethnic groups in New Zealand. Pasifika and Asian populations are less likely to report pain than Europeans.<sup>6</sup> Prevalence for Māori was complex, having a higher rate when sociodemographic factors were taken into account. However, Māori, Pasifika and Asian patients are underrepresented at persistent pain services, but report higher pain levels and disability.<sup>13</sup> Culture plays an important role in the perception, experience and diagnosis of pain,<sup>14</sup> and can be harnessed for better treatment delivery. For example, tinana (physical), hinengaro (psychological), wairua (spiritual) and whānau (family) support need to be incorporated in the treatment plan for best outcomes for Māori. In addition to cultural differences, we need to better understand whether Māori, Pasifika and Asian patients experience barriers to access and transition through services.

Population-based studies show higher prevalence of persistent pain in women, and many specific pain conditions are more common in women. Experimentally induced pain such as cold pressor tests show greater pain sensitivity and temporal summation in women.<sup>15</sup> There is also some evidence which shows that healthcare providers are more likely to rate women as having less pain and be more likely to be exaggerating their pain.<sup>16</sup> Women are more likely to be offered psychological support and men more likely to be offered analgesics.<sup>16</sup>

#### 6. Pain education is lacking

Healthcare professionals need to have a modern understanding of pain for providing high value evidence-based treatments to people with acute and persistent pain. Research shows that clinicians generally demonstrate inadequate knowledge and inappropriate beliefs about pain.<sup>17</sup> Insufficient pain-related competencies may limit how well healthcare professionals provide effective treatments. Research suggests that pain education in the health professional programmes is highly inadequate.<sup>18</sup> It is thus a primary responsibility of universities providing health professional education to equip their graduates with

knowledge and skills essential for effectively managing people experiencing pain. New Zealand has an excellent postgraduate programme for health professionals to upskill in pain management. This is offered by the Department of Orthopaedic Surgery & Musculoskeletal Medicine, University of Otago, Christchurch. The New Zealand Pain Society also supports health professionals in all areas of pain research and practice. There is an urgent need to investigate how pain is being taught (ie, nature, content and learning strategies) in the New Zealand health professional curricula.<sup>19</sup> Such an investigation will help find ways to implement modernised pain education curricula including inter-professional

education opportunities<sup>20</sup> for collaboratively tackling persistent pain, a growing public health concern in New Zealand society.

In summary, pain is extremely common and increasing in prevalence in New Zealand. Pain is always real, acute and persistent pain need to be treated differently, and current biomedical treatment is often ineffective. There are differences in the way men and women experience pain, and in the experience of different ethnicities. Pain education for professionals is poor and more needs done to improve this. More research is needed in all of these areas to increase evidence-based ways of managing pain in the New Zealand population.

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**Competing interests:**

Nil.

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# Neonatal conjunctivitis in the New Zealand Midland region

Samuel Newlands, John Dickson, John Pearson, Chris Mansell, Graham Wilson

## ABSTRACT

**AIMS:** To assess the incidence of chlamydial and gonorrhoeal neonatal conjunctivitis (CON and GON), across six district health boards in the greater Midland region of New Zealand.

**METHODS:** All positive nucleic acid amplification test (NAAT) eye swabs for *Chlamydia trachomatis* and NAAT and bacterial eye swabs for *Neisseria gonorrhoeae* in infants under one year of age were retrieved from three laboratories from 2013–2016. Incidence density rates were calculated using births information from Statistics New Zealand. A subgroup analysis of Waikato and Tairāwhiti cases were further analysed.

**RESULTS:** Calculated rates for the Greater Midland region are CON, 145.9 per 100,000 births/year and GON, 3.79 per 100,000 births/year. For Tairāwhiti and Waikato, the incidence of CON is 2.5 times greater in Māori than non-Māori (95% CI 1.3–5.1,  $P < 0.01$ ). There was no significant difference in mean NZDep13 for Māori vs non-Māori. Mean maternal age at birth was 20.

**CONCLUSIONS:** Greater Midland region rates of CON and GON are higher compared to other international reported rates. For Tairāwhiti and Waikato, rates of CON are significantly higher in Māori than non-Māori, although there is no difference in mean NZDep13 scores between Māori and non-Māori. CON appears to be a condition of babies of young mothers with higher deprivation.

Neonatal conjunctivitis (NC) or ophthalmia neonatorum refers to any conjunctivitis occurring in the first 28 days of life.<sup>1</sup> NC is the most common infection of any kind in neonates, occurring in up to 10% of live births.<sup>2</sup> NC is identified as a specific entity distinct from conjunctivitis in older infants because it is often the result of infection transmitted from the mother to the infant during delivery.<sup>3</sup>

Specific sexually transmitted infections (STIs) include *Chlamydia trachomatis*, *Neisseria gonorrhoeae* and the herpes simplex virus. These may be associated with severe ocular or systemic complications. Indeed, prior to the introduction of prophylaxis with silver nitrate in 1880, NC caused by *Neisseria gonorrhoeae* (GON) was a significant cause of corneal perforation and neonatal blindness.<sup>4</sup> NC caused by *Chlamydia trachomatis* (CON) has a low risk of blindness.<sup>4</sup> However, *Chlamydia trachomatis* is still an important cause of NC as it may lead to corneal and conjunctival scarring if left untreated,<sup>3</sup> is commonly underdiagnosed,

is resistant to usual topical treatments and may be associated with pneumonitis.<sup>3</sup> In mothers who have proven STIs, the transmission to infants developing conjunctivitis is estimated to be around 15% for chlamydia<sup>5</sup> and 30–50% for gonorrhoea.<sup>6</sup> But the rate of transmission is unknown for those who have been treated.

Since 2010, two district health boards (DHBs), Lakes and Tairāwhiti have consistently had the highest chlamydia rates in New Zealand.<sup>7</sup> In those aged 15–29 years the highest estimated chlamydia rates were reported for Māori and Pacific ethnic groups.<sup>7</sup> The highest rate of gonorrhoea was reported in Tairāwhiti DHB, with 316 cases/100,000 population—more than four and a half times the estimated national rate (see Table 1 for further breakdown of DHBs).<sup>7</sup> By comparison, 2016 rates of chlamydial and gonorrhoeal infections in England were 354.7/100,000<sup>8</sup> and 59.6/100,000,<sup>9</sup> respectively, and in the US, 497.3/100,000 and 145.8/100,000, respectively.<sup>10</sup>

**Table 1:** Demographics of DHBs included in this study.

Region	Population 2016/17 +/- 500	Māori %	NZ Dep Q 5* %	2014 adult STI rates <sup>7</sup> per 100,000 population	
				Chlamydia	Gonorrhoea
Bay of Plenty	227,000	25.1	25	689	57
Lakes	105,000	35.2	35	1,144	128
Midcentral	174,000	19.9	26	695	78
Tairāwhiti	48,000	50.2	48	1,143	316
Waikato	401,000	22.9	25	661	97
Whanganui	62,000	26.5	37	702	58
Subtotal	1,017,000	25.6	28	748	96
<b>Total NZ population</b>	<b>4,794,000</b>	<b>15.8</b>	<b>20</b>	<b>629</b>	<b>70</b>

\*Percentage of population in New Zealand Deprivation Quintile 5, the most deprived quintile.

Reported rates of NC around the developed world are sparse. The UK rates of CON and GON in 2003 were 6.9 and 3.7/100,000 births, respectively, while in Ontario, Canada, 2004 combined rates of GON and CON were 4.5/100,000 births.<sup>11</sup> In the US, 2002 combined rates were 8.5/100,000 births<sup>11</sup> and 2015 rates were 2.1 and 0.2/100,000 births for CON and GON respectively.<sup>12</sup>

Prophylactic eye drops have never been formally used in New Zealand. Internationally, including North America and most of Europe, eye drops with a one and two percent silver nitrate solution have been installed into the infant's eyes at birth.<sup>13</sup> Recently, topical povidone-iodine and antibiotics including tetracyclines and erythromycin ointment have been used, due to lower rates of chemical conjunctivitis and perceived increased efficacy against CON.<sup>13-17</sup> There is however a recent trend away from prophylaxis in the developed world.<sup>18</sup>

Given this background, the publicly reported "high rates" of chlamydia and gonorrhoea infections in New Zealand<sup>19</sup> and the recent availability of more sensitive diagnostic swabs, we aimed to characterise rates of NC in a New Zealand setting. Specific aims were to estimate the rates of CON and GON and to compare rates relative to ethnicity and deprivation.

### Study methods

The Midland region of New Zealand is comprised of five district health boards:

Bay of Plenty (BOP), Lakes, Tairāwhiti, Taranaki and Waikato. Waikato, Pathlab and Midlab Central Laboratories provide for four of the five DHBs in the Midland region (Taranaki excluded) as well as Whanganui and Midcentral DHBs (Figure 1). These DHBs are included in the study as these three laboratories provide complete coverage of these DHBs. As CON and GON are relatively uncommon all six DHBs have been included to allow the most accurate rates to be calculated.

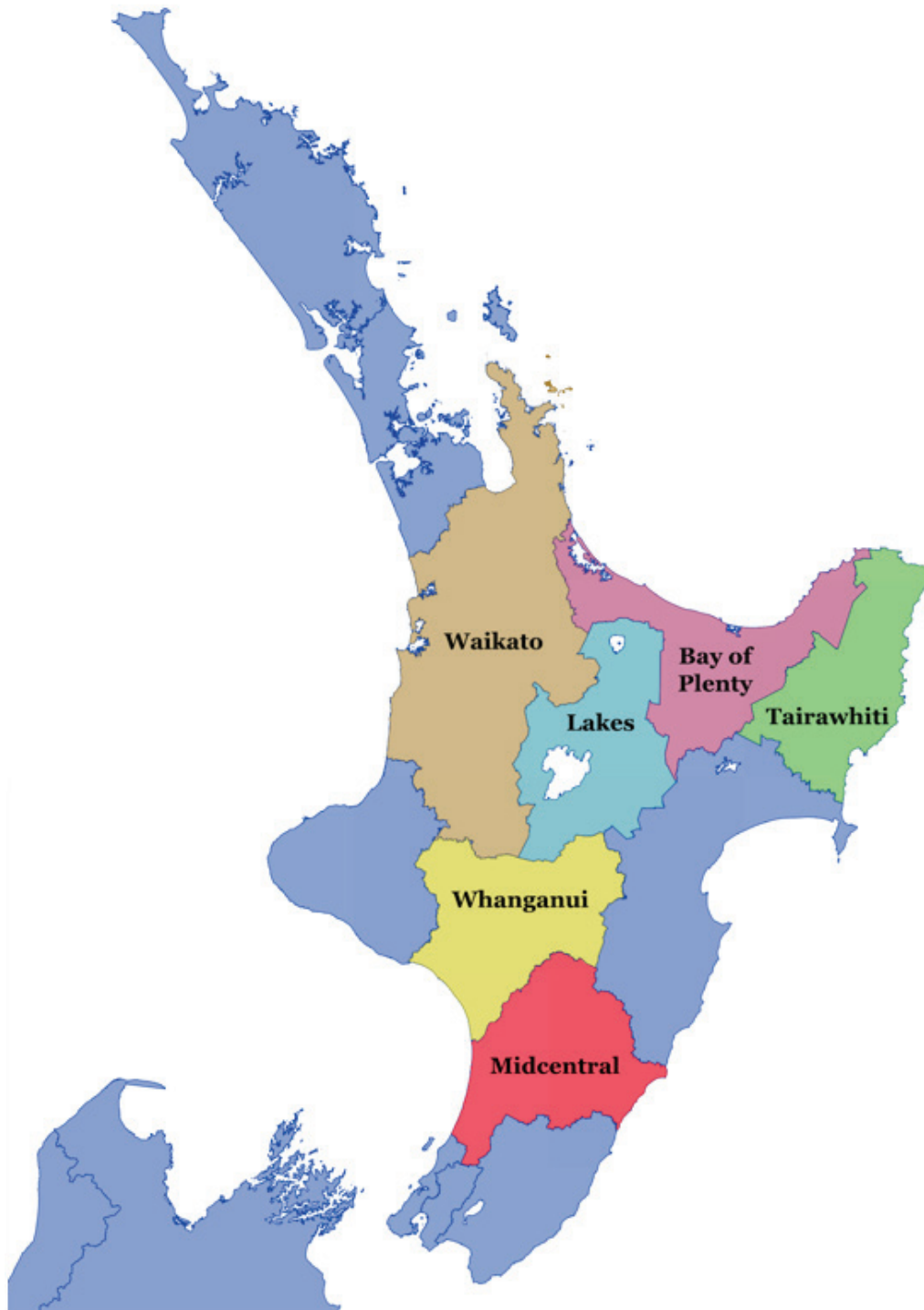
These six DHBs are notable in that they have a higher proportion of Māori, and a higher number of people living in high deprivation compared to New Zealand as a whole.<sup>20</sup> Demographics are reported in Table 1.

### Part 1: incidence of NC

A dual infection Nucleic Acid Amplification Technique (NAAT) test, a more sensitive one swab test for chlamydia and gonorrhoea<sup>21</sup> replaced culture in New Zealand in late 2012/early 2013.

A data search for all positive NAAT eye swabs for *Chlamydia trachomatis* and NAAT and bacterial culture eye swabs for *Neisseria gonorrhoeae* for infants younger than one year of age (this allows capture of all relevant results as although infants may develop conjunctivitis before 28 days, it may be some time before the correct swab is taken which identifies the correct organism) were retrieved from the Waikato Hospital

**Figure 1:** DHBs included in the study.



Source: Ministry of Health.

laboratory, Pathlab and Medlab Central from 1 January 2013 to 31 December 2016 (Medlab Central started NAAT testing in February 2013). The following variables were collected: Date of birth, Date swab taken, Chlamydia swab positive yes/no, Gonorrhoea swab positive yes/no. The National Health

Identifier number (NHI) was collected to ensure no duplication of results.

The annual birth rate, from Statistics New Zealand, was taken for each DHB—1 January to 31 December, available as total live births and live births Māori child.

## Part 2: subgroup analysis

To collect ethnicity, domicile and maternal information, positive swabs from Waikato and Tairāwhiti DHBs were further evaluated using each DHBs intranet health record, Clinical Workstation. If the patient had their NHI anonymised no other data was collected.

The following data was collected: From the infant; total number of eye swabs taken, and organisms tested for (initial misdiagnosis), ethnicity of the infant (using prioritised output),<sup>22</sup> domicile at birth. From the mother (if recorded from DHB clinical intranet); maternal age at birth, if maternal STI investigations during pregnancy and, if diagnosed with an STI during pregnancy, date of subsequent tests occurring during or after pregnancy.

The domicile (as recorded for the infant) was used to link the NZDep2013 index of deprivation score<sup>23</sup> for each infant (ordinal scale ranges from 1 to 10, where 1 represents the areas with the least deprived scores and 10 the areas with the most deprived scores). This score is independent of ethnicity.

To compare the incidence between Māori and non-Māori births, birth rates from Statistics New Zealand were used; this is the ethnicity reported by the parents at the time of birth. To align with the collected ethnicity of the case series, using prioritised output we subtracted Māori births from total births to calculate non-Māori births.

This study is registered with Waikato DHB. Ethics approval was obtained in October 2017 by the Northern B Health and Disability ethics committee full review

pathway; an amendment to include Part 2 was approved in November 2017. Māori consultation has occurred.

## Statistical methods

Incidence was calculated per 100,000 births per annum based on four years of observations and is reported with Poisson 95% confidence intervals calculated using the mid-p method. Incidence rates were compared between regions and ethnic groups with rate ratios with mid-p exact 95% confidence intervals calculated using the epitools package,<sup>24</sup> while for continuous variables (deprivation index and time) linear regression with 95% confidence and prediction intervals were calculated, population means were compared using students t-test assuming unequal variance. All analysis was conducted in R 3.4.3 (Vienna, Austria) with two-sided statistical tests considered significant at 5%.

## Results

### Chlamydial neonatal conjunctivitis

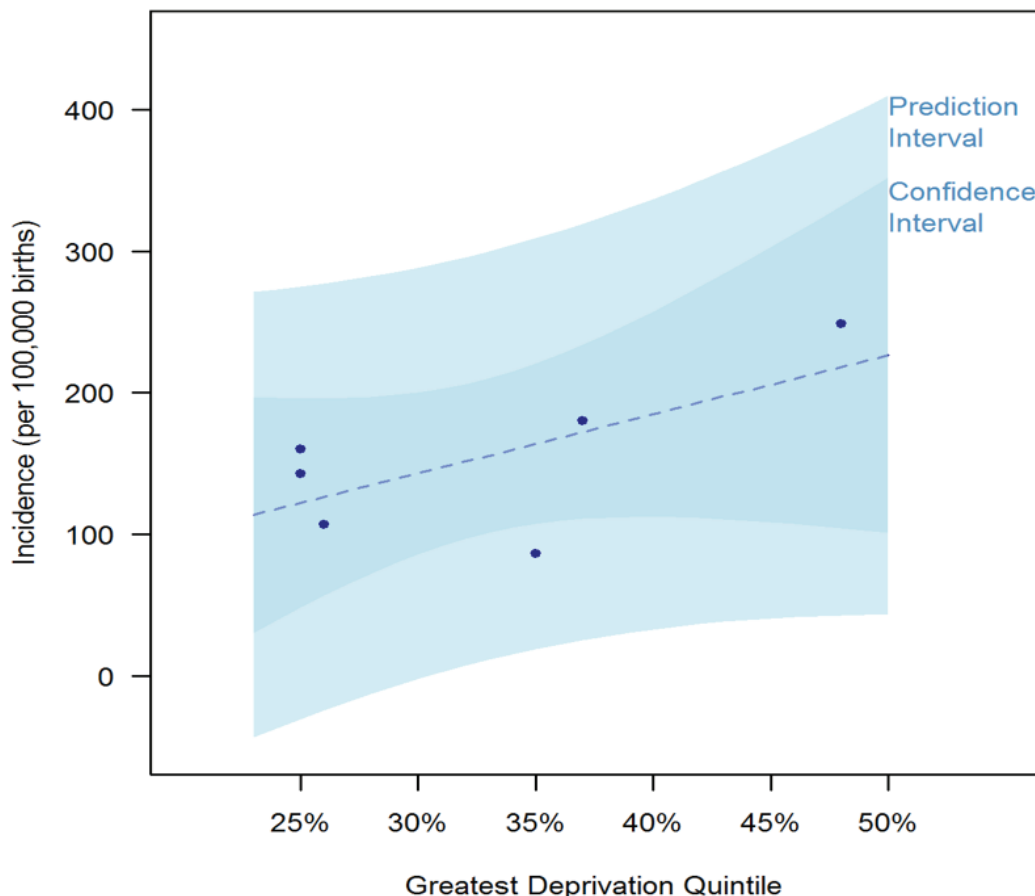
The mean incidence for the six DHBs is shown in Table 2. There was no evidence of a change in rate over time ( $P=0.8$ , linear regression).

Figure 2 shows the rates of CON for each DHB based on their percentage in the most deprived quintile. No DHBs fall outside the prediction interval, the variation in CON rates by DHB is most likely stochastic, that is we have observed no evidence of over or under performance by DHB after accounting for deprivation. However, there was no statistically significant linear relationship between incidence and deprivation ( $P=0.15$ ).

**Table 2:** Incidence of CON.

Region	Cases	Births	Incidence	
	4 years	4 years	Annual per 100,000 births	(95% CI)
Bay of Plenty	16	11,000	143.0	(84.7, 227.3)
Lakes	5	6,000	86.3	(31.6, 191.2)
Midcentral	9	8,500	107.0	(52.2, 196.4)
Tairāwhiti	7	3,000	248.8	(108.8, 492.1)
Waikato	34	21,000	160.1	(112.7, 221.3)
Whanganui	6	3,500	180.3	(73.1, 375.1)
<b>Total</b>	<b>77</b>	<b>53,000</b>	<b>145.9</b>	<b>(116.0, 181.4)</b>

Figure 2: DHB incidence vs percent in greatest deprivation quintile.



The regions studied all have greater deprivation than New Zealand as a whole, with minimum 25% Q5 deprivation.

**Part 2 results from case series Waikato and Tairāwhiti**

The specific ethnicity rates for Māori and non-Māori births for Waikato and Tairāwhiti DHBs is shown in Table 3. Non-Māori were predominantly New Zealand European and Pacifica. The incidence of CON is 2.5 times greater in Māori than non-Māori (1.3,5.1, P<0.01).

The mean number of swabs performed to gain correct diagnosis was 1.35 (median 1, maximum 3). The mean age of the infant at time of the correct swab was 16 days (median 14, minimum 1, maximum 57). The mean NZDep13 score was 8.00 (CI 7.10–8.90), median 9. There was no significant difference in mean NZDep13 for Māori vs non-Māori.

The median maternal age was 20 (minimum 16, maximum 36), (National median age of birth 30 years).<sup>25</sup> There was

Table 3: Specific ethnicity rates for Tairāwhiti and Waikato DHBs.

Location	Ethnicity	Cases <i>n</i>	Births <i>±500</i>	Incidence		Rate ratio		
				Cases/births	(95% CI)	Māori/non-Māori	(95% CI)	P
Tairāwhiti	Māori	5	2,000	255.2	(93.5, 565.7)	1.04	(0.22, 8.12)	0.96
	Non-Māori	2	1,000	233.9	(39.2, 772.8)			
Waikato	Māori	19	8,500	230.2	(142.7, 352.9)	2.70	(1.30, 5.91)	0.008
	Non-Māori	11	13,000	84.8	(44.6, 147.3)			
Total	Māori	24	10,000	235.0	(154.1, 344.4)	2.49	(1.28, 5.06)	0.007
	Non-Māori	13	14,000	94.0	(52.3, 156.7)			

no significant age difference between Māori and non-Māori. Eleven women (30%) had STI screening investigations in pregnancy, of those only one result was negative, and no repeat tests of cure were carried out on the other positive samples. Fifty-four percent (n=20) of women had no STI investigations in pregnancy. It was unknown if a further 16% (n=6) of women were investigated or not.

### Gonorrhoeal neonatal conjunctivitis

Two infants had a positive eye swab for gonorrhoea, giving a total incidence density rate for the study population of 3.8/100,000 births/year (CI 0.5, 12.5).

## Discussion

Our calculated rates for the greater New Zealand Midland region are CON, 146 per 100,000 births/year (CI 116, 181) and GON, 3.8 per 100,000 births/year (CI 0.5, 12.5). For combined Tairāwhiti and Waikato DHBs the incidence of CON is 2.5 times greater in Māori than non-Māori (CI 1.28, 5.06). Mean NZDep13 score was 8.00, there was no significant difference in mean NZDep13 for Māori vs non-Māori. Median maternal age at birth was 20. The mean number of swabs in the case series taken to gain the correct diagnosis was 1.35. This highlights incorrect testing by medical practitioners for NC in infants as some infants did not have the initial correct swab taken for NAAT testing.

Rates from the greater New Zealand Midland region are 21x higher for CON and similar for GON compared to the UK 2003 rates and are 69x higher for CON and 19x higher than US 2015 rates.

These other international studies do not state the methods of testing, collection and reporting rates of CON and GON, so it is unknown if this is the first study to calculate rates of NC using NAAT testing. Comparison of the rates in our study with these other studies should be treated with reservation.

Bacterial STI epidemiology often reflects social determinants of health, including access to quality preventative and screening/treatment services.<sup>26</sup> STI rates are generally higher in areas of greater deprivation and in more rurally isolated areas of New Zealand. In 2014,<sup>7</sup> The highest rates of genital chlamydia infections by age and sex-specific rate occurred in the 15–19 years age group in females in the Māori ethnic group (11,246

per 100,000). Rates among females were consistently higher than those of their male counterparts. The female Māori rates were two to three times greater than the estimated national rate in all three age groups. STIs also frequently co-exist, with dual infection of gonorrhoea and chlamydia present in up to 39% of cases.<sup>27</sup> It is estimated that one in five women aged under 25 years will be re-infected with chlamydia within six months.<sup>28</sup>

These higher rates of genital chlamydia in young Māori women may explain why rates of CON are higher in Māori infants and why the median maternal age of mothers affected by CON is lower than the national median birth age.

The mean NZDep13 score for the infants in the case series is eight (range 0 to 10). This indicates that the infants in this case series reside in areas of high deprivation. This is not a direct measurement of the deprivation of the infant or representative of all the infants included in this study. However, this score is consistent with the higher deprivation indices of the DHBs included in this study. Māori are more likely to reside in areas of greater deprivation in New Zealand compared to non-Māori.<sup>29</sup> As there is no statistical difference in NZDep13 scores between Māori and non-Māori this suggests that deprivation rather than ethnicity is accounting for higher rates among Māori in this case series.

Strengths of this study are that rates have been observed over four years and over 53,000 births. Conjunctivitis in a new born infant creates worry in parents, and so they are likely to seek medical advice. As GON and CON are generally resistant to the usual topical treatments, it is likely that most cases will present for eye swabs until a NAAT test is undertaken, and as NAAT is a more sensitive test, it is likely that most cases over the duration of this study have been identified. Weaknesses of this study are in the fact of its retrospective, observational nature. The regions included in this study are of a higher deprivation than the national average, so data from areas of different demographic regions with less Māori, greater migration, or the major urban area around Auckland is needed to infer national rates. Total birth number ethnicity was recorded from Statistics New Zealand, whereas for identified cases from

DHB records, only two cases of GON were identified. A larger population or longer duration study is needed to calculate more accurate rates. It should be noted that NAAT was introduced in Medlab Central in February 2013 and so cases could have been missed while uptake of the test occurred.

New Zealand guidelines<sup>30</sup> recommend antenatal screening for genital chlamydia and gonorrhoea for those that may be at increased risk of infection due to local prevalence, but don't define increased risk. New Zealand studies have shown variable rates of uptake of antenatal screening (24–61%).<sup>31</sup> Newer evidence also points to the importance of re-infection or persistent infection within three months.<sup>27</sup> It is unknown how much, if any, repeat testing occurs in pregnancy in New Zealand. We feel this study highlights the essential importance of antenatal STI screening. Some revision of the New Zealand guidelines may be needed to better define this.

If NC is suspected in an infant, both a NAAT swab and a bacterial swab are indicated to ensure timely identification of the correct organism and to allow appropriate treatment. This is especially so with the increased prevalence of drug resistant strains of *N. Gonorrhoeae*.<sup>32</sup>

In our study, CON and GON rates are higher than the US and similar to rates of GON in the UK, where prophylaxis has been abandoned. Prophylaxis is generally only effective against GON, with only marginal benefit against CON.<sup>11,33</sup> Larger studies with broader demographic coverage are necessary to make estimates for the entire population of New Zealand and to enable valid recommendations on the role of ocular prophylaxis.

Greater Midland region rates of CON and GON are higher compared to other international reported rates. For Tairāwhiti and Waikato, rates of CON are significantly higher in Māori than non-Māori, although there is no difference in mean NZDep13 scores between Māori and non-Māori. CON appears to be a condition of babies of young mothers with higher deprivation. Practitioners should be aware of this. Current guidelines suggest antenatal screening for STIs only if there is perceived increased risk. We suggest that antenatal STI screening should be routinely advised, especially for those of higher deprivation. If an infant does present with conjunctivitis, practitioners should be aware that taking a NAAT swab to test for chlamydia and gonorrhoea is of essential importance in their evaluation of the infant.

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#### Competing interests:

Nil.

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# A MAP to mental health: the process of creating a collaborative advance preferences instrument

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## ABSTRACT

**AIMS:** To document the process of developing a local advance directive for mental health care, which we are calling a MAP (Mental-health Advance Preferences statement).

**METHODS:** Data on advance directive preferences were collected from consumers and service providers using online surveys and analysed using quantitative methods.

**RESULTS:** Both groups reported strong overall support for advance directives. They particularly favoured inclusion of items concerning personal support at difficult times. Consumers strongly advocated inclusion of statements regarding treatment options. There was broad agreement that advance directives could increase consumers' sense of autonomy and empowerment, but service providers were less inclined to believe they helped consumers engage with mental health services or improve self-management skills. There was a highly significant divergence between service providers and consumers on whether the powers under the Mental Health Act should be able to override the consumer's instructions.

**CONCLUSIONS:** MAPs aimed at facilitating treatment decisions have good acceptability from consumers and mental health clinicians. The use of peer support workers as facilitators may be an important step in successful completion of an advance directive. Future research will aim to examine national implementation of MAPs.

Consumer engagement is well documented as an important step in facilitating mental health recovery.<sup>1</sup> One means of increasing consumers' experience of participation in decisions regarding their mental healthcare is through advance care planning. This has become a feature in mental health systems in the US, the UK and other European countries, and in Australia and New Zealand.<sup>2</sup> It may take the form of joint crisis plans, psychiatric advance directives, wellness recovery action plans or advance statements. The central premise is that consumers and carers are both major stakeholders in the planning and delivery of healthcare.

Studies have shown that while consumers are motivated to collaborate in care-planning, they still face substantial barriers.<sup>3-6</sup> Poor information exchange

and insufficient participation in decision-making may leave consumers feeling marginalised in both inpatient and community settings.<sup>3</sup> Similarly, Farrelly et al showed that although consumers "with psychotic disorders make clinically reasonable requests for specific treatments in crisis/relapse situations",<sup>4</sup> clinicians were ambivalent about care planning, and were concerned that consumers' choices would not be clinically appropriate.<sup>5</sup> Failure by clinicians to engage constructively in the process undermined consumers' experience of joint crisis planning.<sup>5</sup>

A systematic review by Bee et al<sup>6</sup> explored how consumer involvement in care-planning was operationalised in practice as compared to theory. Consumers reported having insufficient information and support to contribute in a meaningful way. They also

consistently reported a persistent failure to provide them with pharmacological information, or choices about their medication. Many said they lacked confidence in their ability to participate in a meaningful manner, experienced a strong power imbalance, or felt that staff displayed an “inherent disregard for their views”.<sup>6</sup> Cree reported that carers also felt that patient confidentiality was used to create a barrier between them and service providers.<sup>7</sup>

One theoretical framework used in this field is that of procedural justice, an idea derived from legal and psychological scholarship.<sup>8</sup> In the current context, this idea concerns fair processes in clinical decision making, being particularly concerned with how decisions are made, not just the outcome. The concepts of voice, dignity and respect for the consumer are central. It has consistently been found that when principles of procedural justice are followed, consumers feel affirmed and are more likely to trust the process, even if ultimately the decisions are not those they prefer. The notion fits well with the use of instruments like MAPs, where the processes of development and implementation are explicitly aimed at eliciting consumers’ preferences and following them as far as possible. Generally, research shows that adherence to procedural justice is associated with greater satisfaction with care.<sup>8–10</sup>

While New Zealand law acknowledges the right of all consumers to use advance directives (AD),<sup>11</sup> in practice there has been limited uptake of this by mental health consumers.<sup>12–13</sup> Consumers and their whānau we spoke with reported that even if they had an AD, these were disregarded by service providers or not followed during periods of crisis. Policy makers in New Zealand are conscious of the perception that the Mental Health (Compulsory Assessment and Treatment) Act 1992 (MHA) fails to comply with New Zealand’s obligations under the Convention of the Rights of Persons with Disabilities, and recent recommendations by the Ministry of Health include the need to encourage a shift towards more collaborative decision-making and a greater use of ADs.<sup>14–15</sup> This is in line with the United Nation’s Committee on the Rights of Persons with Disabilities emphasis away from substitute decision-making

towards prioritising respect for a person’s “wills and preferences”.<sup>14</sup>

The challenge, therefore, is to create an instrument and a process that will produce an advance care plan that is meaningful for all service consumers and has sufficient “buy in” from clinicians and service providers. To this end, we now prefer the term “MAP” (Mental-health Advance Preferences statement), rather than AD, as a more collaborative and less proscriptive approach.

The current paper reports on a survey designed to ascertain what consumers and providers felt was important to include in a MAP. The survey is part of a wider project to create a MAP instrument and process which will be implemented in the Southern District Health Board Mental Health Addictions and Intellectual Disability Services (SDHB-MHAID). An evaluation of this implementation will be reported in a subsequent publication.

## Method

This study was approved by the Auckland University Ethics Committee and was registered with the ANZ Clinical Trial Registry (ACTRN12618001720202). The study was informed by an earlier exploratory survey<sup>16</sup> which demonstrated strong support for the use of ADs within mental health services in New Zealand, but with limited consensus on what should be included in the instrument, and no guidance on processes for completion.

To determine what both consumers and service providers felt would be the key elements of a MAP instrument, we developed two online Qualtrics surveys, one for consumers and their whānau, and the other for service providers. The general format of the two surveys was the same. They used Likert-rated items concerning participants’ familiarity with the concept of a directive, followed by 26 questions that asked participants to rank their views—from strongly agree to strongly disagree—concerning the content, value, utility and legal status of ADs, and two questions regarding general support for ADs. The service-provider survey had seven demographic questions compared to five for consumers. Both surveys included an

open-ended question on the participant's personal experience with ADs, as well as opportunity for participants to provide free text comments about ADs. A second arm of the study was a series of focus groups for service users, their whānau and peer support workers. This was aimed at getting specific feedback on both past experience with ADs and aspirations for what a future instrument should contain. These data will be presented in a forthcoming manuscript.

Participants in the service-provider survey were recruited by email invitation. This was sent initially to all clinical and non-clinical staff of the SDHB-MHAID (approximately 700 individuals). It was followed with a reminder two weeks later. Recruitment of consumers and their whānau was coordinated by a member of the research team who is the Consumer Advisor for SDHB-MHAID. He approached coordinators of local mental health support services and NGOs, who were requested to inform their members of the survey and to distribute flyers detailing the project. In addition, an email was sent to the adult services manager and the specialist services manager who then forwarded the link to staff. The link was also sent to a list of 20–30 providers. All these providers were asked to forward the information and link to their consumers or clients. Data from the surveys were entered in an Excel spreadsheet and were analysed using a Chi<sup>2</sup> ( $X^2$ ; asymptotic, two-sided) analysis to compare the scores of consumers and service providers. Excerpts from the free text comments are included to further illustrate the findings.

## Results

### Demographics

The 23 consumer participants in the survey were almost evenly divided between men and women. Half the respondents were either current or previous outpatients of SDHB's mental health services, with the balance either previous inpatients, or reported they were in the 'other' category. Almost half the consumers had been in contact with mental health services for more than 20 years ( $n=11$ , 45.8%). The clinicians and consumers responding were predominantly New Zealand European. Half of the 75 clinicians said they currently worked in inpatient settings ( $n=37$ , 49.3%); 68%

were nurses ( $n=51$ ); and 16% psychiatrists ( $n=12$ ). Most clinicians ( $n=55$ , 73%) had been working in mental health services for more than 11 years, with the majority of those having more than 20 years experience ( $n=31$ , 41.3%).

### Knowledge of ADs

The majority of consumers surveyed (83%) were aware of the existence of ADs but only about 20% had made one personally or been involved in their use ( $n=5$ , 21%). Sixty-two percent of clinicians who responded had been involved in the process of creating an AD, while almost 15% said they had been involved in provision of services that overrode an AD.

### Content of MAPS

We divided the potential content of an AD (that we have subsequently come to call a MAP) into two separate categories: 'treatment-related options' and 'personal support choices' (see Table 1). The Likert scale was collapsed from seven down to three categories: 'agree' ('strongly agree' + 'agree'); 'neutral' ('somewhat agree' + 'neutral' + 'somewhat disagree'); and 'disagree' ('disagree' + 'strongly disagree'). Comparing service providers' and consumers' responses identified statistically significant differences for two items only: "it would be useful if consumers specified the medications they prefer not to have in their advance directives" ( $X^2=6.39$ ,  $p=0.04$ ) and "an advance directive could allow consumers to state a preference that seclusion is not used" ( $X^2=8.34$ ,  $p=0.02$ ). These were items where there was least agreement between consumers and service providers.

There was strong support for all items in the 'personal support' category from both consumers and providers. There was also strong support from consumers for all the choices listed in 'treatment options'. Consumers and providers were most strongly in agreement with the statement that "advance directives should specify persons to be notified on hospitalisation" (96%,  $n=22$  of consumers and 96%,  $n=72$  of service providers). Service providers and users also strongly agreed that ADs could specify persons they did not wish to have visit if they were hospitalised (Table 1). There were a further four categories that more than 95% ( $n=22$ ) of consumers

considered should be included in an AD: choice of support person; name of legal representative; the ability to initiate a mental health service response when they became aware of early warning signs; and detail on the methods of de-escalation preferred. More than 90% of consumer responders ( $n=21$ , 91%) also believed that an AD should list specific medications they preferred **not** to have, and 83% thought they should detail preferred medications.

While there was general agreement between providers and consumers regarding the content of ADs, Table 2 shows some significant differences in the perceived value and utility of such instruments. Although both groups agreed that ADs increase consumers' sense of responsibility, empowerment and autonomy, service providers were much less likely to agree that ADs helped consumers engage with mental health services or increased their

**Table 1:** Content of MAPS. Collapsed Likert scale (strongly agree + agree) (somewhat agree + neutral + somewhat disagree) (disagree + strongly disagree).

Treatment-related options		Agree (%)	Neutral (%)	Disagree (%)	X <sup>2</sup>	p
It would be useful if consumers specified the medications they prefer not to have in their advance directive.	Consumers	91	9	0	6.39	<b>0.04</b>
	Clinicians	64	32	4		
It would be useful if advance directives included a choice about alternatives to hospital admission.	Consumers	87	13	0	2.03	0.36
	Clinicians	75	20	5		
It would be useful if advance directives allowed consumers to initiate a mental health service response when they become aware of early warning signs.	Consumers	96	4	0	1.48	0.48
	Clinicians	87	12	1		
It would be useful if an advance directive allowed consumers to detail specific medications they would prefer to have.	Consumers	83	17	0	1.20	0.55
	Clinicians	75	21	4		
An advance directive could allow consumers to state a preference that seclusion is not used.	Consumers	83	17	0	8.34	<b>0.02</b>
	Clinicians	50	36	14		
Consumers should be able to make rank-ordered preferences among seclusion, seclusion + restraint, and sedating medication.	Consumers	65	30	4	1.78	0.41
	Clinicians	51	39	14		
It would be useful if consumers detailed what methods of de-escalation they would prefer to be used in emergency situations in their advance directives.	Consumers	96	4	0	.351	0.17
	Clinicians	79	18	3		
<b>Personal support choices</b>						
It would be useful if advance directives specified persons who consumers do not wish to visit during hospitalisation.	Consumers	100	0	0	2.31	0.32
	Clinicians	91	7	3		
It would be useful if the name of the consumer's preferred legal representative were included in their advance directives.	Consumers	96	4	0	1.96	0.38
	Clinicians	88	9	3		
It would be useful if the contact details of persons to take care of finances, dependents and pets during hospitalisation were specified in an advance directive.	Consumers	91	4	4	0.94	0.63
	Clinicians	92	7	1		
It would be useful if advance directives include options for cultural support.	Consumers	91	9	0	0.86	0.65
	Clinicians	85	12	3		
It would be helpful if advance directives specified persons to be notified on hospitalisation.	Consumers	96	4	0	0.47	0.79
	Clinicians	96	3	1		
It would be useful if advance directives included a consumer's choice of support person.	Consumers	96	4	0	1.54	0.46
	Clinicians	87	11	3		
It would be useful if dietary preferences were specified in advance directives.	Consumers	74	26	0	2.96	0.23
	Clinicians	57	37	7		

self-management skills. This was reflected in some of the free text comments included in the survey.

*I have an ambivalent attitude towards (advance directives). Whilst I see them as potentially empowering, and able to give a consumer a greater sense of autonomy/efficacy in negotiating their treatment with*

*health providers, I am also aware they can be overridden. I hate the idea of setting up a false expectation. However, I think they are under-utilised, and can be very useful in enabling people to get the kind of help they would prefer when they are unable to articulate this due to illness. [Service provider respondent].*

**Table 2:** The content of MAPS. Collapsed Likert scale (strongly agree + agree) (somewhat agree + neutral + somewhat disagree) (disagree + strongly disagree).

The value of advance directives		Agree (%)	Neutral (%)	Disagree (%)	X <sup>2</sup>	p
Advance directives increase consumers' sense of responsibility.	Consumers Clinicians	87 58	13 19	0 3	1.45	0.49
Advance directives increase consumers' sense of empowerment.	Consumers Clinicians	96 85	4 15	0 0	NC	NC
Advance directives increase consumers' sense of autonomy.	Consumers Clinicians	93 76	9 23	0 1	2.60	0.27
Advance directives help people engage with mental health services.	Consumers Clinicians	100 64	0 33	0 3	11.43	<b>0.003</b>
Advance directives increase consumers' self-management skills.	Consumers Clinicians	100 68	0 27	0 5	9.75	<b>0.008</b>
<b>The utility of advance directives</b>						
Clinicians generally follow the instructions of an advance directive.	Consumers Clinicians	14 11	82 74	5 15	2.62	0.27
Consumers would use advance directives to refuse hospital admission.	Consumers Clinicians	0 18	82 70	18 12	0.62	0.27
Advance directives are ineffective because clinicians do not know whether they have been completed.	Consumers Clinicians	27 18	64 70	9 12	1.06	0.60
Clinicians should make their own assessment about whether the instructions of an advance directive should be followed.	Consumers Clinicians	14 32	50 55	36 12	7.83	<b>0.02</b>
Consumers would use advance directives to refuse medication.	Consumers Clinicians	9 16	77 72	14 12	.69	0.71
Advance directives are necessary because mental health consumers are at risk of their rights being breached.	Consumers Clinicians	78 18	17 52	4 30	29.45	<b>&lt;0.0001</b>
<b>Legal status of advance directives</b>						
The Mental Health (Compulsory Assessment and Treatment) Act 1992 should override instructions contained within advance directives.	Consumers Clinicians	17 42	53 55	30 3	17.34	<b>0.002</b>

### Perceptions of utility

Consumers' and providers' perceptions varied concerning the utility of ADs (Table 2). Interestingly, only 11% (n=8) of service providers agreed with the statement that they generally followed the instructions in an AD, while 15% (n=11) disagreed. One provider gave the following example:

*...one consumer I have worked with several times has an advance directive that specifies which treatments are effective and tolerable for her. This has (in my opinion) really helped her to get better quickly and get out of hospital. A couple of times I have had to override advance directives that are mainly negative requests and exclude treatments that could be more effective.*

While not statistically significant, consumers were less decided on whether clinicians generally followed the provisions of an AD, with 82% (n=18) neutral. Some consumers who have ADs reported these were effective: "I have used advance directives in the past. My wishes were adhered to in my subsequent times of crisis." Others were less positive, with one consumer reporting: "I created my advance directive with non-DHB services. Unfortunately, no DHB staff follow it, and never have."

There were significant differences in the responses of consumers and providers on two items in this category: the belief that "clinicians should make their own assessment about whether the instructions of an advance directive should be followed" ( $X^2=7.83, p=0.02$ ); and the idea that "advance directives are necessary because mental health consumers are at risk of their rights being breached" ( $X^2=29.45, p<0.0001$ ).

### Legal status of ADs

Consumers and providers also differed in their views on whether the MHA should override instructions in an AD. These

differences were statistically highly significant ( $X^2=17.34, p=0.002$ ), with 42% (n=31) of clinicians agreeing that the MHA should be able to prevail, while only 17% (n=4) of consumer respondents felt this should be the case. In addition, a significant majority of consumers (n=11, 78%) agreed that ADs were necessary because mental health consumers were at risk of having their rights breached.

These findings illustrate a continuing perception that clinicians hold significant power over mental health consumers in this context. One family member of a patient who died in inpatient care said:

*Why do clinicians not offer this to all users of the service and include families in this discussion? Also, are advance directives ever respected since the Mental Health Act overrules everything and gives psychiatrists total power and control over people who are hurting? The power imbalance is huge.*

### General support for ADs

Table 3 illustrates broad support for ADs amongst the consumers, with the majority reporting they would definitely (n=18, 78%) or maybe (n=5, 22%) create one if given the chance.

Service providers were also generally positive about ADs. Nevertheless, only 66% (n=48) agreed they would definitely support an initiative to promote their use in the SDHB, while 8% (n=6) said they would not support this. Their support in principle appeared tempered by concerns about their application in practice. One service provider described the situation as follows:

*Simple in theory and easy to put together. Much more complex, and sometimes a bit fraught, when it comes to enacting it or overriding it. Need to be clear to what extent the AD replaces the current assessment.*

**Table 3:** Support for ADs.

Support for ADs		Agree (%)	Maybe (%)	Disagree (%)	X <sup>2</sup>	p
I would be interested in supporting an advance directives initiative in the SDHB area.	Consumers	78	22	0	2.42	0.30
	Clinicians	66	26	8		

## Discussion

This research builds on a preliminary study conducted by Thom et al.<sup>16</sup> As noted in that study, all questions concerning potential content of a preferences instrument elicited strongly positive responses: almost all participants agreed or strongly agreed that all the items concerning personal choices should be included in the instrument, and a significant majority supported inclusion of items regarding treatment options. The only two items on which service providers and consumers differed concerned choice of medication and use of seclusion. The finding that consumers are not in favour of using seclusion is unsurprising, based on previous studies<sup>4,16,17</sup> and human rights discourse.<sup>14,18</sup>

Under current New Zealand law, it seems that the MHA can lawfully override consumers' preferences regarding their 'treatment for mental disorder'. Partly for that reason, it may be better to avoid suggesting that consumers can 'direct' their future care. Advance directives are primarily focused on giving or refusing treatment in future healthcare whereas the MAP also includes personal choices about functions of daily living. This holistic view of treatment aids in engagement with the treatment team and clinicians should work with these preferences to the maximum extent possible notwithstanding that they may ultimately be overridden. For consumers who are not under the MHA and retain capacity in the matter, the Health and Disability Consumers' Code of Rights (1996) (the Code) already affirms their right to refuse services, including medication.<sup>19</sup>

This study confirms that both providers and consumers generally support a more consumer-focused policy approach in the provision of mental health services. In Australia, psychiatric ADs are now incorporated into mental health legislation in four states,<sup>20</sup> reflecting a stronger recognition of consumer autonomy. The key is to balance respect for individual autonomy with recognition of clinical best practices. Framing the instrument as a MAP, or a statement of preferences, may enable this. Even when a consumer's preferences are not adhered to in clinical decision-making, these preferences should still inform how the clinician negotiates the treatment provided. This

is in accordance with the Code, and also provides an example of how mental health practice can give expression to human rights principles.<sup>21</sup>

### Strengths

This study used an established methodology and confirmed earlier results.<sup>16</sup> The impetus for the study came from a collaboration between a Consumer Advocate of the SDHB and a multi-disciplinary team comprised of legal and health academics, clinicians, service users and service management. This research has resulted in the creation of a practical instrument that will be incorporated into service delivery of that DHB.

### Limitations

While the results confirmed the 2015 study,<sup>16</sup> the overall sample size was relatively small. Of a sample population of 700 service providers, only 75 respondents fully completed the online survey. While we do not have an exact number of potential service users and their whānau eligible to participate, 23 is a very small number and not necessarily representative of the wider population of mental health service consumers. Similarly, this is a local study of one DHB which may not reflect trends in the wider New Zealand population. Although we consulted with Māori, we do not have confirmation that the instrument developed reflects Māori experiences of mental health care, and it does not explicitly incorporate a Pasifika perspective.

## Conclusion

Our results notably confirm those of the earlier study by Thom and colleagues.<sup>16</sup> Both studies show strong support for the general idea of ADs among clinicians and consumers. The two groups seem to have different expectations, however, as to how far the content of such instruments should be followed in practice, especially concerning medication and seclusion. These differences of opinion are well-documented in the literature. As MAPs are more widely introduced, these different expectations must be kept strongly in mind. This study supports wider implementation of MAPs, but shows the need for the different groups' expectations to be very carefully considered.



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# Hepatitis B virus-related hepatocellular carcinoma presenting at an advanced stage: is it preventable?

Thomas Mules, Ed Gane, Oonagh Lithgow, Adam Bartlett, John McCall

## ABSTRACT

**AIM:** Earlier diagnosis of hepatitis B virus (HBV) related hepatocellular carcinoma (HCC) increases treatment options and survival. The aim of this study is to evaluate which factors are associated with late presentation of HBV-related HCC.

**METHOD:** This is a retrospective review of all cases of HBV-related HCC diagnosed with late-stage/incurable HCC in New Zealand between 2003 and 2017. Cases were defined as patients with a positive hepatitis B surface antigen (HBsAg), and advanced (not amenable to potentially curable treatments) HCC at initial diagnosis. Patients were categorised into four groups according to potential reasons for late presentation: no previous diagnosis of HBV infection (Group A); known HBV diagnosis but not receiving HCC surveillance (Group B); known HBV diagnosis and receiving suboptimal HCC surveillance (Group C); and known HBV diagnosis and receiving optimised HCC surveillance (Group D).

**RESULTS:** A total of 368 patients were reviewed. The average age at death was 59 years, and the majority of patients were Māori (39%), Pacific (34%) or Asian (20%). The incidence of patients presenting with HBV-related advanced HCC increased from 4.5 cases to 6.3 cases per million people over the review period. Of the cases, 40% were categorised into Group A, 26% into Group B, 12% into Group C and 23% in Group D. Overall, the median survival was 138 days, and this did not change during the study period. Patients receiving optimised surveillance (Group D) survived longer (mean 469 days) than patients in Group A (90 days), Group B (145 days) or Group C (152 days) ( $p < 0.05$ ). Patients in Group D were more likely to be treated with transarterial chemoembolisation than patients in other groups (40% vs 15%,  $p < 0.05$ ).

**CONCLUSION:** This study has highlighted the need for improved rates of HBV diagnosis, better follow-up of those infected and the importance of optimal HCC surveillance. In New Zealand, HBV-related HCC disproportionately affects minority ethnic groups, and given the increasing incidence, provides a potential domain to reduce health inequities.

An estimated 248 million people worldwide have chronic hepatitis B virus (HBV) infection. The prevalence of HBV infection in New Zealand is approximately 3%,<sup>1</sup> but is higher in Chinese (8.9%), South East Asian (8.1%), Pacific (7.3%) and Māori (5.6%) people.<sup>2-4</sup> Although the introduction of universal neonatal vaccination in 1988 has almost eliminated childhood HBV infection in New Zealand, the high prevalence in adults has been maintained by increasing migration from Asian and South Pacific countries with endemic HBV infection.<sup>3,5,6</sup>

Up to 40% of people with HBV infection will develop chronic hepatitis B (CHB) which, if untreated, may progress to cirrhosis and the liver-related complications of decompensation and hepatocellular carcinoma (HCC). A particular challenge with diagnosing CHB is that symptoms do not develop until liver disease is advanced, at which point treatment options are limited and survival is poor. HCC is the second leading cause of cancer-related death worldwide and the leading cause in the Asia-Pacific region, where it accounts for over 500,000 deaths per annum, most

secondary to HBV.<sup>7,8</sup> Only tobacco causes more cancer deaths than HBV.

Patients chronically infected with HBV have a 10–25% lifetime risk of developing HCC. Risk factors associated with an increased risk of HCC in patients with HBV infection include presence of cirrhosis, high HBV DNA level, a family history of HCC, childhood exposure to aflatoxin, older age, male gender, co-infection with HCV or HDV, and regular alcohol or tobacco use.<sup>9</sup> However, HBV infection alone increases the lifetime risk of HCC more than 100 times, reflecting the direct carcinogenic effect of HBV integration into the host DNA.

Early diagnosis of HBV infection and recruitment into long-term monitoring improves patient outcomes, through early detection of CHB and HCC. Regular monitoring of serum ALT and HBV DNA levels will detect CHB prior to the onset of cirrhosis, when treatment with nucleoside analogues will prevent most liver-related complications, including HCC.<sup>10</sup> Similarly, HCC surveillance will detect HCC at an earlier stage when curative treatment is still possible, resulting in improved survival.<sup>11</sup> Recommended HCC surveillance is six-monthly measurements of serum alpha fetoprotein (AFP) in all patients with HBV infection.<sup>12</sup> Six-monthly imaging of the liver with ultrasound (USS) is recommended in patients who are Asian and male aged 40 years or older or female aged 50 years or older, and at any age if there is either severe fibrosis or cirrhosis, or a family history of HCC.<sup>9,13,14</sup>

The management of HCC depends on the size, location and number of lesions, as well as the severity of underlying liver disease. Curative treatment options include liver resection, ablation (ethanol injection, radiofrequency, microwave, stereotactic body radiation therapy, irreversible electroporation) and liver transplantation. Non-curative treatment options include transarterial embolisation (TAE) or chemoembolisation (TACE), sorafenib (a kinase inhibitor which is approved for use but not funded in New Zealand), and best practice supportive care.<sup>9</sup>

Since 1998, the New Zealand Liver Unit at Auckland City Hospital has provided a national service for the staging and management of HCC. At weekly multidisciplinary meetings, clinicians from around

New Zealand present via video conferencing all new cases of HCC. Patient and tumour details are stored on the HCC Database, along with treatment modalities and outcomes.

The aim of this current study is to determine what factors contributed to the late presentation of HBV-related HCC, including the impact of late diagnosis of HBV, lack of treatment with antiviral therapy and failure to recruit into the community HCC surveillance programme.

## Method

### Study design and population

This is a retrospective review of all advanced (not amenable to potentially curable treatments) cases of HBV-related HCC referred to the New Zealand Liver Unit over a 15-year period from 1 January 2003 to 31 December 2017.

Inclusion criteria were all patients who were hepatitis B surface antigen (HBsAg) positive at the time of HCC diagnosis, who had advanced HCC at initial diagnosis and who subsequently were treated with TAE, TACE, sorafenib or best practice supportive care. Exclusion criteria were a prior diagnosis of HCC or non-resident status.

### Data collection

Data were collected by reviewing patients' medical records and the national death database, including gender, ethnicity, age at diagnosis, date of HCC diagnosis, age and date of death. The date of the magnetic resonance imaging (MRI) or computed tomography (CT) diagnostic for HCC was considered the date of HCC diagnosis. Whether the patient had a prior diagnosis of cirrhosis by a hepatologist or gastroenterologist was recorded, as well as the HCC treatment received and if the patient had a first-degree relative with HCC.

A search of hospital and community laboratory databases was performed to determine if the patient had a positive HBsAg result prior to HCC diagnosis. If a patient was HBsAg positive prior to HCC diagnosis, previous radiological liver imaging (USS/CT/MRI) and AFP results were reviewed to determine the time-period between surveillance and HCC diagnosis, and if the patient was receiving the appropriate surveillance method.

Patients were then categorised according to potential reasons for late presentation. Patients were categorised into one of four groups:

- A. No previous diagnosis of HBV infection
- B. Known HBV diagnosis but not receiving HCC surveillance (defined as not having had liver imaging or AFP for two or more years)
- C. Known HBV diagnosis and receiving suboptimal HCC surveillance (defined as AFP without liver USS in patients who are cirrhotic or have a positive family history of HCC; or receiving surveillance outside the recommended time-period)
- D. Known HBV diagnosis and receiving optimised HCC surveillance.

To allow for short delays in investigations being performed, HCC surveillance was considered optimised if performed less than 12 months prior to HCC diagnosis, and suboptimal if more than 12 months.

### Statistical analysis

The 15-year study period was divided into three five-year periods to determine trends in incidence over time. Incidence rates were calculated using Statistics New Zealand mid-year population estimates as the denominators.

Comparison of Kaplan Meier survival curves were performed using the log-rank test. The chi-square test was used to compare parametric data. A p-value <0.05 was considered statistically significant.

## Results

A total of 374 patients from the New Zealand Liver Unit's database were identified as presenting with late-stage/incurable HBV-related HCC. Six patients were excluded from the study, four because they did not reside in New Zealand and two because their HCC was not initially diagnosed in New Zealand. The final number of patients included in the study was 368.

### Patient demographics

Of the 368 patients, 305 were male. The median age of death was 59 years (range 24–88). The most common ethnic groups were Māori (143 patients), followed by Pacific (125), Asian (72) and New Zealand

European (20). The ethnicity of study patients is shown in Table 1.

**Table 1:** Patient ethnicity.

Ethnicity	Number (%)
Māori	143 (39)
Pacific	125 (34)
Tongan	53 (14)
Samoan	40 (11)
Cook Island	24 (7)
Niuean	7 (2)
Tokelauan	1 (0.3)
Asian	72 (20)
Chinese	(14)
SEA	16 (4)
Taiwanese	1 (0.3)
Japanese	1 (0.3)
Filipino	1 (0.3)
Indian	1 (0.3)
NZ European	20 (5)
Other European	4 (1)
Middle Eastern	2 (0.5)
African	2 (0.5)

### Incidence

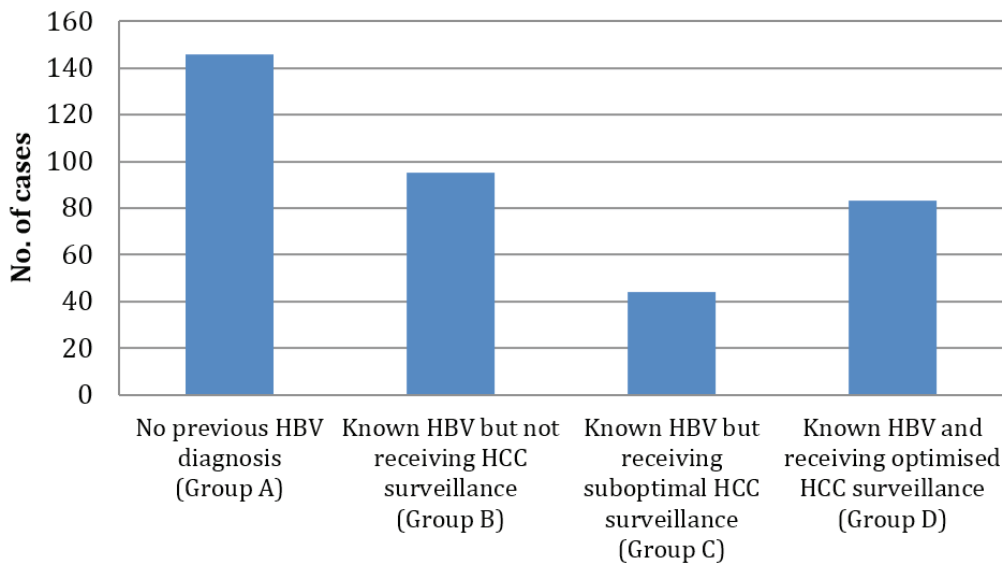
The incidence of advanced HBV-related HCC increased during the 15-year study period from 4.5 cases per million people between 2003 and 2007, to 6.0 cases per million people between 2008 and 2012, to 6.3 cases per million people between 2013 and 2017.

### Factors associated with late diagnosis

Of the total patient cohort, 146 patients (40%) did not have a previous diagnosis of HBV infection prior to HCC diagnosis (Group A). Ninety-five patients (26%) were known to be infected with HBV but were not receiving any HCC surveillance (Group B).

The remaining 127 patients (35%) were in an HCC surveillance programme at the time of diagnosis. Forty-four (12%) were having suboptimal surveillance (Group C) and 83 (23%) were having optimised surveillance (Group D). This is shown in Figure 1.

Figure 1: Factors associated with late diagnosis of advanced HCC.



**Suboptimal surveillance (Group C)**

Forty-four patients were receiving suboptimal surveillance. In 27 patients this was considered suboptimal because HCC surveillance was not performed within 12 months of HCC diagnosis. Eleven patients should have been receiving liver USS in addition to AFP due to having known cirrhosis, and six due to having a first-degree relative with HCC.

**Survival**

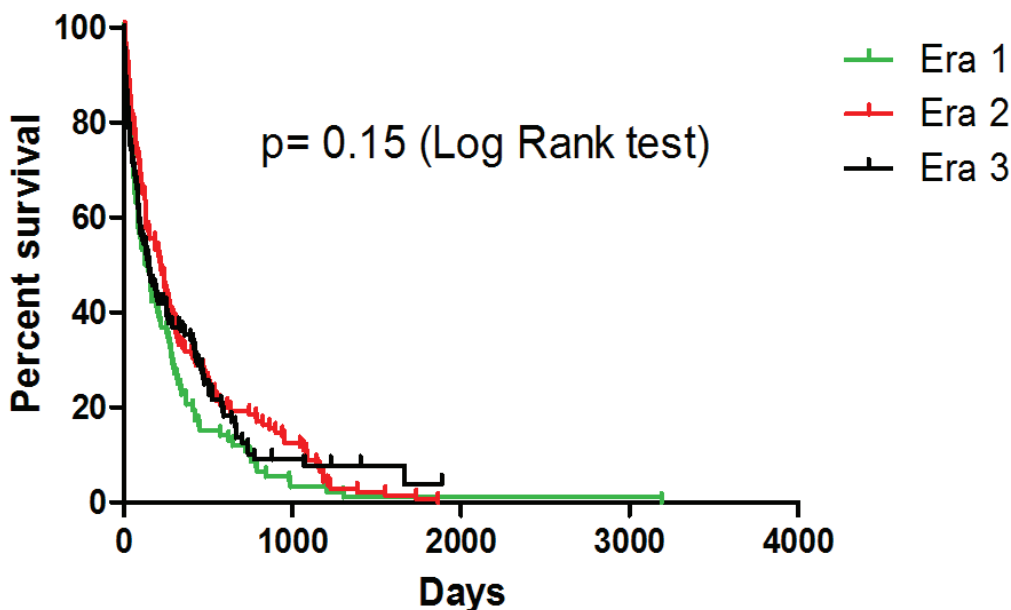
The median overall survival was 138 days (range: 2 to 3,191 days). There was no significant difference in survival between the three five-year periods. This is shown in Figure 2.

The median survival in patients receiving optimised surveillance (Group D) was 469 days, which was significantly longer compared with Group A (90 days), Group B (145 days), and Group C (152 days) ( $p < 0.05$ ). This is shown in Table 2 and Figure 3.

**Proportion of patients receiving TACE**

Patients receiving optimised surveillance (Group D) were significantly more likely to receive TACE (40% of patients) than patients in the other groups (Group A= 11%, Group B=22%, Group C=18%),  $p < 0.05$ .

Figure 2: Overall survival for each five-year period.



**Table 2:** Median survival for each group and overall.

	Overall	Group A	Group B	Group C	Group D
Median survival (days)	138	90	145	152	469

## Discussion

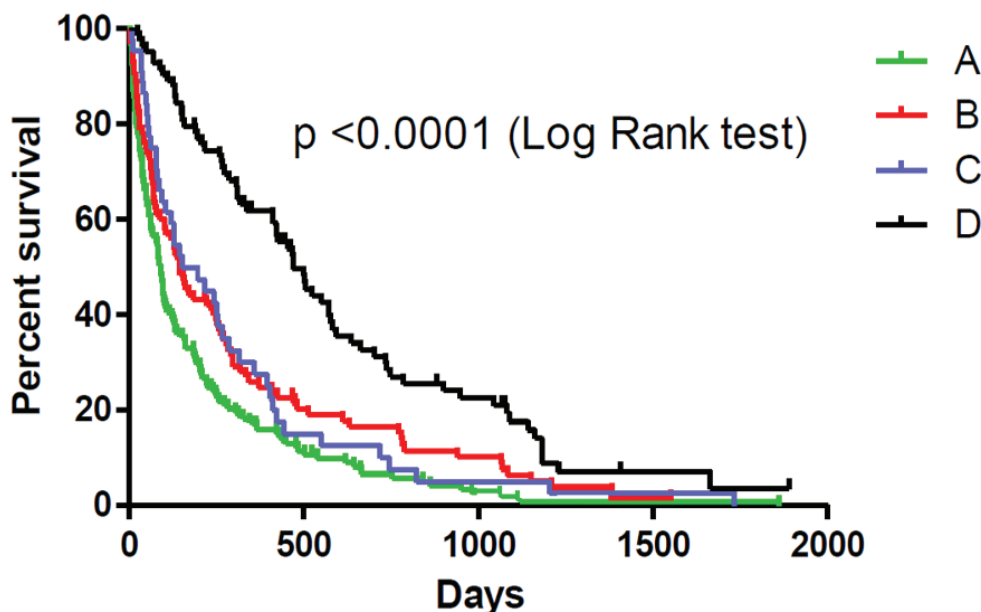
This study evaluated factors associated with late presentation in patients with HBV-related HCC. Identification of modifiable factors could help reduce the high liver-related mortality rates in New Zealand and other countries with endemic HBV infection.

The incidence of HBV-related HCC is highest in Polynesian (Māori and Pacific) and Asian men, reflecting endemic HBV infection in these populations.<sup>2-4</sup> The male predominance reflects the effect of androgens on promoting HBV replication.<sup>15</sup> This study demonstrated a similar distribution in patients presenting with advanced HBV-related HCC. Also, most patients die in their 5<sup>th</sup> and 6<sup>th</sup> decades of life within three months of diagnosis. These factors have the highest impact on Māori and Pacific Island communities, as most patients represent the primary income earners for large families. This high disease burden when combined

with poor access to healthcare contributes to the substantial health disparity between different ethnic groups within New Zealand.<sup>16</sup> Hence better prevention and earlier diagnosis of HBV-related HCC would contribute to reduction in health inequities in New Zealand.

This study suggests that the incidence of HBV-related HCC presenting at an incurable stage is steadily increasing in New Zealand, despite the introduction of universal neonatal vaccination in 1987 and funded oral antiviral therapy in 2000. During the study period the incidence increased from 4.5 to 6.3 cases per million people. Although diagnosis and reporting rates may have increased, it is likely that there has also been an increased incidence of HCC in New Zealand over the last 15 years. Other Western countries have seen similar trends. For example, South Australia has recorded an annual 20% increase in incidence over a 15-year period from 1996 to 2010 and this is projected to continue.<sup>17</sup>

**Figure 3:** Survival for each group.



Factors contributing to this increase include an ageing cohort effect of the pre-immunisation population, and increasing levels of migration to New Zealand from neighbouring countries with endemic HBV infection including China, and South East Asian and Pacific nations. In 2013, Asians and Polynesians made up 15% of New Zealand's population. During the next 25 years, if migration trends continue, then this is projected to increase to 40%,<sup>18</sup> resulting in a continued increase in incidence of HBV-related HCC until HBV prevalence rates fall in the countries of origin from universal neonatal vaccination.

This study identified several factors associated with late presentation of HBV-related HCC, including lack of HBV diagnosis, lack of follow-up in diagnosed patients and suboptimal HCC surveillance in diagnosed patients receiving follow-up. Almost 40% of patients with advanced HBV-related HCC were not aware of their HBV status at the time of presentation. Many other patients with a prior diagnosis had never been recruited into long-term monitoring for the complications of CHB and HCC. Not surprisingly, these patients had the most advanced stage of HCC with the shortest survival. Early diagnosis and management of HBV will prevent cirrhosis and subsequent HCC, while early detection of HCC through optimal surveillance will improve survival in those patients who develop this complication.<sup>11</sup>

Hepatitis B virus infection meets the World Health Organization's criteria for screening in endemic countries with readily identified at-risk Asian and Polynesian populations; a safe, inexpensive and reliable HBsAg screening test which allows early diagnosis and treatment early in the natural history of chronic hepatitis B; straightforward recall procedures based on interval monitoring with serum ALT, HBV DNA, AFP and abdominal ultrasound; and safe and effective oral antiviral therapy treatment for active CHB.<sup>19,20</sup> In 1998, the New Zealand Government funded a national HBV screening programme, targeting Asian, Pacific and Māori New Zealanders aged over 15 years (and therefore unlikely to be protected by universal neonatal vaccination). Over the next two years, more than 10,000 new cases of HBV infection were

diagnosed.<sup>2</sup> Unfortunately, the programme was halted early when only one quarter of the target population had been screened.<sup>21</sup> Although an additional 10,000 new cases have since been identified through opportunistic screening in primary care, an estimated 80,000 remain undiagnosed. Urgent consideration should therefore be made to fund a second national HBV testing programme targeting the 800,000 untested adult Māori, Asian and Pacific New Zealanders at risk for HBV infection. This could be expected to identify almost 60,000 HBsAg+ New Zealanders for recruitment into the community-based surveillance programme.<sup>2</sup>

A significant proportion (26%) of patients who presented with advanced HCC had previously been diagnosed with HBV infection but were not receiving HCC surveillance. Factors likely to be contributing to this high rate include lack of awareness of long-term HCC risk by both patient and health professional, poor access to healthcare, and unwillingness to engage in follow-up because of the stigma associated with HBV infection.<sup>16,22-24</sup> Since 2002, the Hepatitis Foundation, a non-government organisation, has provided a community-based surveillance programme, focusing on improving HBV awareness and reducing stigmatisation in affected communities. Unfortunately to date, less than one quarter of the 120,000 HBV-infected New Zealanders have been recruited into this community-based programme.<sup>1</sup>

Finally, some patients who are receiving recommended HCC surveillance may present with advanced HCC, highlighting the limitations of current surveillance methods. Serum alpha fetoprotein measurements lack sensitivity (almost one-third of HCCs do not produce AFP) and specificity (in a healthy HBV population, most AFP elevations are secondary to either pregnancy or active CHB). Abdominal ultrasound also lacks sensitivity (15% of HCCs are not visible on USS until very large) and specificity (multiphase CT or MRI are needed to distinguish HCC from benign lesions).<sup>25,26</sup> Overall however, HCC surveillance improves survival by detecting HCC at an earlier stage when curative intervention is possible.<sup>11</sup> The observation in this current study that



survival is also improved in patients who present with advanced HCC is explained by the higher proportion who receive TACE in this group.

The current APASL and AASLD recommendations state that all patient groups with an annual HCC incidence of at least 0.2% receive six-monthly liver USS in addition to AFP, including Asian females aged over 50 years and Asian males over 40 years who have CHB.<sup>9,14</sup> Our results would support expansion of these recommendations to include Māori and Pacific people, given the similar age of HBV infection and HBV genotype distribution in Polynesian and Asian populations.

Limitations to this study include the likelihood that some cases of advanced HCC were discussed in regional multidisciplinary meetings and not referred to the New Zealand Liver Unit HCC multidisciplinary meeting, particularly patients with very advanced HCC requiring immediate palliative care. Secondly, a higher rate of

referrals to the New Zealand Liver Unit may account for the increasing incidence found in this study. Lastly, the reasons why recommended HCC surveillance was not being performed on patients with previously diagnosed HBV infection are not known. Such data would inform action to improve access to HCC surveillance.

In summary, in New Zealand, a high-income country with endemic HBV infection, almost half of all cases of HBV-related HCC are diagnosed late when curative intervention is no longer possible. This study has identified factors contributing to patients with HBV infection presenting with advanced HCC. It has highlighted the need for improved rates of HBV diagnosis and better follow-up of those infected, and the importance of optimal HCC surveillance. Finally, in New Zealand, HBV-related HCC already disproportionately affects minority ethnic groups, and the increasing incidence suggests this as an area of focus to reduce health inequities.

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# Creaky voice or extreme vocal fry in young women

Jeremy Hornibrook, Tika Ormond, Margaret Maclagan

## ABSTRACT

An extreme use of a voice feature with a lowered rough sound called vocal fry or creaky voice has become increasingly recognised in American, British and New Zealand English speaking young women. It is not regarded as an involuntary voice disorder, but rather as a volitional strategy. Intermittent vocal fry is recognised as a common voice feature, particularly at the end of a sentence. It occurs at the lowest range of a speaker's F0 (pitch). We present evidence that vocal fry use is increasing in young New Zealand women. This article is to highlight the new phenomenon of extreme and sustained vocal fry as a vocal style, which is the first voice feature to have come to the attention of the general public through the news media.

Vocal fry or creaky voice is a type of voice production that seems to be becoming more prevalent and more popular within New Zealand, particularly among young women who apparently do not consider it to be a voice disorder as they do not present at voice disorder clinics. This is an interesting development as the voice is a reflection of personality and can reflect a person's physical and psychological state. The majority of patients presenting to voice disorder clinics have vocal misuse issues with subtle visible signs in the larynx but no overt pathology. The predominant disorder is now called supraglottic constriction—an *involuntary* overuse of the so-called false vocal folds which impinge on the true vocal folds to effect a deterioration in voice quality. It is an indication for and will usually respond to voice therapy.

### Modal voice register and vocal fry

Modal voice is the register used most frequently in speech and singing for vowels in most languages. Modal voice is the optimal combination of airflow and vocal fold tension that yields maximum vibration. Vocal fry (vocal creak, croak, glottal rattle) is produced by tight adduction of the arytenoid cartilages with reduced tension of the vocal folds with large and irregular vibrations and a *low* rough sound when air passes. It is not viewed as an involuntary voice disorder, but rather as a *volitional* strategy that has been mainly recognised as a feature of

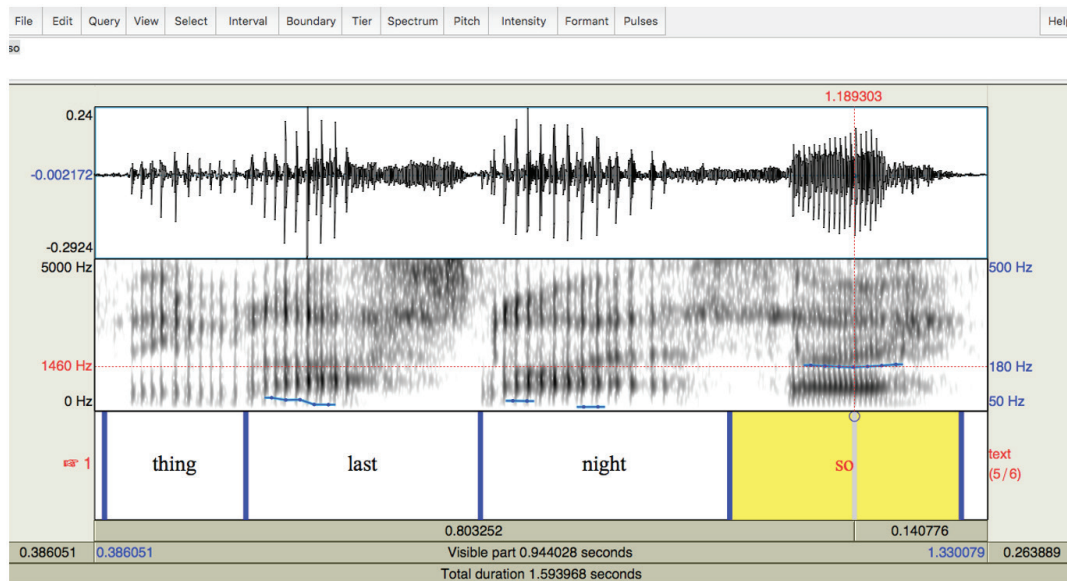
some styles of singing. Figure 1 shows the fragment of a longer utterance *thing last night, so* spoken by a young New Zealand woman born in 1982. *Thing* shows extreme vocal fry, *last* and *night* show slightly less extreme vocal fry and *so* shows modal voice with a pitch of 180Hz.

### Vocal fry as a speaking voice phenomenon

Vocal fry in speaking voice became recognised in the 1960s.<sup>1</sup> More recently the perceived increased prevalence of extreme vocal fry in young women has attracted the interest of voice scientists, particularly in the US and Britain. Because the studies we refer to do not make a distinction between biological sex and identified gender, we here refer simply to 'males' and 'females', 'men' and 'women'.

In a study, 20 young and 20 middle-aged female Standard American-English speakers were tested using sustained vowels and standard sentences with perceptual and acoustic evaluations. Approximately two-thirds used vocal fry and it was most likely to occur at the end of sentences.<sup>2</sup> In a further study, 40 American women were asked to describe all the steps in making a peanut butter and jelly sandwich and in doing laundry. All participants had at least one episode of glottal fry and it usually appeared at the *end* of sentences. Contrary to the hypothesis, there was no significant difference in the amount of vocal

**Figure 1:** Sound spectrogram of the fragment *thing last night, so* spoken by a young New Zealand woman.



*Thing* shows extreme vocal fry, *last* and *night* show more moderate vocal fry and *so* shows modal voice. Her voice pitch of 180Hz on *so* can be read on the right hand side of the figure.

fry per minute used by the younger and middle-aged women.<sup>3</sup>

Twenty-two female and 18 male young American college students read a standard voice passage and were assessed by three expert listeners for glottal fry under different acoustic conditions. Female gender was associated with an increased occurrence. It was less likely to occur with the increased effort of talking above higher background noise, and therefore likely to be volitional.<sup>4</sup>

In a New Zealand study 36 speakers balanced for age, gender and ethnicity were recorded speaking for two minutes.<sup>5</sup> Fifteen-second samples of their voices were analysed for creakiness and breathiness. Overall, Māori speakers had more vocal fry than Pākehā, women had more vocal fry than men and older speakers had more vocal fry than younger speakers.

The assertion that vocal fry is a new feminine voice quality for urban-orientated and upwardly mobile American women has stimulated interest from social commentators and journalists.<sup>6</sup> There is evidence that in young women it is modelled from other users. In young adult female American English speakers engaged in dialogue, those who naturally used little or no vocal fry exhibited significantly more vocal fry when conversing with young women with substantial vocal fry.<sup>7</sup>

There is a paucity of non-laboratory studies on opinions on vocal fry. Online surveys are becoming increasingly employed and it can be argued that on sensitive topics they may elicit more frank responses than formal laboratory studies. An online survey of 800 listeners revealed that vocal fry is viewed negatively by the general public. Relative to a normal speaking voice, female vocal fry users were perceived to be less competent, less educated, less trustworthy, less attractive and less hireable. The negative perceptions were stronger for female voices than for male voices. The conclusion was that young American females should avoid using vocal fry speech in order to maximise their labour market opportunities.<sup>8</sup>

### Vocal fry in New Zealand speakers

In order to check our perception that vocal fry was increasing in New Zealand we analysed young female speakers aged between 20 and 30 from the Canterbury Corpus, which is part of the Origins of New Zealand English archive held at the University of Canterbury.<sup>9</sup> There were 10 speakers born between 1972 and 1976 and 10 born between 1980 and 1987. The speakers were recorded talking with a university student of a similar age. We auditorily analysed 10 minutes of conversation from each speaker. All the speakers used vocal fry, though the amount varied. The

average number of instances of vocal fry per speaker over 10 minutes in the older cohort was 51.3 (range 23–98); the average number of instances of vocal fry per speaker in the younger cohort was 146.7 (range 18–303). When the speaker with extreme vocal fry is excluded from the younger cohort, the average number of instances in 10 minutes drops to 129.3, still more than double the frequency for the older cohort.

### Media reactions to extreme vocal fry

Academic authors have been quiet and cautious as to the origins and the true public perceptions of young women's vocal fry, a silence that has been filled by newspaper and online journalists and commentators, much of it speculation. Online links to websites and Youtube are abundant. On the website 'Lexicon Valley' by Mike Vuolo, it is described as a "much reviled phenomenon" and equated to the ubiquitous use of "like" originating in female 'Valleyspeak'.<sup>10</sup> Some interpret it as conveying a lack of confidence, or of overconfidence, or of a lowering of the voice to sound more authoritative.<sup>6</sup> Others speculate that *extreme* use has been perpetuated by popular singer Britney Spears and media personality Kim Kardashian.<sup>11</sup> New Zealand Journalist Rosemary McLeod says "I have tried to analyse why anyone would want to talk like this...it's a new version of babytalk".<sup>12</sup>

### Vocal perceptions of masculinity, femininity and authority

Most studies on listener perceptions of voice are performed as experiments in voice laboratories. It could be argued that they are not "ecologically valid" (natural), but they reveal interesting men's and women's notions about voice characteristics in regard to masculinity, femininity, attractiveness, authority, physical strength and fidelity. Such studies do not usually specifically consider vocal fry. However, since vocal fry occurs at very low F0 (pitch), studies that evaluate reactions to voice pitch can throw light on listener perceptions of vocal fry.

In general, heterosexual men prefer relatively high-pitched women's voices.<sup>13–15</sup> Men's ratings of women's attractiveness are correlated with female voice pitch.<sup>13,16</sup> These findings stand when women's voices are manipulated to have a higher pitch compared with manipulations to a lower pitch.<sup>14,16–18</sup> Women's attractiveness

judgements of men's voices are negatively associated with men's voice pitch,<sup>19</sup> women also prefer experimentally manipulated lower pitched voices to higher pitched voices.<sup>18,20–23</sup> Men who rated themselves high on physical dominance rated the voices of other men lower on dominance.<sup>24</sup> In a study on F0, five vowels were recorded at four different F0 (low 185Hz, medium 224Hz, high 262Hz, very high 310Hz) and rated for attractiveness by men and for dominance by men and women. Women with lower voices were perceived as more dominant, and women were more sensitive to dominance cues in women's voices. The men rated female voices higher than 280Hz as less attractive and sounding babyish.<sup>15</sup>

Men prefer women with higher pitched voices as marriage partners.<sup>17</sup> The preferences for low (masculine) pitch in men's voices are positively correlated to self-rated attractiveness in women who are using hormonal contraceptives, but negatively if not using hormonal contraceptives.<sup>22</sup> Women rating artificially masculinised men's voices considered such speakers to be more likely to commit infidelity than speakers with feminised women's voices. Men attributed infidelity to feminised women's voices, but women did not.<sup>18</sup>

In an experiment on a hypothetical school board election, men and women listened to pairs of female and male voices differing only in pitch.<sup>25</sup> Both men and women preferred females with masculine voices. Men preferred males with masculine voices, but women did not discriminate between male voices. In another hypothetical election experiment, 86 undergraduate students and 89 passers-by were asked to judge pairs of male and female voices as to who they would elect. Both men and women selected male and female leaders with lower-pitched voices.<sup>26</sup> The manipulated pitch voice recordings of nine US presidents were played to 61 females and 61 males. Lower pitched voices were associated with favourable personality traits more often than higher pitched voices. The participants preferred to vote for politicians with lower-pitched voices.<sup>27</sup> In the movie 'The Iron Lady' Margaret Thatcher has voice lessons after her colleagues criticised her voice as being "too shrill".<sup>28</sup> Analysis of ecologically valid speech from 792 male public company

CEOs concluded that CEOs with deeper voices manage larger companies, command higher salaries and enjoy longer tenures.<sup>29</sup>

Overall there is a paradox that men prefer women with higher voices but that both men and women interpret a lower pitch as sounding more dominant in both sexes. In 2008 the third author was quoted as saying that Pākehā females seemed to be using low pitch vocal fry more frequently than they used to.<sup>5</sup> Ten years later this observation is still valid, and the rates of use of vocal fry seem to be increasing.

### Why mainly in young women?

In linguistics or the formal science of language there is a well-accepted principle that middle-class young women lead linguistic change in new word expressions and speech sound changes.<sup>30</sup> Eventually these changes tend to be adopted by young men. It could be postulated that the increasing prevalence of extreme vocal fry in young English-speaking women is an analogous voice phenomenon or fashion. It remains to be seen whether it becomes widely adopted by young men.

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# Chronic red eye—think outside the eye

Louis S Han, Rebecca Stack

Up to 10% of general practitioner consultations are eye related, and red eye is the most common ocular presentation.<sup>1,2</sup> Many are benign conditions, including conjunctivitis, dry eyes and subconjunctival haemorrhage. However, there are sight- and life-threatening conditions which may present as a red eye, and it is important for clinicians to keep these in mind.<sup>3</sup>

## Case report

A 75-year-old woman presented to her general practitioner with three-week history of left red sore eye. She has been initially treated for conjunctivitis and dry eye disease. However, there was no response to treatment, then she developed difficulty closing the eye. She was then investigated for stroke with computed tomography (CT) scan of the head, which was reported as normal. Her symptoms progressed to horizontal diplopia, and discomfort with the left eye movement. She was subsequently referred to ophthalmology, where imaging was reviewed. Original CT showed non-specific enlargement of superior rectus and fat stranding, with subtle proptosis,

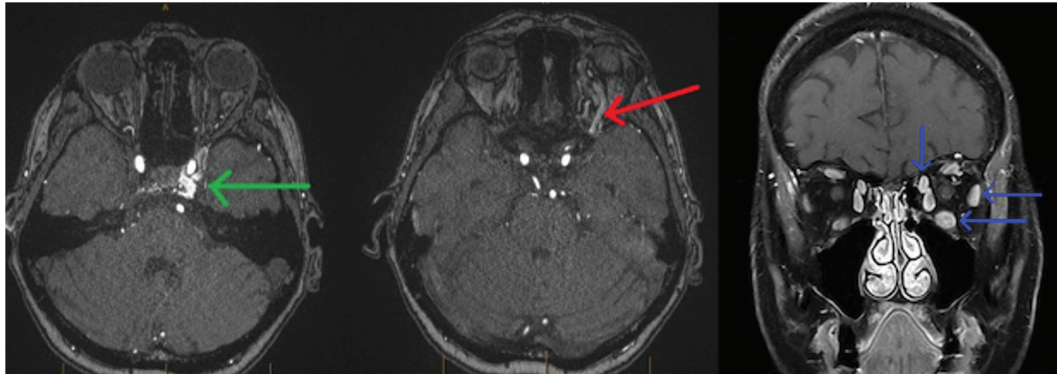
suggesting inflammatory condition such as thyroid eye disease and idiopathic orbital inflammatory disease. On examination, the patient was found to have best corrected visual acuity (BCVA) of 6/7.5 both eyes, mild proptosis, downward displacement of the globe, chemosis, corkscrew episcleral vessels and mechanically restricted ocular movement (Figure 1). Fundus and disc examination was normal. Thyroid function and antibody tests were negative. Further imaging with magnetic resonance imaging (MRI) orbit showed enlarged left superior ophthalmic vein, with increased size of vasculature within the orbit, and abnormal left cavernous sinus, confirming carotid cavernous fistula (CCF) (Figure 2).

The patient was referred to neurosurgery. Digital subtraction angiography (DSA) confirmed dural CCF. Coil embolisation was done via trans-venous approach. The patient recovered well from the procedure, and her signs and symptoms have resolved on Day 1 post-procedure, other than residual reduced abduction of the left eye (Figure 3). The patient was seen in a follow up clinic in eight weeks, with complete resolution of signs and symptoms.

**Figure 1:** Pre-procedure. LEFT sided proptosis, downward displacement of globe, corkscrew episcleral vessels.



**Figure 2:** MRI scan showing abnormal hyper-intensity signal of left cavernous sinus (green arrow) and enlarged superior ophthalmic vein (red arrow), enlarged extraocular muscles on the left side (blue arrows).



## Discussion

Carotid cavernous fistula is a non-congenital arteriovenous malformation, with unknown epidemiology. It is classified in to four types depending on the nature of connection.<sup>4</sup> Type A is direct connection between internal carotid artery (ICA) and cavernous sinus, Type B to D are indirect connections via dural branches of either ICA or external carotid artery (ECA) or both. Table 1 compares type A with the others. Common signs and symptoms of CCF are compiled in Table 2.

Basic neuro-anatomy aids understanding of CCF (Figure 4). The cavernous sinus (CS) is a plexus of veins lateral to the pituitary fossa, with a number of important structures passing within it.<sup>7</sup> ICA sits on medial side, along with abducens nerve (CN VI) within the CS. Oculomotor, trochlear, ophthalmic and maxillary division of trigeminal nerve (CN III, IV, V1, V2) sit within the lateral wall of cavernous sinus. The CS receives

venous drainage from cerebral, ophthalmic and emissary veins. Hence, with CCF, the superior ophthalmic vein is often enlarged, leading to ocular and orbital symptoms.

If CCF is suspected, non-invasive imaging such as CT and CT angiography (CTA) is the first-line investigation. It can look for other lesions that could cause proptosis, eg, thyroid eye disease, idiopathic orbital inflammatory disease, orbital mass lesion. If suggested from imaging, neurosurgical referral is recommended for consideration of cerebral angiography and definitive treatment with coil embolisation or open surgery.

Pathology affecting the cavernous sinus can often present with multiple cranio-neuropathies, and vascular signs and symptoms. It is important for clinicians to test relevant cranial nerves. Carotid cavernous fistula is an uncommon cause of red eye, but an important diagnosis not to be missed, as untreated, it could lead to loss of vision and intracranial haemorrhage.<sup>6,9</sup>

**Figure 3:** Day 1 post-coiling. Resolution of proptosis, white eyes.



**Table 1:** Comparing direct and indirect carotid cavernous fistula (adapted from Zanaty et al).<sup>5</sup>

Barrow classification	Type A (direct)	Type B-D (indirect)
Connection to cavernous sinus	Intracavernous ICA	Meningeal branches of ICA and/or ECA
Haemodynamic feature	High flow	Low flow
Aetiology	Trauma	Unknown—hypertension suggested
Epidemiology	Young, male	Elderly, female
Onset	Abrupt	Insidious

**Table 2:** Common symptoms and signs of carotid cavernous fistula.<sup>6</sup>

Symptoms	Signs
Orbital/ocular pain	Pulsatile proptosis (usually type A)
Diplopia	Chemosis
Decreased vision	Corkscrew episcleral vessels
Headache	Asymmetric high intraocular pressure (IOP)
Pain with eye movement	Retinal vein occlusion
	Ischaemic optic neuropathy
	Other cranio-neuropathy (III, IV, V <sub>1</sub> , V <sub>2</sub> , VI)

**Figure 4:** Diagram of coronal section of cavernous sinus. Note the neurovascular structures.

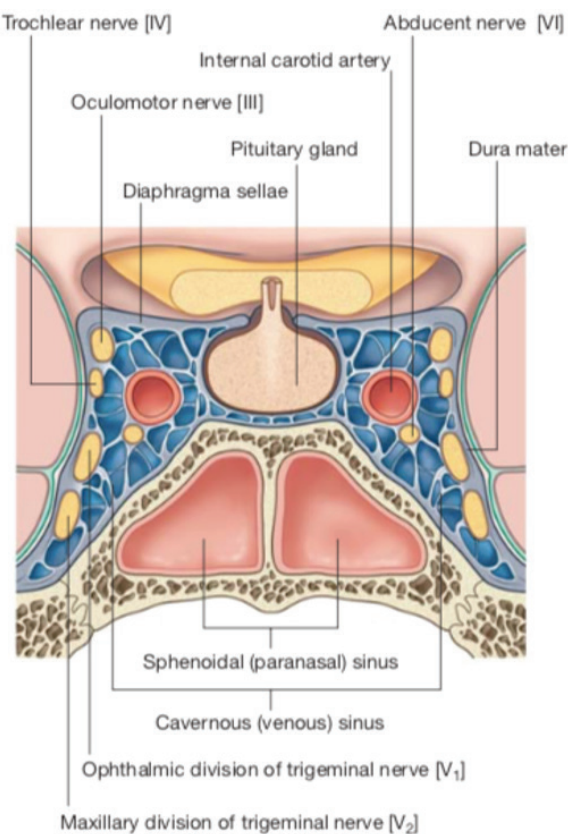


Diagram from Gray's Anatomy for students.<sup>8</sup>

**Competing interests:**

Nil.

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# LV epicardial lead placement at time of cardiac surgery: useful for some—but not all

Tom Kai Ming Wang, Andrew Martin, Khang-Li Looi, Nigel Lever

**C**ardiac resynchronisation therapy (CRT) is a proven device-based adjunctive treatment for heart failure with reduced ejection fraction to reduce mortality and morbidity.<sup>1-4</sup> When patients undergo cardiac surgery, left ventricular (LV) lead placement can also be undertaken concurrently if indicated or considered potentially necessary in the future. We reviewed the experience of LV epicardial lead placement in terms of eventual utility in CRT device therapy, characteristics and outcomes.

## Methods

All patients undergoing surgical LV epicardial lead placement from July 2012–July 2017 at Auckland City Hospital were retrospectively included. The decision for LV epicardial lead replacement was made pre-operatively at the multidisciplinary cardiosurgical meeting via consensus in the absence of local policies or guidelines. Baseline demographics, pacing indication, clinical data, pre-operative electrocardiograms (ECG) and left ventricular ejection fraction (LVEF: normal, mild 40–50%, moderate 30–40% and severe impairment <30%) on transthoracic echocardiography were collected. Three authors adjudicated the adequacy of LV epicardial lead position anatomically, using orthogonal chest x-ray views or computed tomography when available. The position was considered satisfactory if located lateral and posterior on the LV. In-hospital outcomes reported include mortality and length of stay. Follow-up outcomes recorded include CRT connection, mortality and lead re-intervention, up until 30 September 2018.

Quantitative and categorical variables were presented as mean±standard deviation and frequency (percentage) respectively. Analysis was also performed to compare patients with or without eventual connection to a CRT device and among these patients those with good or suboptimal LV epicardial lead position on radiology, using Mann-Whitney U and Chi-squared tests for quantitative and categorical variables. SPSS (Version 17.0, SPSS Inc., Chicago, IL, USA) was used for statistical analyses, with  $P < 0.05$  deemed statistically significant, and all tests were two-tailed.

## Results

There were 47 patients with LV epicardial lead surgical placement, with 23 (49%) subsequently having CRT devices implanted and 24 (51%) without. Table 1 lists the characteristics and outcomes for the cohort and by these groups. Among those with CRT device implants, eight were performed during the cardiac surgery, nine during the same admission and six post-discharge. Patients with CRT device implantation had higher proportions of pre-existing pacing indications (73% versus 38%,  $P = 0.008$ ).

In-hospital mortality occurred in four (9%) and total mortality during mean follow-up of 2.8±1.7 years occurred in eight (17%), seven of those in patients without connection to a CRT device. There was one lead re-intervention due to dislodgement in the CRT group, and one due to threatened erosion in the no CRT group.

Table 2 compared those patients who received CRT device implants based on good versus suboptimal anatomical LV

**Table 1:** Patient characteristics and outcomes with or without CRT device implant with left ventricular epicardial lead utilisation.

N	All 47	CRT implant 23	No CRT 24	P
<b>Demographics</b>				
Age (years)	64+/-13	64+/-11	64+/-14	0.537
Male	35 (74%)	16 (67%)	19 (83%)	0.318
Ethnicity				0.365
New Zealand European	29 (62%)	15 (65%)	14 (58%)	
Māori/Pacific islander	12 (26%)	4 (17%)	8 (33%)	
Other	6 (13%)	4 (17%)	2 (8%)	
<b>Pacing characteristics</b>				
Indication				0.069
Heart failure, EF<35%, QRS>120ms	18 (38%)	5 (22%)	13 (54%)	
Pacing indication, impaired LVEF	27 (57%)	17 (74%)	10 (42%)	
Tricuspid surgery, heart block	2 (4%)	1 (4%)	1 (4%)	
Previous pacemaker	17 (36%)	11 (48%)	6 (25%)	0.135
Prior attempt at LV pacing	2 (4%)	2 (9%)	0 (0%)	0.234
Pacing indication present	27 (57%)	18 (73%)	9 (38%)	0.008
<b>Pre-procedural investigations</b>				
QRS duration (ms)	162+/-33	161+/-35	163+/-32	0.965
LBBB (non-paced)	18/38 (47%)	11/22 (50%)	7/16 (44%)	0.146
Pre-op LVEF				0.535
Normal	18 (38%)	11 (48%)	7 (29%)	
Mild impairment	8 (17%)	3 (13%)	5 (21%)	
Moderate impairment	10 (21%)	5 (22%)	5 (21%)	
Severe impairment	11 (23%)	4 (17%)	7 (29%)	
<b>Operation</b>				
Coronary	9 (19%)	3 (13%)	6 (25%)	0.100
Valve	33 (70%)	15 (65%)	18 (75%)	
Coronary and valve	4 (9%)	4 (17%)	0 (0%)	
Other	1 (2%)	1 (4%)	1 (4%)	
<b>LV lead position on x-ray</b>				
Good	19/40 (48%)	9/22 (41%)	12/18 (67%)	0.125
Poor	21/40 (53%)	13/22 (59%)	6/18 (33%)	
Cannot be assessed	7	1	6	
<b>Outcomes</b>				
Length of stay (days)	13+/-10	11+/-7	15+/-12	0.232
In-hospital mortality	4 (9%)	0 (0%)	4 (17%)	0.109
Follow-up (years)	2.8+/-1.7	3.0+/-1.6	2.6+/-1.9	0.355
Lead reintervention	1 (2%)	1 (4%)	0 (0%)	1.000
Total mortality	8 (17%)	1 (4%)	7 (29%)	0.048

Figures are mean+/-standard or frequency (percentage), CRT=cardiac resynchronisation therapy, LBBB=left bundle branch block, LV=left ventricle, EF=ejection fraction.

**Table 2:** ECG and echocardiographic characteristics of CRT device implant patients with good and poor LV epicardial lead position on chest x-ray (LV lead position could not be assessed in 1).

N	All CRT 23	Good LV lead position 9	Suboptimal LV lead position 13	P
<b>ECG</b>				
QRS duration pre-CRT (ms)	161+/-35	170+/-38	154+/-33	0.151
QRS duration post-CRT (ms)	153+/-24	151+/-27	154+/-22	1.000
QRS duration reduction >20ms	7/18 (61%)	4/8 (50%)	3/10 (30%)	0.630
Follow-up data not available	5			
<b>Echocardiography</b>				
Pre-CRT LVEF				0.614
Normal (%)	11 (48%)	3 (33%)	8 (62%)	
Mild impairment (%)	3 (13%)	1 (11%)	1 (8%)	
Moderate impairment (%)	5 (22%)	3 (33%)	2 (15%)	
Severe impairment (%)	4 (17%)	2 (22%)	2 (15%)	
Post-CRT LVEF				0.549
Normal (%)	6/18(33%)	4 (67%)	2 (33%)	
Mild impairment (%)	9/18 (50%)	3 (33%)	5 (63%)	
Moderate impairment (%)	2/18 (11%)	1 (11%)	1 (13%)	
Severe impairment (%)	1/18 (6%)	1 (11%)	0 (0%)	
LVEF improvement >1 grade post-CRT (%)	8/18 (44%)	5 (63%)	3 (33%)	0.347
Follow-up data not available	5			
<b>Outcome</b>				
Length of stay (days)	11+/-7	12+/-5	10+/-8	0.600
Follow-up (years)	3.0+/-1.6	3.5+/-1.8	2.8+/-1.4	0.367
Total mortality (%)	1 (4%)	0 (0%)	1 (8%)	0.409

CRT=cardiac resynchronisation therapy, LV=left ventricle, EF=ejection fraction.

epicardial lead position (9 and 13 patients) respectively. Sufficient imaging data was not available for one patient. Post-operative ECG and echocardiogram data were available for 18 patients who had CRT device implants. Among these, 7 of 18 (39%) and 8 of 18 (44%) had QRS duration reduce >20ms and LVEF improve >1 grade respectively, though neither showed statistical significance comparing good and suboptimal LV epicardial lead position (50 versus 30% and 63% versus 33% respectively).

## Discussion

The most striking finding in this study was the low use of the implanted LV epicardial leads for CRT at only 49% of the cohort. The high number of unused LV epicardial leads suggests over-prescription and implies the procedure benefits are limited to less than

half the cohort. A minority of patients in fact had normal LVEF, suggesting conventional CRT indications were not met prior to LV lead placement. This exposes patients to unnecessary procedural complexity and risks as well as preventing future use of magnetic resonance imaging investigations. Furthermore, the majority of those who got CRT had the weaker Class IIb indication for pacing as opposed to the conventional Class I indication for severe LV systolic dysfunction, partly because many had a previous device and/or were pacing dependent.<sup>1-4</sup>

Suboptimal LV lead positioning regardless of approach limits the ability for CRT to be beneficial and results in poor CRT response rates and outcomes.<sup>5</sup> An acceptable anatomic position was not achieved in 21/40 (53%) patients, with 30% and 33% having significant improvements in QRS duration and

LVEF respectively, compared to 50% and 63% in those with acceptable anatomical position. Optimising the LV epicardial lead position may involve additional manoeuvres of the heart intra-operatively, but potentially improves the efficacy of CRT. A potential advantage of surgical placement is the ability to place the LV lead in any location. Edgerton et al described a thoracoscopic method in 19 patients using a pacing lead attached to a pulse analyser as a mapping electrode to electrically map exposed areas of the LV.<sup>6</sup> When the depolarisation time between the LV and RV lead was >110ms, 71% reported slight to marked improvement on the quality of life questionnaire. Similarly, Maessen et al described a surgical mapping technique that allowed multiple pace site selection guided by optimising pressure-volume loops in 14 patients after failure of a transvenous approach.<sup>7</sup> Optimising the pacing site with this technique allowed functional improvement up to 40% versus random pace site selection. The best pacing sites in both studies tended to be the posterior and lateral surface of the LV,<sup>6,7</sup> although employment of these methods does require additional operative and testing time, and are not consistently adopted at our centre.

This patient group are high-risk as shown by the in-hospital mortality of 9%. Some observational studies found higher upfront mortality risk of epicardial compared to transvenous LV lead placement even as an isolated procedure.<sup>8</sup> This finding is not consistent with two small randomised trial compared epicardial with transvenous LV leads, which found no difference in outcomes and complications except for longer hospital or intensive care stay for surgical epicardial leads.<sup>9,10</sup> It is noteworthy that among our patients, almost all the

deaths during follow-up occurred in those not having their LV lead connected to a CRT device. Our findings highlight the importance of careful selection of appropriate patients pre-operatively who do not have a high surgical risk, poor prognosis or without a strong indication for epicardial lead placement, who may not live to have or need CRT at all.

This study has several limitations. It is a single-centre retrospective observational study and their associated biases. Due to the small cohort size, the study was not powered to detect significant associations and predictive factors for mortality. Important characteristics and outcomes not collected include symptoms, comorbidities and stroke. Not every patient had follow-up ECGs, echocardiography or chest radiology suitable for lead position assessment to review. Follow-up duration was limited due to it being a contemporary cohort, which would not have revealed benefits and risks that occur late. Nonetheless the important findings were seen in the early and intermediate post-surgical phase.

In conclusion we found that only half of the surgical LV epicardial leads placed were subsequently connected to a CRT device and used. Approximately half of these epicardial leads were placed in a good posterolateral LV position for CRT, and optimal lead placement remained important to improve efficacy of subsequent CRT therapy when used. Overall mortality rates were high, and mostly in patients without having a CRT device implant despite the presence of an LV lead. Selection criteria for appropriate implantation of LV leads at time of concomitant cardiac surgical procedures requires further modification to avoid unnecessary additional surgical complexity.



**Competing interests:**

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# The first analytic evidence for socio-economic gradients in 1918 pandemic influenza mortality rates for New Zealand

Nick Wilson, Osman D Mansoor, Michael G Baker

The international evidence is mixed on there being socio-economic mortality gradients from the 1918 influenza pandemic,<sup>1</sup> but in New Zealand no clear socio-economic gradient in mortality rates has been reported for the overall European population.<sup>2</sup> For example, Rice<sup>3</sup> described the distribution of mortality by occupational groupings and socio-economic status but there was no obvious gradient (albeit without statistical analysis being performed). Also there was no socio-economic gradient in two studies of military populations when analysed using an occupational class measure.<sup>4,5</sup> However, military populations in 1918 were of relatively younger men subjected to selection processes for health status as part of recruitment. An unpublished study of mortality in Dunedin identified the socio-economic characteristics of the deceased, but also did not calculate rates.<sup>6</sup> Another local study<sup>7</sup> did calculate rates, but reported no apparent variation in mortality for different housing districts in Auckland City. This latter work referred to an unpublished history thesis,<sup>8</sup> which contained data that we have now analysed further using modern biostatistical methods.

The data in this unpublished thesis<sup>8</sup> was at the suburb level with suburbs being categorised as ‘working-class suburbs’ and ‘well-to-do suburbs’ (albeit this being a sample that excluded 15 ‘outlying suburbs and districts’ and 11 other suburbs/areas in Auckland). When we analysed the data in these two groupings we calculated that the former collectively had a mortality rate of 9.1 per 1,000 and the latter of 6.4 per 1,000

population (Table 1). This was a statistically significant difference with a rate ratio of 1.42 (95% CI: 1.10–1.82,  $p=0.008$ , mid-p exact two-tailed test). Furthermore, for pandemic-related deaths of the ‘head of the household’ with occupational class coded on a six point scale (ie, from 1 = higher professional and administrative; vs 6 = unskilled),<sup>8</sup> the mean score we calculated was higher in working-class suburbs than in ‘well-to-do’ suburbs (4.3 vs 3.7,  $p=0.0031$ , Table 1). That is, those dying in working-class suburbs also had lower (more deprived) *individual-level* occupational class.

We also took this opportunity to consider an analysis of national data collected by Rice.<sup>3</sup> But given the difficulties of assigning socio-economic status to the occupational groupings, we simply compared ‘professionals’ to all the other occupations which were harder to rank (Table 2). This analysis suggested a statistically significant lower mortality rate in the professionals group vs the other occupations.

All these results could potentially be somewhat confounded by age, eg, if proportionately more young adults in their 20s and 30s, with elevated pandemic-related death rates,<sup>3</sup> resided in the working-class suburbs. However, we have no data on suburban age structures or occupational age structures to evaluate these possible effects. Furthermore, analysis of ‘suburbs’ has various limitations, eg, a ‘working class suburb’ may contain pockets of wealthier population groups.

Nevertheless, the suggested socio-economic gradients we observed in these analyses are consistent with other data for

**Table 1:** Analysis of pandemic-related mortality data for Auckland City for 1918 (data for individual suburbs extracted from Bryder 1980<sup>8</sup>).

Type of suburb in 1918*	Pandemic-related deaths in 1918	Population in the 1916 Census	Crude mortality rate per 1,000 population (95% CI)	Average occupational class of the 'head of the household': 6 point scale; 6 is lowest (SD)
<i>'Well-to-do' suburbs</i>				
Mt Eden	90	12,555	7.2 (5.8–8.8)	3.7 (1.5)
Takapuna	20	2,756	7.3 (4.7–11.2)	4.0 (1.6)
Birkenhead	15	2,116	7.1 (4.3–11.7)	3.4 (1.7)
Northcote	10	1,651	6.1 (3.3–11.1)	5.0 (0.9)
Devonport	36	7,613	4.7 (3.4–6.5)	3.4 (1.4)
<b>Total</b>	<b>171</b>	<b>26,691</b>	<b>6.4 (5.5–7.4)</b>	<b>3.7 (1.5)</b>
<i>'Working-class' suburbs</i>				
Onehunga, Te Papapa	59	5,913	10.0 (7.7–12.9)	4.3 (1.5)
Newmarket	24	2,863	8.4 (5.6–12.7)	4.4 (1.4)
Ellerslie	9	1,363	6.6 (3.5–12.5)	3.8 (1.6)
<b>Total</b>	<b>92</b>	<b>10,139</b>	<b>9.1 (7.4–11.1)</b>	<b>4.3 (1.5)</b>

\*Despite some levels of gentrification in the working-class suburbs, these socio-economic patterns still partly apply in modern day New Zealand. For example, using an area deprivation measure "NZDep2006", Birkenhead and Northcote contain census area units (CAUs) that are in the 2<sup>nd</sup> decile of deprivation (ie, 2<sup>nd</sup> least deprived decile); while Onehunga and Te Papapa have CAUs in the 8<sup>th</sup> decile (ie, near to the most deprived 10<sup>th</sup> decile). At this time in New Zealand's history the Māori urban population was very low and so this analysis is essentially of the European New Zealand population.

New Zealand in this historical period which indicates lifespan differences by male occupational class<sup>9</sup> and for ethnic inequalities in mortality for three previous influenza pandemics in New Zealand (higher Māori vs European mortality).<sup>10</sup> Also these observed gradients are consistent with at least some of the international literature for mortality patterns in the 1918 pandemic, eg, for the US,<sup>11</sup> for Chicago (US),<sup>12</sup> for Sweden<sup>1</sup> and for

Norway<sup>13</sup> (albeit with variation by pandemic wave in one setting in Norway<sup>14</sup>). It is also very plausible that such a pandemic-related mortality gradient existed given that poverty is associated with household crowding and chronic conditions such as tuberculosis, which increased the risk of death in this pandemic. Even so, more research relating to such socio-economic gradients (and ethnic gradients) in this, and subsequent

**Table 2:** Analysis of professionals vs other occupation groups among both male and female "breadwinners" (numerator and denominator data from Rice;<sup>3</sup> with the latter from the 1916 Census<sup>15</sup>).

Occupational group	Pandemic-related deaths in 1918	Population in the 1916 Census	Crude mortality rate per 1000 population (95% CI)	Rate ratio (95% CI)
Professionals	189	29,970	6.3 (5.5–7.3)	0.87 (0.76–1.01); (p = 0.035, 1-tailed test)
All other occupational groups*	2,971	412,190	7.2 (7.0–7.5)	Reference (1.0)

\*Includes: Armed forces; Accommodation and domestic services; Commercial, financial and retail; Transport and communication; Industry and manufacture; Trades and construction; and Primary production. Note: due to the lack of relevant data the rates are not age/sex standardised.

pandemics, would seem desirable, so as to achieve a better understanding of their true impact. Indeed, future studies in New Zealand could try to devise ways to grade localities in 1918 according to socio-economic status or deprivation (eg, by infant mortality rates) and analyse individual level data with adjustment for potential confounders.

Prudent policy-makers should, however, assume that such socio-economic gradients may arise with future influenza and other pandemics and so pandemic planning should aim to minimise health inequalities. That is

if border control was not implemented or failed, more deprived communities could be more intensely supported with disease control activities that both minimised incidence rates and maximised healthcare support to those who become ill. The bigger implication is that pandemic preparedness is yet another reason to reduce health inequalities now, eg, by improving housing, reducing crowding and eliminating preventable causes of health burden among low-income New Zealanders (eg, tobacco and obesogenic food environments).

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**Competing interests:**

Nil.

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# Update from the New Zealand Familial GI Cancer Service 2018

Christopher J Wakeman, Teresa Chalmers-Watson, John Keating,  
Ben Griffiths, Maggie Ow, Rachael Bergman, Susan Parry

**L**ynch syndrome is the most prevalent cause of inherited colorectal cancer with a lifetime risk of CRC of up to 50%. There is also an increased risk of other cancers, including endometrial, ovarian, gastric and small bowel. Gastric cancer was initially reported as the most common cancer after CRC and endometrial cancer with up to an 11% lifetime risk. Consequently, there was the recommendation that surveillance gastroscopy be considered in individuals with Lynch syndrome.

The incidence of gastric cancer in the general population has shown a marked decline over the last 30 years due to a number of reasons, including the identification and eradication of *H. pylori*. This decline is mirrored in the Lynch syndrome population, and more recent data suggests the risk of gastric cancer is lower, between 1–6% depending on genotype.<sup>1</sup>

Previously, based on published risks, NZFGICS recommended annual surveillance gastroscopies in Lynch syndrome patients with an MLH1 and MSH2 mutation. We wanted to re-assess the appropriateness of these recommendations and therefore undertook an audit of the outcome of surveillance gastroscopy in these patients.

Between 1 May 2011 and 1 November 2014, 320 gastroscopies were performed in 177 mutation-positive individuals across New Zealand. There were two cancers detected at surveillance. One adenocarcinoma at the GO junction arising within a short segment of Barrett's oesophagus and one duodenal cap tumour. Both of these individuals underwent curative resection. In summary, 160 gastroscopies were needed to identify one resectable upper GI cancer.

As a result of these reassuring results as well as recently published international Consensus Guidelines<sup>2,3</sup> and aware of the resource-constrained environment in which we practice, from mid-2016 we have changed our recommendations with regards to gastroscopy surveillance in Lynch syndrome.

As a result, we now recommend only a single gastroscopy at the age of 35 years in Lynch syndrome patients carrying the MLH1 or MSH2 mutation. This should include 1) inspecting the distal duodenum as 50% of small bowel tumours occur in the duodenum and 2) eradicating *H. pylori* if present. If there are significant findings (such as extensive intestinal metaplasia), further surveillance gastroscopy will be considered in three years.

There are no specific recommendations for gastroscopic surveillance in Lynch syndrome patients with the other MMR mutations. If there is a history of gastric cancer in a particular family, specific recommendations may be made by the Service.

## Familial adenomatous polyposis— update on surveillance of the anal canal and retained rectum

Familial adenomatous polyposis patients who have undergone proctocolectomy and ileorectal anastomosis require ongoing surveillance of the anal canal as there remains a risk of adenoma and potentially carcinoma development. The risk of neoplastic development at this site is reduced if a mucosectomy is performed in preference to a double-stapled pouch-anal anastomosis, and consideration may be given to this at the time of pouch formation. Adenomas may also develop in the ileum of the pouch and should be biopsied or removed.

Therefore we recommend annual 'pouchoscopy' for all patients with an ileoanal pouch, up to the age of 75 years, with careful examination of the pouch-anal anastomosis (including retroflexion). A paediatric colonoscope may be preferable in this regard. Examination of the pouch can be usefully combined with upper GI endoscopy to examine the duodenum for adenomatous polyp formation according to recommendations for upper GI surveillance in FAP patients.

In individuals who have undergone an ileorectal anastomosis and have a retained rectum with increasing polyp burden, the frequency of surveillance may be increased. Chemoprotective agents including Sulindac or Celecoxib may reduce the polyp burden but do not change the recommendations. If the polyp burden is uncontrolled endoscopically, consideration should be made for completion proctectomy +/- pouch formation.

### Serrated polyposis syndrome (SPS)

There are three criteria as defined by the WHO (2010) for the diagnosis of serrated polyposis syndrome (SPS)

1. Five or more serrated polyps proximal to sigmoid colon ( $>10\text{mm}$ )
2. Any number of serrated polyps proximal to the sigmoid colon in an individual who has a first-degree relative with serrated polyposis
3.  $>20$  serrated polyps of any size throughout the colon (not confined to rectum). Note this polyp count is cumulative over repeated colonoscopies.

As hyperplastic polyps are simple serrated polyps, the term hyperplastic polyposis syndrome has been replaced by the term serrated polyposis syndrome.

Although the initial reports of colonoscopy surveillance in SPS cancer reported cumulative colorectal risks during surveillance of 6.5–7%,<sup>4,5</sup> more recent studies have been provided evidence that colonoscopy surveillance is safe.<sup>6</sup> However, control of the initial polyp burden is essential as is caution in extending the surveillance interval, particularly in those with higher than 20 pan colonic polyps. Consequently, in line with international recommendations, because the initial polyp burden in some patients with SPS can be high, we advise that an initial colonoscopy may be required every 3–6

months to clear all polyps (or at least ones  $>10\text{mm}$ ). Once control of polyp burden is achieved, annual surveillance colonoscopy is recommended with removal of all lesions  $>5\text{mm}$  and smaller as time allows. In our cohort of 96 patients with SPS1 (polyps alone at presentation) followed for a median of 4.8 years, the majority of patients have an average of fewer than 10 polyps at the fourth colonoscopy procedure. This refers to colonoscopies performed, after diagnosis of SPS, at intervals appropriate to the polyp burden.

Based on these findings we advise that patients who have had two consecutive annual colonoscopies meet the following criteria:

1. Less than 10 polyps where the majority of polyps are less than 5mm in size
2. All right-sided polyps have been removed
3. No histology of concern such as SSPs with dysplasia
4. Good bowel preparation (particularly in the right colon).

Then an extension of the surveillance interval to two-yearly can be considered.

However, a return to annual surveillance should be considered if the polyp burden exceeds these criteria at any procedure. A possible algorithm of clinical and endoscopic management in SPS has recently been proposed in GUT by Hassan<sup>7</sup> and is in keeping with the above recommendations, although we have been more conservative with regards to polyp size with regards to extending the interval.

There will be some patients with SPS whose polyps are not adequately controlled by colonoscopy and polypectomy, even if colonoscopy is initially performed at 3–6 monthly intervals—in these patients surgery may be the best management option. It would appear from our data that a review of the polyp findings at the fourth colonoscopy could alert clinicians to which patients may not be achieving adequate polyp control within an appropriate time frame—such patients could then be kept under close review with consideration being given to the option of surgical management.<sup>8</sup>

Risk factors for colorectal cancer in SPS have also been identified and are summarised below.<sup>9,10</sup>

These factors should be taken into consideration when determining surveillance intervals in SPS.

- Any proximal polyp SSP with high-grade dysplasia
- Two proximal SSA/P's
- 1 serrated polyp (SP) with dysplasia or advanced adenoma
- Fulfilment of both WHO criteria 1 and 3

Patients who only meet WHO criterion 2 for SPS while still at increased risk of CRC should undergo surveillance colonoscopy

on a five-yearly basis or as dictated by their polyp burden. If these patients eventually meet criterion 1 or 3 in their own right, they should enter appropriate SPS surveillance.

Two studies<sup>4,11</sup> have documented that first-degree relatives of individuals with SPS have a five-fold increase in their lifetime risk of developing bowel cancer and a higher risk of developing SPS themselves. For this reason, it is recommended that first-degree relatives be offered five-yearly bowel screening by colonoscopy from the age of 40 to 75 years if they are otherwise well.

#### Competing interests:

Nil.

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<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1486-30-november-2018/7757>

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# Voluntary undertaking to chaperone

## Charge

On 17 April 2018 by video conference, the Health Practitioners Disciplinary Tribunal considered a charge laid by the Professional Conduct Committee against Dr Vijay Harypursat, medical practitioner of Whangarei (the Doctor).

The charge alleged that the Doctor had:

On 14 occasions between 15 July 2014 and 5 March 2015, breached a voluntary undertaking between him and the Medical Council of New Zealand (MCNZ) effective from 15 July 2014 that he have a chaperone present when seeing female patients.

On 10 occasions between 15 July 2014 and 9 September 2015, incorrectly and/or falsely recorded that a chaperone was present during consultations with female patients.

Between 5 March 2015 and 9 September 2015, failed to observe a condition imposed by the MCNZ on his scope of practice effective from 5 March 2015 that he have a chaperone present when seeing female patients on two occasions.

## Findings

The hearing proceeded on an agreed summary of facts basis.

The Tribunal was satisfied that Particulars 1 and 2 of the charge were established and amounted to negligence, malpractice and were likely to bring discredit to the profession. The Tribunal considered the Doctor's conduct was a significant departure from accepted standards. The Tribunal found Particular 3 was established and warranted a disciplinary finding against him.

## Penalty

The Tribunal suspended the Doctor for a period of two years and censured him. Conditions were imposed on his practice following recommencement of practice. He is required to undergo training and assessment prior to commencing clinical practice and further conditions were imposed for a period of two years once he recommences clinical practice. The Tribunal ordered the Doctor pay a contribution of \$9,703 towards the costs of and incidental to the hearing.

The Tribunal directed publication of its decision and a summary.

Full decision available on website:  
<http://www.hpdt.org.nz/ChargeDetails.aspx?file=Med18/413P>

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## URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1486-30-november-2018/7758>

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# Dr Peter William Gould

11 February 1945–13 October 2018



BSc University of Auckland 1965, MBChb University of Otago 1970, FRACP 1977

**P**eter Gould was born in Auckland. After completing a BSc in mathematics and physics at Auckland University he studied medicine at Otago University. Peter was blessed with a photographic memory and sailed through his studies. He lectured in Internal Medicine at Otago in the 1970s and became a Medical Research Council Scholar of Great Britain. He trained as a dermatologist but retained a great interest in a broad range of medical subjects.

Peter was a member of several dermatological societies and a sought-after speaker at international meetings, particularly in the UK and US. He was a member of the British Association of Dermatologists and a life fellow of the Royal Society of Medicine. He is remembered as a friend and colleague at the Mayo Clinic where he was a visiting

fellow. Several of his junior colleagues benefitted by his arranging training positions with these important contacts. Peter strongly supported the New Zealand Dermatological Society of which he was a member from 1977 and President in 1988. He worked as a consultant dermatologist at Auckland Hospital for many years and later in his busy and renowned private practice in Milford, Auckland.

Problem solving came naturally to Peter; he trimmed the complex to the simple. He thrived on difficult and rare diagnostic challenges. He taught and lectured widely, and he dropped pearls regarding the most fundamental aspects of medical care: communication, clinical acumen and kindness. His lectures to medical students are remembered as virtuoso performances.

Peter was an entertainer, he loved music and was an exceptional violinist, but it was his wit and storytelling that formed him. Where ever he was and whoever he was with, he made friends through his lively exchanges. He entertained his family, patients, staff, colleagues, friends, taxi drivers, porters, waiters, shopkeepers, anybody he met in the street; he was unremitting. His jokes were frequently rude; his after-dinner speeches devastating. Despite this he was extraordinarily appropriate and caring as a medical practitioner and a person. Above all he was worthy of great trust. Many of his patients recall him as a close friend.

Sharing a love of food was at Peter's heart; much of his generosity was expressed through this passion. There were favourite restaurants around the world and formal dinner parties, but he was possibly happiest in his own kitchen. He methodically cooked while he entertained with stories, his family or friends perched benchside while he served beautifully prepared food. Seasoning was his hallmark; he knew how

to lift the simplest ingredients. His pantry was enormous and there were endless kitchen gadgets, the best, the beautiful and the quirky. He plied his guests with the fine wines but insisted on no driving, which resulted in a close relationship with his own drivers, several taxi companies and Dial a Driver.

He had an eye for excellent design in furnishings and clothing and kept his wardrobe overflowing with shirts, jackets, shoes and the special socks his patients loved and looked for.

Family was paramount to Peter. He is survived by his children, Catherine and Michael, of whom he was immensely proud. This was a close relationship of mutual support and love. He was delighted with the arrival of his grandchildren, Ella, George, Jake, Meila and Chae. He was close to his siblings and extended family. As a loyal father, friend, colleague and employer he was the first to pick up the phone if there was a problem. One of life's true characters, Peter was a most generous spirit and will be greatly missed by all who knew him.

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**URL:**

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1486-30-november-2018/7762>

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## Coronary CT angiography and five-year risk of myocardial infarction

Although coronary computed tomographic angiography (CTA) improves diagnostic certainty in the assessment of patients with stable chest pain, its effect on five-year clinical outcomes is unknown.

In this trial, 2,073 patients were randomised to standard care plus CTA and 2,073 were managed with standard care alone. The primary endpoint was death from coronary disease or non-fatal myocardial infarction at five years. The primary endpoint was found to be significantly lower in the CTA group ( $P=0.004$ ). The rates of coronary angiography and revascularisation were similar in both groups at five years. However, more preventive and antianginal therapies were initiated in the CTA group.

It was concluded that the use of CTA in addition to standard care in patients with stable chest pain resulted in a significantly lower rate of death from coronary heart disease or non-fatal myocardial infarction at five years than standard care alone, without resulting in a significantly higher rate of coronary angiography or coronary revascularisation.

*N Engl J Med* 2018; 379:924–33

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## Association between maternal adherence to healthy lifestyle practices and risk of obesity in offspring

The objective of this study was to examine the association between an overall maternal healthy lifestyle (characterised by a healthy body mass index, high quality diet, regular exercise, no smoking and light-to-moderate alcohol intake) and the risk of developing obesity in offspring.

The participants were approximately 17,000 women involved in the Nurses Health Study in the US and over 24,000 of their children. 5.3% of the offspring became obese during a median of five years of follow-up.

When all healthy lifestyle factors were considered simultaneously the offspring of women who had adhered had a 75% lower risk of obesity than offspring of mothers who did not adhere to any low risk factor.

*BMJ* 2018; 362:k2486

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## Cannabis: what you need to know

This interesting paper reviews information on this topic derived from the Dunedin Multidisciplinary Health and Development Study and the Christchurch Health and Development Study.

It is noted that the use of cannabis prior to age 18 is associated with an increased risk of failure to achieve educational qualifications, a greater risk of under- or unemployment, and a higher likelihood of welfare dependence. Another potential harm is the gateway effect in which the use of cannabis, particularly in younger and heavier users, increased the risk of other illicit drugs by more than three times to age 25. Another point arising from the Christchurch Study is that those using cannabis daily at some point prior to age 21 had an 80% increase in risk of psychotic symptoms by age 25.

Very alarming information. Certainly important to know before the referendum on the legal status of cannabis.

*University of Otago Magazine* 2018; 47:32–33

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### URL:

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# The End of the Great War

December 1918



New Zealand soldiers and civilians in London at the end of World War I. Royal New Zealand Returned and Services' Association: New Zealand official negatives, World War 1914-1918. Ref: 1/2-014090-G. Alexander Turnbull Library, Wellington, New Zealand. /records/22889302

The crowning victory which our Empire and her noble Allies have gained over a mighty, but at the same time despicable, enemy is a matter for profound thankfulness and pride—thankfulness that Providence has continued in our race and in our day the same old doggedness that served our fathers, and pride that although we never doubted our supremacy on the sea, on land we were able to forge, during the stress of actual war, a military machine more powerful than the reputed invincible legions of the German War Lord. Truly of him it may be said that he “came in with vanity and went out in darkness, and his name shall be covered with darkness.” Withal, there is a sense of sadness—sadness for many brave men and companions who are no more, and for whole nations that have been stricken

and stripped bare by an overbearing and relentless foe. In these ravished parts of the world “the fig tree shall not blossom, neither shall fruit be in the vines; the labour of the olive shall fail, and the fields shall yield no meat; the flock shall be cut off from the fold, and there shall be no herd in the stalls.” The victory will not be complete until ample reparation has been made by the Germans and their allies.

The war has been a triumph for medical science. The medical service of the Army, when untrammelled, has approached closely to perfection, and its success in checking preventable disease and giving comfort and restoration to the sick and wounded has exceeded the highest hopes of the most sanguine minds.

Our New Zealand Medical Corps has shared the honours with the parent service, and the profession in New Zealand has given more than one-third and nearly one-half of its members to military service. The New Zealand Branch of the Medical Association has been privileged to help in the great cause. In the early stages of the war the Association, if it did not actually initiate, at all events was the main agency, by advocacy and financial assistance, to establish, proper hospital accommodation in the camp at Trentham, and a committee of the Association, after investigation, presented a report upon conditions arising out of the first serious epidemic of cerebro-spinal meningitis, which was adopted practically in its entirety by the Government. Hundreds of our members threw their practices to the winds and went away to serve the Army. Not a few gave their lives for the cause, and many others suffered permanent injury to their health. The doctors who remained behind undertook to the verge of exhaustion the heavy burden of attending medically to the needs of the civil population and of soldiers in camp and on home service,

and supplied Medical Boards and medical examiners from the North Cape to the Bluff. Throughout, the Association gave the utmost practical and moral support to the medical military administration, and even on the few occasions when its advice was rejected, notably on the question of the best and fairest way of maintaining a supply of doctors for the Army from the ranks of a depleted and seriously overburdened profession, it accepted the situation as it was and worked for its success. We make this recital of some of the main parts of the work of our organisation during the war not to belaud one another, but because we all derive satisfaction from the recollection that we were privileged to have been of some material help to our country in great crisis. We could not have done less, and we doubt if we could have done more. We may still be able to assist during the period of demobilisation and reconstruction, and we have no doubt of the continuation of the cordial relations that already exist between General Henderson, Colonel Purdy, and the other administrative officers on the one hand and the Association on the other.

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**URL:**

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# Proceedings of the Waikato Clinical Campus Biannual Research Seminar

27 September 2018

## Pyogenic vertebral column osteomyelitis in adults—modified frailty index correlates with 30-day mortality

Jeevan Vettivel,<sup>1</sup> Joseph F Baker<sup>2</sup>

<sup>1</sup>School of Medicine, Monash University, Melbourne, Australia;

<sup>2</sup>Associate Professor in Surgery, University of Auckland; Consultant Orthopaedic Surgeon, Waikato Hospital, New Zealand.

### Study design

Retrospective cohort analysis.

### Objective

Describe the characteristics of a cohort of patients treated for vertebral column osteomyelitis at a single centre, analyse factors associated with 30-day and one-year mortality with particular focus on the modified Frailty Index.

### Summary of background data

Vertebral column osteomyelitis is increasing in incidence globally. Understanding the burden of disease, its characteristics and risk factors for mortality can guide both clinician and patient in treatment choices.

### Methods

Retrospective study of 76 patients treated at a tertiary referral centre. Demographic details, disease characteristics, laboratory measures, details on treatment modality and microbiologic results were collected. Comorbid conditions were detailed to calculate the modified Frailty Index.

### Results

The mean age was 64.1 years and 77.6% were male. The 30-day and one-year mortality rates were 5.2% and 22.3% respectively. The mean number

of conditions calculated towards the mFI was 1.4 (s.d. 1.3), range 0–5. The mFI (R = 0.400) and chronic renal failure (R = 0.332) significantly correlated with 30-day mortality while the number of levels involved (R = 0.334) and age (R = 0.286) correlated significantly with one-year mortality.

### Conclusions

Our 30-day and one-year mortality rates were not dissimilar to those reported elsewhere. The modified Frailty Index offers promise as a tool to identify patients with vertebral column osteomyelitis at risk of early mortality and may be of use to both clinicians and patients.

## The safety, efficacy and utility of same-day discharge after sinus and nasal surgery

Cassie Wang,<sup>1</sup> Andrew Wood<sup>1,2</sup>

<sup>1</sup>Department of Otorhinolaryngology-Head and Neck Surgery, Waikato Hospital, Hamilton; <sup>2</sup>Department of Surgery, Waikato Clinical School, The University of Auckland, Auckland.

Practices vary with regards discharge after sinus and nasal surgery with reasons for overnight admission cited, including medical comorbidities, distance travelled home and risk of early post-operative bleeding. We aimed to test the hypothesis that a culture of same-day discharge is safe and effective.

### Aims

Document outcomes from the practice of a single surgeon working at two institutions: one where the culture is of same-day discharge (Hospital 1) and the other where it isn't (Hospital 2).

### Method

Retrospective audit of all cases of frontal drillout, endoscopic sinus surgery, septoplasty or turbinoplasties performed by a single surgeon across two hospital sites over a 12-month period. Demographic and clinical details including distance travelled from home were collected as were details of timing of discharge and re-presentation to hospital.

### Results

A total of 183 patients were identified (95 Hospital 1, 88 Hospital 2). One hundred and seventy-five out of 183 patients (96%) were American Society of Anesthesiologists grade 1 or 2. 0 out of 95 from Hospital 1 (0%) and 22 out of 88 patients (25%) from Hospital 2 lived more than 60km from the hospital. One hundred and seventeen out of 183 patients were discharged the same day (95 out of 95 Hospital 1, 22 out of 88 Hospital 2). Four out of the 117 day surgery patients (3.4%) re-presented to the emergency department within the first 24 hours. All four of these cases were due to bleeding. A total of 12 out of 183 patients re-presented to the emergency department at any point after surgery (6.6%).

### Conclusion

Routine same-day discharge after sinus and nasal surgery is achievable, safe and results in an acceptable rate of re-presentation within the first 24 hours (3.4%). Potential barriers include institutional culture, geographic size of the catchment area and patient comorbidities.



### Measured implementation of an accelerated chest pain diagnostic pathway in rural primary care

Tim Norman

Regional Implementation Manager, Pinnacle, Midland Health Network.

**Aim**

To assess the efficacy, safety and feasibility of implementing an Emergency Department Assessment of Chest Pain Accelerated Diagnostic Pathway (EDACS-ADP) using a current generation point-of-care cardiac troponin (POC cTn) assay for rule-out of acute myocardial infarction in patients presenting to rural general practices in the Midland region of New Zealand with suspected cardiac chest pain.

**Method**

The EDACS-ADP was implemented and evaluated in 12 rural Midland general practices. The primary outcomes assessed were the number of patients identified as low risk managed without transfer to hospital following presentation and major adverse cardiac events (MACE) (myocardial infarction, death, cardiac arrest, revascularisation, shock, arrhythmia) at 30 days.

**Results**

Between October 2016 and March 2018, 142 patients with chest pain of suspected cardiac origin entered the pathway. Sixty-nine (49%) were male, mean age of 56. Over half were considered low risk, managed and discharged home by primary care. Low risk were more likely to be younger (mean age 53yrs v 63yrs). No MACE was noted in the low risk group. One in 3 patients were assessed as non-low risk and referred to hospital with MACE rate of 15%.

	Number	30 days MACE
Low risk	80 (56%)	0
Non-low risk	46 (44%)	7 (15%)

**Conclusion**

This rural chest pain pathway has the potential to identify a low-risk population who may

be safely managed locally thereby reducing transfer to hospital and allowing more rural autonomy, benefiting both patients, and secondary and tertiary healthcare services.

### The effect of EEG wave shape on anaesthetic depth calculations

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Anaesthetic depth calculations are based on ratios of frequency information contained in the electroencephalogram (EEG)—brain signals obtained from the scalp. These calculations assume that each neurological process contributes a unique frequency pattern. However, recent research of the effect of deep brain stimulation on EEG beta oscillations suggests that wave shape, a non-sinusoidal feature that is only measurable in the time-domain, can change the frequency 'signature' of a neurological rhythmic process—for example, the inclusion of harmonic frequencies. If wave shape variations are present in the EEG of anaesthetised patients, then depth of anaesthesia calculations likely overestimate the patient's true state. The focus of our research was to investigate alpha-wave shape in the EEG of anaesthetised patients and demonstrate the effect of wave shape on anaesthetic depth calculations.

EEG and patient data was collected prospectively from 305 patients undergoing a general anaesthesia for elective surgery. Alpha-wave shape was categorised by sharpness of the EEG extrema, a measure of how peaked (towards a sawtooth wave) or flat (towards a square wave) the extremum was. The alpha-wave was then artificially modified to either a sawtooth wave or square wave. Common frequency ratios used in anaesthetic depth calculations were calculated before and after the changes.

We found that the alpha-wave of anaesthetised patients contains non-sinusoidal components. Sex, age and concentration of volatile anaesthetic drug were significant predictors of alpha-wave sharpness. The artificial sawtooth and square waves both increased the major frequency ratios. Any artefactual increase in sharpness therefore could result in artificial elevation of proprietary EEG monitor index values and misguide patient management.

### Single-centre evaluation of metastatic spine disease prognostic tools and development of the metastatic spine risk index

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**Background context**

Predicting post-treatment survival in patients with spinal metastatic disease is an important consideration when considering treatment options. Most existing scoring systems include a combination of subjective and objective prognostic items that complicate survival prediction, especially in external patient populations.

**Purpose**

The aim was to compare existing scoring systems and identify key prognostic indicators in the local population. The four scoring systems compared were the Oswestry Spinal Risk Index (OSRI), modified Bauer score (MBS), van der Linden score (VDLS) and New England Spinal Metastasis Score (NESMS).

**Study design**

This was a retrospective, single-centre study of post-treatment survival.

**Patient sample**

All patients who had a secondary metastasis to bone between 2006 and 2016 at our tertiary centre were screened for spinal metastatic disease.

**Outcome measures**

The outcome measure was post-treatment survival in months.

**Methods**

Demographic, functional, laboratory, imaging, histological and survival data were gathered from the centre's medical records. Existing prognostic systems along with their individual scoring items were evaluated with univariate and multivariate analysis. Significant items on multivariate analysis were used to design a simple, population-specific and objective scoring system, which was then compared with the existing scores.

**Results**

In the 11-year period under investigation, 106 patients received a combination of surgery and radiotherapy for spinal metastatic disease. Eleven patients (10%) were still alive at the time of analysis and the mean post-treatment survival time was 13.7 months. All four scoring systems were significantly correlated with survival and had similar concordances. The MBS had the largest coefficient of determination (Cox and Snell's  $R^2 = 0.18$ ), followed by the NESMS ( $R^2 = 0.14$ ). The OSRI and VDLS were the poorest performing scores in our patient population ( $R^2 = 0.11$  and  $0.10$ , respectively). On multivariate analysis, the lung cancer (MBS) and serum albumin (NESMS) items were significant. A system using a modified OSRI primary tumour item and NESMS serum albumin outperformed the MBS ( $R^2 = 0.20$ ).

**Conclusions**

The present study suggests that the existing scoring systems' use of functional status and extra-spinal metastases for prognostic purposes is suboptimal. Based on our findings we propose the 'Metastatic Spine Risk Index' as a simple and objective tool for predicting survival and can be used in conjunction with other clinical information when considering treatment options.

**Pathways to thoracic surgery for lung cancer patients—sensitive referral or serendipity?**

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**Purpose**

There are concerns that too few patients are diagnosed early enough in general practice to influence outcomes. We wanted to quantify the mechanism of detection in lung cancer patients receiving thoracic surgery in Waikato, New Zealand. This will guide the development and implementation of strategies to increase the detection and treatment of thoracic malignancy in our region.

**Methodology**

The study sample is a prospectively maintained group of patients who underwent potentially curative thoracic surgery between July 2015 and June 2018 at Waikato Hospital. The primary objective was to identify the mode diagnosis and the symptoms at time of presentation.

**Results**

Total sample was 128 patients. Mean age is 66 (+/-10.2), M:F 1.3:1, smoking history in 82% and COPD in 34%. Māori represent 25% of patients. Fifty-seven patients were diagnosed as an incidental finding (44%). The main modality of detection was chest x-ray in 79 patients

(62%) followed by computed tomography in 38 (30%). Of those that were detected on CT, there was no prior positive chest x-ray (0%). Symptoms at presentation were cough in 66 (52%), dyspnoea in 28 (22%), haemoptysis in 15 (12%), chest pain in 25 (19%), hoarseness in 3 (2%), fatigue in 15 (12%), weight loss in 23 (18%) and finger clubbing in 5 (4%).

**Discussion**

There is ongoing conjecture over the most effective respiratory malignancy awareness program. There have been previous examples worldwide with varying results (1–3). This cohort demonstrates cough, dyspnoea, chest pain and weight loss as the most common findings. Just under half of all cases are incidental. Compared to the general population, there is a disproportionately high percentage of the cohort from Māori origin (25%).

**The utility of virtual reality surgical simulation in the undergraduate otorhinolaryngology curriculum**

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**Objectives**

Surgical simulation is increasingly used in postgraduate surgical teaching. There are little data, however, about its role in undergraduate medical education. We hypothesised that a temporal bone virtual reality (VR) surgical simulator has utility in the undergraduate curriculum, both as a teaching tool for otology, but also in stimulating students to consider their long-term specialty career plans.

**Method**

Participating medical students attended a workshop which involved both didactic teaching around middle ear disease and imaging, and the use of a temporal bone VR surgical simulator to carry out a cortical mastoidectomy. Students filled out a questionnaire on career interests prior to the workshop. Students evaluated the usefulness of the virtual reality surgical simulator, their enjoyment of the experience and any changes in their interest in otorhinolaryngology or surgery in general with a post-workshop questionnaire.

**Results**

Thirty-two fifth-year University of Auckland medical students were prospectively recruited while completing their otorhinolaryngology attachment at Waikato Hospital during the 2017 academic year. Most students (53.1%) had made some decisions around their career path, although the majority did not think their university experience was sufficient to make this decision (59.4%). The VR surgical simulator experience was useful for stimulating thoughts around career plans (71.9%), providing a hands-on experience (93.8%)

and teaching disease processes (93.8%). After the workshop, 50% of students were more interested in a career in surgery, and 53.1% of students were more interested in a career in ORL.

**Conclusion**

Virtual reality simulation shows promise as a fun and efficient way of teaching surgical specialties such as otorhinolaryngology. If virtual reality was implemented as part of the medical curriculum as a teaching tool, it could also provide students with an experience which helps guide career planning.

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