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EDITORIALS

Overcrowding and infectious diseases – when will we learn the lessons of our past?

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The association between overcrowded living conditions and infectious disease incidence is hardly new. While overcrowding does not cause infectious disease, people living in overcrowded rooms are more likely to catch infections as they talk, laugh, eat, cough, sneeze and sleep close together. Infectious diseases are just that – infectious. Common sense tells us that families in overcrowded conditions not only suffer increased risk of disease themselves, but they are reservoirs of disease transmissible to others in society.

Numerous studies have demonstrated links between household overcrowding and infectious diseases. Greenwood's 1935 text "Epidemics and Crowd-Diseases" unequivocally describes tuberculosis, an important cause of mortality for over 2000 years, as a crowd disease. A strong association was demonstrated between crowding and tuberculosis in Scotland during the 1930's.¹ Research in the United States has shown that crowding mediates much of the recent spread in tuberculosis, irrespective of AIDS-related disease.² A linear association between crowding and rheumatic heart disease was first shown in England over 60 years ago.³ Studies in the US in the 1950s clearly showed overcrowding to be associated with rheumatic heart disease, regardless of socio-economic status,⁴ and the continuing rates of rheumatic fever in New Zealand's Pacific Island and Maori children today are attributed, at least in part, to overcrowding.⁵

A British study concluded that household crowding was more important than repeated casual contacts in the spread of acute respiratory infections,⁶ and a Norwegian case-control study found a significant association between overcrowded homes and infections with respiratory syncytial virus (RSV),⁷ which causes annual epidemics of pneumonia and bronchiolitis in young children. Respiratory infections in young children, including RSV, are a major cause of hospital admission in New Zealand, particularly from areas with high overcrowding levels. Midland Health data indicate that if infectious disease admission rates, amongst which respiratory infections are prominent, were reduced in young Maori children to that in non-Maori, young Maori admissions would more than halve, with potential savings of millions of dollars.

Neisseria meningitidis can cause devastating illness, and is renowned for capricious epidemics, such as that which currently plagues New Zealand. These epidemics have been attributed to overcrowded living conditions as far back as World War One, when Glover showed that meningococcal infections rose dramatically in overcrowded military barracks, especially if beds were too close together.⁸ A case-control study undertaken in the UK during the 1990s

showed a clear association between meningococcal disease and household overcrowding.⁹

Closer to home, a New Zealand case-control study published last month unequivocally confirms the association between meningococcal disease and overcrowding.¹⁰ Using a multivariate model and controlling for age, ethnicity, season and socio-economic factors, the risk of meningococcal disease was strongly associated with overcrowding, as measured by the number of adolescent and adult (ten years or older) household members per room (odds ratio 10.7, 95% confidence interval 3.9 to 29.5). This means that if a family living in an average sized house of six rooms increased the number of adolescents or adults by two, the risk would double. The addition of four adolescents or adults results in a five fold increase in risk, and the addition of six, a 10.7 fold increase. If the house had four rooms, an almost doubling of risk results with the addition of only one extra adolescent or adult. This study shows it is the number of adolescent and adult household members that is important in the transmission of *Neisseria meningitidis*. The finding is biologically plausible, as these age groups carry the organism in their throat. Importantly, the effect of overcrowding applied equally to all ethnic groups. The researchers concluded that while household overcrowding is unlikely to have caused our meningococcal disease epidemic, overcrowding has almost certainly intensified its effect among the most vulnerable, notably Maori and Pacific Island families in Auckland.

Historically, the most dramatic gains in public health have been through improved housing conditions and sanitation. The decrease in most infectious diseases runs parallel to improved socio-economic conditions. However, gains in health status have not been uniform. While the proportion of overcrowded households has fallen consistently, the gains have been uneven and absolute numbers remain substantial. For the 1996 Census, Statistics New Zealand used a definition used by Canada and Australia to analyse crowding levels. It revealed that 69 200, or 5.7% of New Zealand households, required one or more additional bedrooms to meet the sleeping needs of the household. Using the same definition, 7.8% of respondents aged 15-64 years in the 1996/7 New Zealand Health Survey also lived in overcrowded conditions, and in these households, people reported significantly poorer physical and mental health.

Families with young children are even more likely to live in overcrowded conditions. In 1996, even using a narrower definition of crowding – the need for two or more additional bedrooms – almost 60% of crowded homes included children aged under five years. While overall crowding levels

reduced between 1976 and 1981, the gaps increased between Maori and Pacific Island families and others. In 1981, Maori and Pacific Island households were six to ten times more likely to be overcrowded than other households, compared with four to five times in 1976 (crowding defined as more than one person per room). In 1996, Maori and Pacific people represented 74.6% of people living in crowded homes, yet these two groups together formed just over 20% of our population.

Overcrowding mainly reflects the inability of those with low incomes to buy or rent adequately sized houses. A recent New Zealand study of a random sample of 401 low-income families showed 40% of families lived in overcrowded homes and 25% spent half or more of their income on rent or mortgages.¹¹

The relationship between overcrowding and infectious disease is complex. Income, education and occupation together act as underlying factors relating to housing conditions. These interrelationships make it difficult to establish simple causal links between overcrowded conditions and infectious diseases. Where housing and health research has been undertaken, the complexity of results and methodological issues have been used as justification for policy paralysis. However, the picture emerging is very clear and cannot be ignored. Affordable and appropriately sized housing should be factored into social and health policy. There is strong anecdotal evidence, backed up by qualitative research,¹² that policy changes, which saw a move to market rentals for state houses, and reductions in state benefits, led to overcrowding as families doubled up to offset rising rentals.

People who live in industrialised countries cannot afford to be complacent. Infectious pathogens, particularly those related to social conditions, can emerge and re-emerge. Tuberculosis has re-emerged in association with urban decay

in large American cities,² and in New Zealand, there is the emergence of the meningococcal disease epidemic.¹⁰ Given that infectious diseases do not confine themselves to where they originate, the need to address household overcrowding is clear on both grounds of social justice and enlightened self-interest – to benefit society as a whole.

Adequate housing is a cornerstone of public health, yet vulnerable New Zealanders continue to live in overcrowded conditions. Measures to improve public health by addressing such obvious and ordinary problems as overcrowded homes may lack prestige and glamour, but such population-based approaches have enormous potential to improve everyone's health and reduce suffering.

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Qualitative approaches in health research

Elizabeth W Plumridge, Senior Lecturer, Department of Public Health and General Practice, Christchurch School of Medicine, Christchurch.

There are an increasing number of introductions to qualitative research appearing in medical journals¹⁻⁷ arguing for its utility or explaining some of its methods. In reality however, there is no one such entity as 'qualitative' research. Rather, there are a number of radically different traditions of research, qualitative in the sense that they do not proceed from the basis that the world (and thus the research problem) can be understood solely by measuring, counting and statistical analysis, however sophisticated. In these traditions, the research 'problem' is seen as arising from causal factors best understood by non-numeric means. Understanding the 'essence' of an experience (eg, phenomenology), patterns of meaning-making (eg, humanism), the character of relationships of power between genders, ethnic groups or socio-economic classes (critical theory), or the constraining and enabling effects of language (eg, discourse analysis, conversation analysis) all call for something other than reliance upon numbers. Some have therefore described research as a domain of 'competing paradigms'.⁸ Leaving the issue of the usefulness of the term 'paradigm'⁹ for those with an interest in the philosophy and history of science, it is nevertheless important for those with an interest in its empirical results to recognise that different traditions of research will make different demands about how to be rigorous and scientific in collecting and analysing data. For instance, if a researcher is interested in the essence

of an individual's experience, careful procedures to establish rapport, or to ensure the participant 'brackets out' extraneous matters might be needed. If intent upon revealing the range of ways people make sense of an issue, an interviewer may need to challenge or confront in interviews or group discussions. Ensuring standardised interviewing, or preoccupation with interviewer 'neutrality' or 'bias' may not only be irrelevant in such approaches, but may actually compromise rigour. Similar examples could be given in regard to almost every stage of the research process, from sampling, to analysis, to presentation of results. In qualitative traditions, article length is much greater than in most medical journals and it is usual to have a considerable exposition of the assumptions made in the research, and of how all stages of the research process are therefore defensible. This is not usual in medical journals where authors typically report how well they met the requirements of study design like randomised control trials, rather than enter into any defence of whether the study design is itself defensible or credible. This means there are major problems in presenting qualitative reports in medical journals. Long articles and long explanations of methodology are impossible, and the inevitably brief and introductory descriptions that can be made will not make lay readers into expert readers, may not satisfy expert readers and may not convince other interested readers.

The formulation of qualitative research for medical journals will remain a challenge. We may have to settle for a methodological statement that establishes the tradition within which a study operates and a very brief description of what was done and why that is at least coherent to lay readers, and can be seen as defensible to specialist readers. Perhaps medical journals will have to develop a breadth of critical appreciation unique among specialist audiences. To benefit fully from the range of health research, readers of medical journals need to recognise that different traditions of research conceptualise research problems differently, and have different procedures for rigorous data collection, analysis and presentation. This will require more of a reader than simply applying standards of his or her own tradition, and will be increasingly necessary as health outcomes are appreciated to be results of subjective understandings and the quality of social interactions.

The qualitative paper in this issue of the Journal¹⁰ makes a sincere effort to meet the challenge of bringing qualitative research to a medical audience. It deals with matters of considerable interest to a medical readership which could hardly be explored outside some qualitative approach: how do New Zealand doctors react to complaints against them, even when such complaints are not proceeded with? Overseas research suggests reactions may be profound, but there is a dearth of New Zealand information. Quite sensibly therefore, the authors describe their study as 'exploratory', for which a 'qualitative methodology' was suited to allow the 'discovery' of 'major themes and issues' through an inductive analysis (here a thematic analysis or grouping together of common themes in talk). The paper is not without problems. A lay reader for instance, might raise the issue that despite inductive analysis for 'discovery', the interviewer apparently disclosed his bias to participants. Did this therefore provide the

categories for responses and pre-empt 'discovery'? An expert reader might want answers to questions relating to exactly how the researchers understood their issues. Were they intent upon uncovering the 'essence' of participants' experience through 'phenomenological reduction', or did they seek patterns of meaning-making, or how discursive 'representations of reality' worked to justify the speaker or lay blame on others? Perhaps such issues can be laid aside as demanding more than can be promised in an 'exploratory' paper. On that basis however, this reader at least has problems accepting a leap to policy recommendations. We hardly yet understand the problem, let alone its solution. As an exploratory study, this research is nevertheless valuable. It is original, of pertinence to a substantial readership, points to the need for fully conceptualised research into the issue, and should provoke discussion. If at least some of this discussion concerns methodological issues, the paper will have served a doubly valuable purpose and played an honourable part in developing the broad appreciation needed in a specialist medical audience.

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Memories from 1949

Over-specialisation. It is right that a doctor should have special interest and knowledge about one subject. It is wrong for him to show special indifference and ignorance about all other subjects. A good doctor should be a jack-of-all-trades and master of one. For example, a surgeon should be able to advise a patient with simple obesity about her diet and not refer her to an endocrine clinic; a gynaecologist should be capable of treating a mild iron-deficiency anaemia without referring her to an anaemia clinic; and a physician ought to squash a small ganglion on the back of the hand with his thumbs (or bible). I have known an eye surgeon after seeing a case of retinitis pigmentosa write in the notes: "This might be part of the Laurence-Moon-Biedl syndrome; is there any evidence of polydactyly?" For an ophthalmologist to feel himself incapable of counting fingers is surely the limit of over-specialisation; and, if nothing is done to stop this tendency, we shall have one physician who specialises in the first heart sound, and the other who is only concerned with the second.

Richard Asher. *Lancet* 1949; 2: 358-60.

Pathogenesis of atherosclerosis. It appears that the human arterial tree is not perfectly adapted to the normal mechanical demands made upon it. This maladaptation is especially pronounced at the sites of maximum mechanical stress. In these places, from a very early age, foci of lipoid degeneration appear, as the result of an absolute or relative excess of plasma constituents. Resorption of these lesions ceases after the age of 25, and thereafter the foci increase in size and pass successively through the stages of fibrosis, vascularisation, and ischaemic necrosis. It is over these lesions - more especially in their necrotic end-stage (when they release thromboplastic substances) - that mural thrombi tend to form, which either in themselves, or by their organisation, are responsible for most of the clinical effects of atherosclerosis.

These conclusions, based on analysis of 300 cases, combine the view of Rokitansky, Virchow, Anitschkow, Moschcowitz, Winternitz, and Duguid into an integrated picture of this disease-entity.

Erich Geiringer. *Lancet* 1949; 2: 1054.

Transposition of the great arteries: operative outcome in the current era

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Abstract

Aims. To assess the operative outcome, cardiac and neurodevelopmental sequelae in infants with transposition of the great arteries (TGA) undergoing the arterial switch operation (ASO).

Method. Cross-sectional review of the 48 consecutive patients operated on in the calendar years 1995 and 1996 was undertaken to obtain recent cardiac, growth and neurodevelopmental parameters, and the mortality results were compared to the entire cohort of infants who underwent the ASO for definitive repair of TGA and double outlet right ventricle at Greenlane hospital between 1984 and 1998.

Results. Between January 1995 and December 1996, 48 patients underwent the ASO. 96% were alive, and 88% alive and free from reoperation or significant neurological sequelae at a mean followup interval of sixteen months. Six (13%) had important residual cardiac lesions, of which supra valvular pulmonary stenosis was the most common. Growth parameters at follow-up were normal, as was the neurodevelopmental progress of all but two survivors (96%).

Conclusion. In the current era, the ASO is a relatively safe procedure with excellent cardiac and neurodevelopmental outcome in the majority of infants.

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Transposition of the great arteries (TGA) is the commonest cause of cyanotic heart disease in the newborn period. Because the aorta arises from the right ventricle and the pulmonary artery from the left ventricle, the systemic and pulmonary circulations function as two separate circuits. Postnatal survival is dependent on mixing of oxygenated and deoxygenated blood via the ductus arteriosus and foramen ovale. Those infants with TGA and no ventricular septal defect develop life-threatening hypoxaemia as the ductus arteriosus closes. Without treatment, most die during early infancy.¹ Early attempts at physiological repair using the intra-atrial baffling procedures of Mustard and Senning significantly reduced mortality.² However, atrial baffle procedures were associated with important late sequelae including atrial dysrhythmia, stenosis of the interatrial pathways³ and systemic right ventricular dysfunction.^{3,4}

Anatomic correction involving relocation of the great arteries and translocation of the coronary arteries to the neo-aorta was reported by Jatene in 1976.⁵ Initial attempts at the arterial switch operation (ASO) were associated with high mortality, but modifications in the surgical technique, and introduction of repair in early infancy have resulted in a marked decrease in operative risk. Since the mid 1980s, the ASO has replaced the atrial baffle procedure as the operation of choice in repair of TGA with intact ventricular septum, ventricular septal defect (VSD) and double outlet right ventricle with subpulmonary VSD.⁶

At Green Lane Hospital, the ASO was attempted in the late 1970's in a small number of patients. The operation was used in a more routine way from 1984 onward, initially in the subgroup with TGA and VSD, who appeared at greater risk of developing tricuspid valve and right ventricular dysfunction after the atrial switch operation, and later in patients with TGA and an intact ventricular septum.

The ASO is associated with a lower incidence of arrhythmias than the atrial baffle procedure, and with normal post operative systemic ventricular and atrioventricular valvular function.⁶ The most common late cardiac complications for survivors are supraventricular pulmonary stenosis⁷ and neo-aortic valve dysfunction.⁸ In this study, we review the operative outcome, and cardiac and neurodevelopmental sequelae in infants undergoing the ASO at our institution between 1995 and 1996.

Methods

Patient selection and data collection. A cross-sectional review was undertaken in a subset of patients who had an ASO between January 1995 and December 1996. Demographic, operative and postoperative data were obtained from a retrospective chart review, and the most recent cardiac, growth and neurodevelopmental parameters were obtained, either during routine review at our hospital, or by letter and phone call to the patient's cardiologist or paediatrician. In addition, early mortality data were collected for patients who had undergone the ASO for primary treatment of TGA and double outlet right ventricle at Green Lane Hospital between 1984 and 1998. Patients who underwent ASO as palliation for single ventricle circulation (n=five), or were converted from an atrial switch (n=two) were not included.

End points. Early mortality was defined as death within 30 days of operation, or during the hospital admission. These data were ascertained from the records of the Departments of Cardiothoracic Surgery and Cardiology.

Operative technique. Cardiopulmonary bypass was instituted through a median sternotomy, excising most of the thymus for exposure and using a single venous cannula in the right atrium. Infants with intact ventricular septum were cooled to 18-22°C. Following aortic cross clamping, a single dose of cold blood cardioplegia was given and the heart cooled with ice slush. Perfusion flows were reduced to 1.2 L/m²/min during coronary transfer and neo-aortic reconstruction. The atrial septum was repaired during a five to ten minute period of circulatory arrest. Substrate enriched (glutamate and aspartate) warm cardioplegia was then infused and following de-airing, the aortic clamp was released. The neo-pulmonary artery was constructed during rewarming with full bypass flows. Infants with VSDs require somewhat long periods of circulatory arrest for repair, but these rarely exceed 30 minutes. Extra cerebral protection was achieved by cooling to 15°C, combined with head cooling with ice.

Peritoneal dialysis catheters were placed for post-operative use. Conventional ultrafiltration during bypass and modified ultrafiltration bypass are now routinely used to improve haematocrit and remove inflammatory mediators.

Statistical analysis. Kaplan Meier survival analysis was used to predict freedom from death and from death and reoperation. Dichotomous variables were compared by t-test, with a p value of < 0.05 considered significant. All results are expressed as a mean ± 1 standard deviation unless otherwise stated.

Results

Patient characteristics. Of the 48 infants operated on between 1995 and 1996, 28 had TGA with intact ventricular septum. Nineteen had TGA with VSD; two of these also had hypoplasia of the aortic arch not requiring surgical correction, one had coarctation of the aorta and one had associated pulmonary stenosis. One patient had double

outlet right ventricle, a subpulmonary VSD and coarctation of the aorta (Taussig-Bing anomaly).

Ventricular septal defects were multiple in two patients. Morphology included subpulmonary (13) and muscular defects (7). The usual pattern of coronary arteries in TGA, with the left anterior descending and the circumflex arising from the left-facing sinus, and the right coronary artery arising from the right-facing sinus, was found in 36 (75%), the circumflex arose from the right facing sinus in five patients (10%), the coronary pattern was inverted in six patients (13%), and there was a single origin of the right, left anterior descending, and circumflex coronary arteries in one (2%). No patient had an intramural coronary artery course.

The mean birthweight of the 48 patients was 3457 ± 508 gm (range 2620-4500 gm). One was born prematurely at 35 weeks gestation, weighing 2620 gm. Important non-cardiac comorbidities included left renal agenesis in one infant, and meconium aspiration syndrome in another. In addition, there were two infants with significant ventricular hypertrophy. Both were infants of diabetic mothers.

Perioperative management. Surgery was undertaken between the first and 367th day of life (median, day nine), with 69% undergoing ASO by day fourteen (Figure 1).

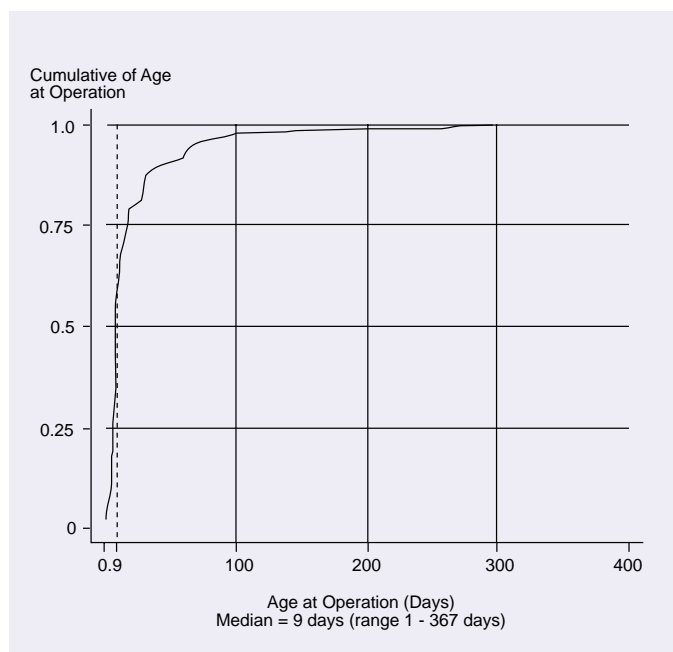


Figure 1. Cumulative age at arterial switch operation in 1995 and 1996.

Preoperative balloon atrial septostomy was undertaken in 33 (69%) infants. Of the remaining patients, twelve had a VSD and one with an intact ventricular septum had an unusually thick atrial septum; balloon atrial septostomy was not attempted and he proceeded to an emergency ASO. A further two infants with TGA and intact ventricular septum were maintained on a prostaglandin E_1 infusion and proceeded to surgery without preoperative balloon atrial septostomy.

Operative and early postoperative results. Early mortality in 1995 and 1996 was one of 48 (2.0%). This is comparable to the early mortality experienced in 1997 and 1998 (one of 37 (2.7%)), and significantly improved, compared to our experience in previous years (Figure 2).

The early death in the 1995 to 1996 cohort occurred in a term 2.8 kg female who died on the second postoperative day with severe hypoxic ischaemic encephalopathy. She was delivered by emergency caesarean section for foetal distress

and remained acidotic and difficult to ventilate preoperatively despite a prostaglandin E_1 infusion and balloon atrial septostomy. Operation was uneventful; perinatal asphyxia may have contributed significantly to her poor outcome, although an intra-operative event may also have been responsible. There were a total of 26 other events in the immediate post operative period, affecting 20 infants (Table 1). Operative parameters are detailed in Table 2. Five (10%) infants required greater than seven days ICU care, and six (12%) infants were hospitalised for more than 21 days after operation (Table 3).

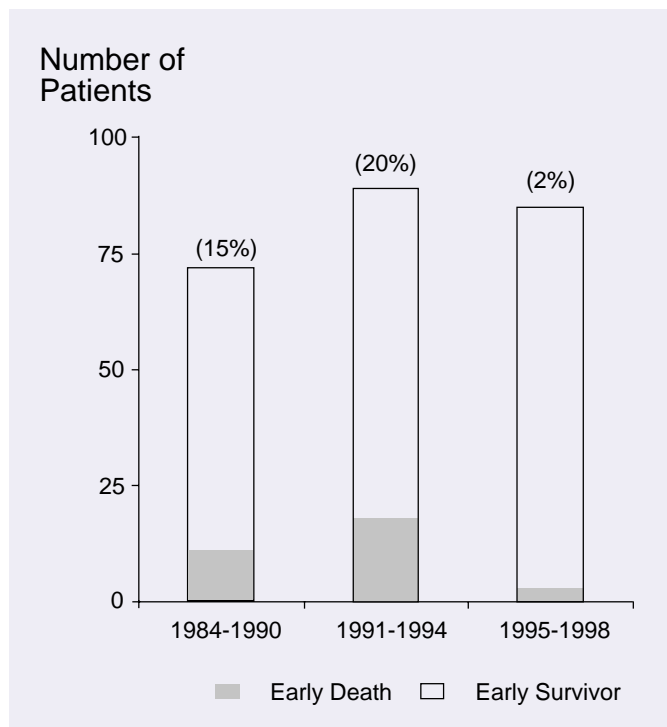


Figure 2. Early mortality grouped by four yearly intervals, excepting 1984 to 1990 where numbers were small. Numbers in brackets indicate the percentage of early deaths.

Table 1. Early postoperative events (1995 and 1996; n=47).

Event	Number
Tamponade*	5 (11%)
Arrhythmia†	6 (13%)
Sepsis	8 (17%)
Seizures	4 (9%)
Acute renal failure	2 (4%)
Chylothorax	1 (2%)

* Requiring sternotomy

† Requiring anti-arrhythmic treatment or electrical cardioversion
Several patients had more than one event.

Table 2. Operative parameters (1995 and 1996).

	Time (mean \pm 1 SD)
Total bypass time	155 \pm 47 min
Cross clamp	80 \pm 19 min

SD = standard deviation

Table 3. Post operative parameters (1995 and 1996).

	Median (days)	Range (days)
Intensive care stay	4	1-28
Inotropes	3	0-13
Ventilation	3	1-21
Total postoperative hospital stay	12	8-40

Late Complications. In the 47 survivors, there were a total of 783 months of clinical follow-up (16.1 ± 7.4 months, range 2.5-31 months). At the time of cross sectional review, 46 patients (96% of the study cohort) were alive and accounted for, and 42 (88%) had not required reoperation and were neurologically normal (Figure 3). Two years after operation, the actuarial probability of survival was 94% and the probability of freedom from death and reoperation was 88% (Figure 4).

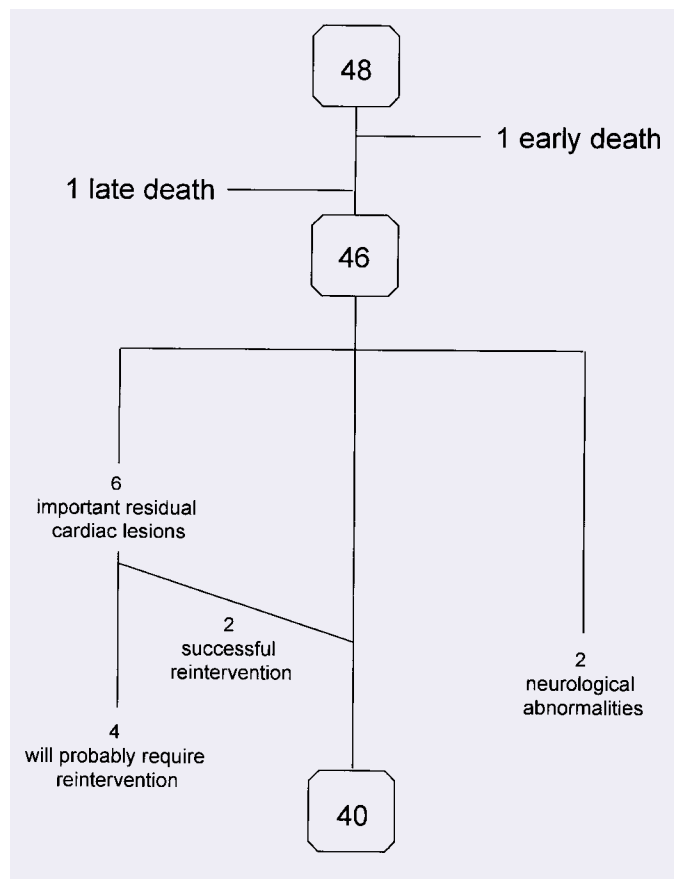


Figure 3. Summary of clinical outcome in the 1995 and 1996 cohort. 40 patients were neurologically normal with no significant cardiac residua at the time of the review.

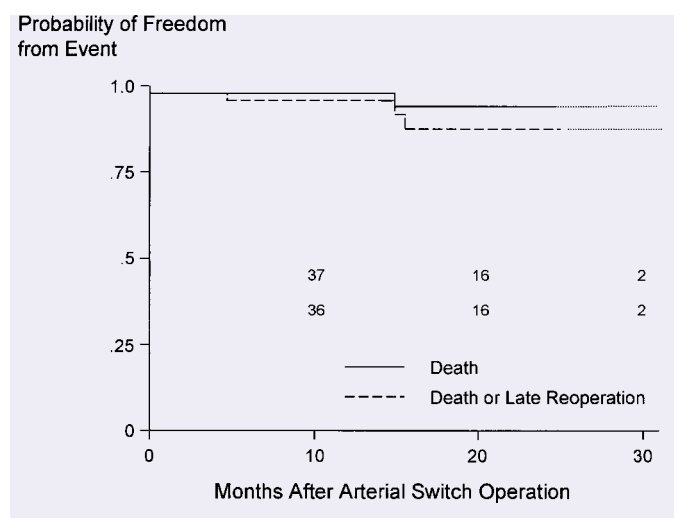


Figure 4. Actuarial plot showing probability of freedom from event (death and late reoperation) in the 1995 and 1996 cohort.

There was one late death. This occurred in a fifteen-month-old male, who underwent uneventful ASO and

closure of his VSD at one week of age. An echocardiogram at eleven months of age suggested pulmonary artery hypertension. At cardiac catheterisation, pulmonary vascular resistance was markedly elevated and there was thrombosis of the right jugular vein. Of the remaining 46 patients, six have significant cardiac residua. Two infants have required re-intervention. The first has undergone repair of a false aneurysm of the right ventricular outflow tract, four months after repair of TGA and a VSD. At nineteen months of age, she is asymptomatic with no significant residual cardiac anomaly. A second infant required balloon angioplasty of her right pulmonary artery at seventeen months of age. At the time of cross-sectional follow-up, she was asymptomatic with moderate right pulmonary artery and mild left pulmonary artery stenosis. There are four patients with significant supra valvular pulmonary stenosis (right ventricular outflow tract maximum instantaneous gradient > 50 mmHg) who will likely require further intervention. One of these infants also developed severe left main coronary artery stenosis and severe left ventricular dysfunction, several months after the ASO operation. Intervention was not attempted; ventricular function improved over a twelve month period and is now normal.

In addition, one infant has left main bronchus compression. He is now 30 months old, and has had recurrent respiratory tract infections, but growth and development are normal.

Growth and neurodevelopmental outcome. Height and weight of the 46 patients alive at the time of cross-sectional follow-up are similar to those of the normal population (weight z-score 0 ± 1.2 , height z-score 0.3 ± 1.2 percentile, $p =$ not significant for both). 44 patients were assessed by their paediatrician or cardiologist as having normal developmental milestones. The other two patients have significant neurological sequelae.

The first is now seven months of age and has cerebral palsy with spastic quadriplegia. He had significant birth asphyxia, having been born by emergency caesarean section for foetal distress at term. Meconium was present during delivery, scalp pH indicated significant acidosis and Apgars were one and four at one and five minutes. He required ventilation preoperatively and operation was unremarkable. Abnormal neurological behaviour was evident in the post-operative period and a CT scan demonstrated widespread cerebral and brain stem ischaemic changes.

The second child has mild right arm hemiplegia and expressive speech delay at sixteen months of age. He presented aged nine days with marked cyanosis and congestive cardiac failure. He had several focal right-sided seizures in the preoperative period. Internal cardiac massage was required during the immediate postoperative period, and recovery involved a one month stay in intensive care.

Discussion

Medium term survival after the ASO in 1995 and 1996 was excellent, with 96% survival at a mean follow-up interval of sixteen months. This compares favourably with results from other centres. Wernovsky and associates reported a ten year survival rate of 91%.⁶ Survival rates at one month and eight years among 470 patients were 93% and 91% respectively. The hazard function for death declined rapidly in the first postoperative year and approached zero by twelve months,⁶ indicating little risk in the longer term. Earlier studies of the ASO in TGA reported a mortality as high as 35% in the first three years of institutional experience,⁹⁻¹¹ consistent with the early mortality demonstrated in our earlier experience. This phenomenon is indicative of the steep surgical and

institutional learning curve necessary to master a technically demanding operation, and to manage the critically ill infant in the immediate postoperative period. In addition to absolute numbers, annualised case volume is probably also important; a recent report from smaller institutions in North America indicates a mortality approaching 15%, even in the current era.¹² The reduction in mortality is most likely reflective of cumulative surgical and institutional experience, and coincided with a trend toward subspecialisation within the team of medical, nursing and technical staff responsible for the care of these infants. A detailed analysis of factors responsible for this trend is currently underway.

In our cohort, 12% of infants had important residual cardiac defects. Two of these infants have required reoperation, and another four, with supraventricular pulmonary stenosis, may do so in the coming years. Supraventricular pulmonary stenosis is a commonly recognised complication following the arterial switch operations. The pulmonary arteries are moved anterior to the neo-aorta, and tension, particularly during the time of rapid growth in infancy and early childhood, can result in narrowing of the main pulmonary artery and proximal branch pulmonary arteries. Because the mechanism of the stenosis is usually tension, transcatheter balloon pulmonary angioplasty is frequently unsuccessful, and reoperation is required. In our experience, the incidence of this complication has decreased following more aggressive augmentation of the pulmonary anastomosis with pericardium, and is similar to that reported elsewhere.¹³

Coronary artery stenosis or occlusion is rare after the ASO,^{14,15} and left ventricular size and function are almost always normal.¹⁶ One patient in our series had severe proximal left coronary arterial stenosis, presumably a consequence of tension on the coronary artery after reimplantation. Left ventricular function was severely impaired, but progressively recovered. Earlier in our experience, another patient had a similar clinical course with severe heart failure and then a gradual recovery of function. Others have reported cases of asymptomatic coronary occlusion detected late after ASO in patients with normal ventricular function.¹⁵ It appears that coronary artery collateral formation is rapid in young hearts, and that severe myocardial ischaemia may be associated with myocardial stunning, rather than necrosis. Although late sudden death has been reported after the ASO, late coronary complications are rare.

The one late death in our series occurred as a result of progressive and intractable pulmonary hypertension. The reason for this is not clear. There was jugular vein thrombosis, probably secondary to central line placement, and recurrent pulmonary microthrombi may have been responsible. Pulmonary vascular disease was not an uncommon late sequelae in patients with TGA and VSD in the era of the atrial switch operation, when definitive surgery was postponed until later in infancy.¹⁷ This infant's ASO and VSD closure were undertaken at one week of age; pulmonary vascular disease in response to increased pulmonary blood flow and cyanosis in these circumstances would be extraordinarily unusual.

Despite a presentation that is frequently associated with significant hypoxia and major cardiac surgery in early infancy, height and weight were normal at follow-up. Furthermore, the majority of late survivors (96%) are neurodevelopmentally normal. Neurological outcome is an important endpoint that has recently been linked to the duration of circulatory arrest.¹⁸ Because of this, we have limited the use of circulatory arrest as far as is possible. Importantly, all three of the infants with major neurological complications had pre-operative risk factors for an adverse neurologic outcome. It is likely that improved recognition of cyanotic heart disease and more rapid treatment with prostaglandin E₁ will reduce the incidence of neurological deficit in these children.

In conclusion, the ASO has been used for the definitive repair of TGA at Green Lane Hospital for more than a decade. During our initial experience, this operation was associated with significant early mortality, but in the current era, early mortality has been low. At a mean follow-up interval of sixteen months, 96% of patients operated on in 1995 and 1996 are alive and 88% are free from death, reoperation and significant neurological sequelae. These results indicate that the ASO is a relatively safe procedure, with an excellent cardiac and neurodevelopmental outcome in the majority of infants. Further improvements in outcome will, to a large part, be dependent on an increased awareness of cyanotic heart disease, early diagnosis, and early transfer to the paediatric cardiac surgical centre.

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One dark rainy night our good friend Walter was called out to see a woman with suspected cholecystitis. Arriving at the house, he was greeted by a large and enthusiastic dog, who rose from a puddle to spatter mud, water, and hair all over W. Door opened in response to frantic knocking. Dog bounded upstairs and leaped on patient's bed - transferring more mud, hair, to patient. Examination was difficult with dog sprawled over patient's abdomen. Finally, in exasperation, W said "Would you mind terribly if we asked your dog to wait outside?" "My dog" groaned the patient, "I thought it was *your* dog!"

In England Now - Fifty years of peripatetic correspondence in *The Lancet*. Hodder & Stoughton, 1989. p86.

The sexual activity of 654 fourth form Hawkes Bay students

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Abstract

Aims. To describe the self reported patterns of sexual behaviour of 4th form High School Students from the Hawkes Bay region of New Zealand, in 1998.

Methods. Subjects completed a self administered written anonymous questionnaire in a supervised classroom situation.

Results. 654 4th form students, median age fourteen years, completed the questionnaire- 45% male, 54% female. 39.4% of the sample reported having had sex/intercourse. Maori students were nearly three times (74.9%) as likely as European students (26.7%) to be sexually active ($p < 0.0001$). 20.1% of these sexually active 4th formers

report more than five partners. 11.9% of the total group and 30.2% of those who are sexually active, reported having first sex at age 12 or younger.

Conclusions. The sexual activity of this sample of 4th form students is higher than reported previously in New Zealand, particularly so for Maori. Further research is needed to examine sexual behaviours and attitudes of young New Zealanders in the different communities to enhance the development and provision of geographically and culturally appropriate early sexuality education programmes and services. These should be designed to have particular relevance to the needs of young Maori.

NZ Med J 2000; 113: 460-4

Both in New Zealand and overseas, there is a trend towards greater sexual activity in young teenagers. This is seen in a decrease in the age of onset of sexual activity, and also in the greater proportion of young people who are sexually active with more partners.^{1,2} An early sexual debut is known to increase the likelihood of: multiple life-time sexual partners, developing sexually transmitted infections (STI) including HIV and cervical dysplasia, and becoming unintentionally pregnant at a young age. Early parenthood may reduce lifetime socioeconomic opportunities, with resultant intergenerational consequences.³ These are all important matters for the public health and may be largely preventable.

Until now, there have been no large population based studies on the sexual behaviour of younger teenagers in regional New Zealand. The largest and most comprehensive studies have been carried out in urban areas in the South Island in the late 1980s.^{4,5}

Only one of these studies⁴ documented the prevalence of sexual activity in those under fifteen, reporting at ages thirteen to fifteen years. All other samples in New Zealand have estimated rates by retrospective questioning and none have included significant samples of young Maori.⁴⁻⁶

The aim of this study was to estimate the prevalence of sexual activity in a sample of 4th form students attending schools across Hawkes Bay in August 1998. The relationships between gender, ethnicity and sexual activity were examined.

Methods

The survey format and content were designed by RF. The Hawkes Bay ethics committee gave ethical approval to the project.

Secondary schools in Hawkes Bay from Wairoa to Waipukurau, including Napier and Hastings, were approached by telephone and letter, requesting their participation in the survey. Information about the nature and purpose of the survey and copies of the proposed questionnaire were provided to school principals and to the Boards of Trustees for approval. The Boards of Trustees sought parental input as they thought appropriate, before making their decisions whether or not to participate.

The survey was conducted by way of a self administered anonymous questionnaire. The pencil and paper tick-box format was designed both to facilitate understanding and to protect confidentiality. Information about the survey and an anonymous consent form preceded the questionnaire. Pre-testing was undertaken to ensure that the intent, purpose and format of the questionnaire were understandable and acceptable to students. Students indicated their choice as to whether or not to participate in a section on the front of the questionnaire, and their subsequent responses were taken to imply consent.

Among other questions, the students were asked "Have you ever had sex/intercourse?" This question has been asked in previous surveys in New Zealand and overseas.^{3,6} The possible responses were: Yes, No and Unsure.

To overcome significant administration problems (including cost), a cluster sampling procedure was used. Form classes were randomly selected in each participating school. The number of form classes selected in each school was proportionately related to the total number of 4th form students attending that school.

Ethnicity was self defined using a question that allowed participants to identify with one or more stated options, or to write their own definition. Maori participants were those who identified solely as Maori, or who chose Maori as one of their ethnicities, ie as in the Maori ethnic group from the 1996 Census.

Data were coded and analysed by computer using SPSS and SAS software. Variances for the reported rates were estimated, allowing for the effect of school clusters, with the survey means procedure in the SAS software. These variances were used in t-tests to assess the significance of the different reported rates of sexual activity between males and females, and between European and Maori. Rates adjusted for school size, gender and ethnicity were calculated using the group specific rates for the combinations of these factors and applied to the participating school populations.

Most of the populations of the non-participating schools differed from the participating schools in socioeconomic, private versus public funding source and ethnic characteristics. However, it was possible to match the populations of two non-participating schools to two of the participating schools for gender, decile rating, ethnic composition and common funding source. The results of the matched participating schools were assigned to these additional schools and the enlarged data set were analysed. The two additional schools were deciles 9 and 10, and increased the total study population to 91% of the Hawkes Bay 4th form population. This adjustment was done to improve representativeness of the rates of sexual activity of the 4th form school population of Hawkes Bay. It was not possible to match the remaining non-participating schools and therefore it is acknowledged that approximately 10% of the school population of Hawkes Bay were not represented.

This survey has involved community input. Boards of Trustees, staff of schools and school communities have facilitated the survey process. Results of the survey have been presented back to the schools involved. Health providers, both Pakeha and Maori, have also been consulted as to the significance of the results, their meaning to the greater community, and the need for further discussion, research and future service provision.

Results

Of the 20 state funded and private secondary schools across Hawkes Bay, fourteen chose to participate. In the month of the survey, August 1998, there were 2174 4th form students in Hawkes Bay. The students attending participating schools represented 81% of the total Hawkes Bay high school population in July 1998 (Ministry of Education). Schools who chose to take part were more likely to be totally state

funded (78%) than non-participating schools (16%). Participating schools had a higher proportion of Maori students (31.3%) than non participating schools (19%) and were more likely to come from lower socioeconomic backgrounds. The average decile rating (a measure of socioeconomic disadvantage based on a scale of 1 to 10, with 1 representing the greatest disadvantage) of all schools in Hawkes Bay was 4.6. The average decile rating of participating schools was 4.0 compared with 6.0 in non-participating schools.

654 4th form students completed the questionnaire (Table 1) - 357 females (54.6%) and 297 males (45.4%). Of the questionnaires distributed for answer, 0.8% (representing five students) were not completed. 62% were aged fourteen years and 36% fifteen years and 25.5% (167/654) described themselves as Maori. 31% of all Hawkes Bay fourteen year olds attending school in July 1998 were classified as Maori (Ministry of Education data).

39.4% (258/654) of respondents reported that they had 'had sex/intercourse'. 1.8% (12/654) did not answer. Those who reported they were unsure were not included in further analysis. 64.3% (166/258) of the sexually active group had had more than one partner and 20.1% (52/258) reported more than five partners. 30.2% (78/258) of the sexually active group reported onset of sexual activity at age twelve years or under and 12.4% (32/258) reported onset at age ten years or under. There were no significant differences in the rates of sexual activity between males and females. Maori 4th form students were 2.8 times more likely to have had sex than Europeans ($p < 0.0001$).

69.7% (249/357) of females described themselves as European, and 23.0% (82/357) Maori. 65.0% (193/297) of males described themselves as European and 28.6% (85/297) Maori (Table 2). Maori female students were more than twice (69.5%) as likely to report having had sex than European females (27.7%; $p < 0.0001$). Of those who reported having sex, Maori females were four times (31.6%) as likely to report having had more than five partners than European females (8.7%; $p = 0.013$). Maori female students were also more than three times (40.4%) as likely to report their onset of sex/intercourse under the age of twelve years than European females (13.0%; $p = 0.009$).

Maori male students were more than three times (80.0%) as likely to report having had sex than European males (25.4%; $p < 0.0001$). Of those who reported sexual activity, Maori males (19.1%) were almost twice as likely to report more than five partners than European males (12.2%), but this was not statistically significant ($p = 0.45$). Maori male students were twice (42.6%) as likely as Europeans (18.4%) to report their onset of sexual activity under the age of twelve years ($p=0.003$).

Table 3 presents the rates of those reporting sexual activity, adjusted for school size, ethnicity and gender. When the populations of two non-participating, but demographically similar schools were included, the adjusted rates represented 91% of the Hawkes Bay 4th form population. These rates were slightly higher than the unadjusted rates.

Discussion

In August 1998, 39.4% of a sample of 654 fourth form students from the Hawkes Bay region of the North Island of New Zealand, reported that they had had sex/intercourse. When adjusted for school, gender, ethnicity, school funding source (ie private versus state) and non-participating schools, the rate was 40.9%. As approximately 10% of the Hawkes Bay 4th form population were not able to be included in this study, it is possible that the results from responding schools may not be entirely representative of all students in Hawkes Bay.

Rates of sexual activity in the Christchurch Health and Development study, which is the only other New Zealand study to have directly surveyed thirteen to fifteen year olds, were 8.5% at age fifteen and 1.6% at age fourteen.⁴ In the Dunedin Multidisciplinary Health and Development Study, 28% of males and 32% females reported they had had first intercourse at the age of fifteen years.⁷ In a later publication from this study, 2.4% of the sample reported they had been thirteen years or younger at the onset of sexual activity.⁸ When compared with results from previous New Zealand studies (Table 4), this group of Hawkes Bay 4th form students, and Maori students in particular, had significantly higher rates of sexual activity.

There may be a number of reasons to explain these higher rates in Hawkes Bay teenagers. First, we assumed that

Table 1. 654 form 4 high school students (August 1998). Total group: ethnicity : gender.

	Total Group	Total European	Total Maori	Signif of European versus Maori	Total Male	Total Female	Signif of male versus female
Total	654/654	442/654 (67.6%)	167/654 (25.5%)		297/654 (45.4%)	357/654 (54.6%)	
Had sex	258/654 (39.4%)	118/442 (26.7%)	125/167 (74.9%)	t=7.34 d.f.=26 p<0.0001	128/297 (43.1%)	120/357 (36.4%)	t=0.84 d.f.=20 p=0.41
First sex 10 years and under	32/654 (4.9%)	6/118 (5.1%)	21/125 (16.8%)		15/128 (11.7%)	14/130 (10.8%)	
First sex 12 years and under	78/654 (11.9%)	18/118 (15.3%)	52/125 (41.6%)	t=4.00 d.f.=25 p<0.0004	41/128 (32.0%)	33/130 (25.4%)	t=0.72 d.f.=20 p=0.78
One partner	97/654 (14.3%)	56/118 (47.5%)	32/125 (25.6%)		42/128 (32.8%)	49/130 (37.7%)	
Two partners	39/654 (6.0%)	14/118 (11.9%)	24/125 (19.2%)		18/128 (14.1%)	20/130 (15.4%)	
Two-five partners	75/654 (11.5%)	34/118 (28.8%)	35/125 (28.0%)		39/128 (30.5%)	35/130 (26.9%)	
Five + partners	52/654 (8.0%)	12/118 (10.2%)	31/125 (24.8%)	t=2.83 d.f.=25 p<0.009	25/128 (19.5%)	25/130 (19.2%)	t=0.4 d.f.=20 p=0.97

Table 2. 654 form 4 high school students : gender and ethnicity.

	Females (European)	Females (Maori)	Signif of European versus Maori	Males (European)	Males (Maori)	Signif of European versus Maori
Total	249/357 (69.7%)	82/357 (23.0%)		193/297 (65.0%)	85/297 (28.6%)	
Had sex	69/249 (27.7%)	57/82 (69.5%)	t=5.36 d.f.=21 p<0.0001	49/193 (25.4%)	68/85 (80.0%)	t=6.75 d.f.=17 p<0.0001
First sex 10 years and under	4/69 (5.8%)	10/57 (17.5%)		2/49 (4.1%)	11/68 (16.2%)	
First sex 12 years and under	9/69 (13.0%)	23/57 (40.4%)	t=2.88 d.f.=20 p<0.009	9/49 (18.4%)	29/68 (42.6%)	t=3.46 d.f.=16 p=0.003
One partner	37/69 (53.6%)	11/57 (19.3%)		19/49 (38.8%)	21/68 (30.9%)	
Two partners	9/69 (13.0%)	11/57 (19.3%)		5/49 (10.2%)	13/68 (19.1%)	
Two-five partners	17/69 (24.6%)	16/57 (28.1%)		17/49 (34.7%)	19/68 (27.9%)	
Five + partners	6/69 (8.7%)	18/57 (31.6%)	t=2.74 d.f.=20 p=0.013	6/49 (12.2%)	13/68 (19.1%)	t=0.78 d.f.=16 p=0.45

Hawkes Bay teenagers understood that ‘sex/intercourse’ referred to penile/vaginal penetration. Studies conducted by the United States Centre for Health Statistics indicated that adolescents understood the term sexual intercourse.³ Another study from the United States however, reported that while almost 100% of 599 20-30 year old students defined penile vaginal intercourse as having had sex, 40% also defined oral genital contact as having had sex.¹¹ It is possible, therefore, that other sexual behaviours such as oral/genital sex could have been reported as having had sex. Such an interpretation alters the significance of the findings in as much as the risk of pregnancy can only be related to vaginal/penile penetration. However, the risk of STI’s and development of subsequent emotional and development problems and ongoing risk behaviours, can all be associated with premature sexual experiences.

Table 3. Unadjusted and adjusted rates of reported sexual activity total group: gender.

	Unadjusted	Adjusted for Schools Ethnicity and gender	Adjusted for Schools Ethnicity, Gender, Funding Source and two Non Participating Schools
Total	38.8%	42.9%	40.5%
Females	36.1%	41.3%	38.3%
Males	42.1%	44.6%	42.9%

Secondly, self reports of sexual behaviour may not be accurate, although this is unlikely to apply only to this sample. There has, to date, been no means devised of externally validating responses in this type of study. Dickson et al reported that when asked at age 18 years and again at 21 years, 94% and 98% of New Zealand males and females respectively were consistent with their report of age of onset of sexual activity.⁷ In overseas studies, the underlying reliability of high school student’s responses in such surveys has been tested.^{12,13} These studies show that middle and late adolescents (fourteen to eighteen years) generally reported high levels of consistency in answers over time. However, race, gender, and social and economic factors have been shown to be associated with a degree of inconsistent

reporting. This did not affect overall study conclusions, but may limit the use of self-reported data to evaluate programmes designed to alter adolescent behaviour.¹³

Thirdly, the higher rates reported in this sample of Hawkes Bay 4th formers may be specific to the population sampled, and/or they may represent an extension of the trend to a lower age of onset of sexual activity—as documented for women in New Zealand in the NZ:FEE study.¹ Information about men’s, and in particular Maori men’s, sexual activity is limited. The rates in this sample of 4th form students would also appear to be higher than reported internationally. In Australia in 1997, 20% of fifteen year olds reported they had had sex.¹⁴ In 1996/97, 16.2% of a school sample of Scottish fourteen year olds reported having had intercourse.¹⁵ 53-54% of US high school students aged fourteen to eighteen years reported being sexually active, and higher rates were reported in young blacks (73.4%) and native Americans (60.5%).^{16,17}

Fourthly, this group of Hawkes Bay students differs from other groups of young people sampled previously in New Zealand in a number of respects. This is the first time that young people from an agriculturally based region of the North Island has been sampled. Maori make up 25%, and while this is less than the 31% of Maori in the eligible school population, it is a higher percentage than in previous studies.

It is a deficiency of this study that the socioeconomic status of the respondents was not assessed directly. From Ministry of Education and Census data it is possible, however, to describe some socioeconomic characteristics of the population from which the sample was drawn. The median annual income for females over fifteen years living in Hawkes Bay in 1996 was \$11 950, compared with the National median of \$12 609. For males, the median income in Hawkes Bay was \$19 927, compared with a National median of \$22 040. The unemployment rate for the Hawkes Bay/Gisborne region for the September quarter 1998 was 10.1%, while the national rate was 7.7% (Department of Statistics). In 1996, 50.7% of families with children in Hawkes Bay were sole parent families.¹⁸ The average decile rating of the participating schools (4.0) is lower than the average decile rating (6.0) of non-participating schools. The study participants were drawn

Table 4. New Zealand studies : teenage sexual activity.

Year of publication	Researcher (reference)	Place	Sample No.	Age (Years)	Males had sex	Females had sex	Total Group had sex
1987	Lewis ⁹	Hutt Valley	389	≤15		14.4%	
1988	McEwan et al ¹⁰	Nth Is	162	<16 <14 <12-13			22% 6% 3%
1989	Brander ¹¹	Christchurch	221	≤16			58%
1993	Lynskey & Fergusson ⁴	Christchurch	952	≤15 ≤14	6.8% 1.5%	10.2% 1.6%	8.5% 1.6%
1998	Dickson & Paul et al ⁷	Dunedin	935	≤16	28%	32%	29.3%
2000	Paul & Fitzjohn ⁸	Dunedin	935	≤13	2.5%	2.4%	2.4%
	Fenwicke & Purdie (this survey)	Hawkes Bay	654	≤14	43.1%	36.4%	39.4%
			442	European ≤14	25.4%	27.7%	26.7%
			167	Maori ≤14	80.0%	69.5%	74.9%
			654	≤12 yrs	13.8%	9.2%	11.3%

from populations of disadvantage, existing within a region of comparable socioeconomic disadvantage to the rest of the country. This compares with those adolescents sampled in both the Christchurch and Dunedin studies, in which there was a slight but measurable bias to underrepresentation of children from disadvantaged families.^{5,19}

Previous studies, both in New Zealand and overseas, have shown that low socioeconomic status is associated with higher rates of sexual activity at younger ages.^{3,4,20} Different rates of sexual activity have been found in different ethnic groups, both in New Zealand and overseas.^{4,16,21} The Family environment, including maternal teenage pregnancy, is also known to be predictive of an early onset of sexual activity.^{7,20} Individual factors such as low self esteem, decreased aspirations for the future with little sense of control or direction in life, risk taking behaviour and a past history of physical and/or sexual abuse are associated with the onset of early sexual activity.^{4,17,20}

In this study, there was no significant difference in the rates of sexual activity between males and females. This finding differs from both the Dunedin and Christchurch studies where higher rates were reported in young women.^{4,7} It is consistent with overseas results however, where males report an earlier onset of sexual activity.^{15,16} Further research is needed to determine the reason for the difference in findings within New Zealand.

An early age of onset of sexual activity is known to have important effects on the future health and socioeconomic well being of not only today's young people, but also their children. Data from the NZ:FEE study show that women who have first sex at age eleven to thirteen were almost six times more likely to have an adolescent birth than women who had first sexual intercourse at age seventeen to nineteen years. A majority of women who have an adolescent birth do not manage to gain a high level of education, and there are few schools with suitable facilities where young parents can attend and catch up.

New Zealand has one of the highest age specific fertility rates for fifteen to nineteen year old women amongst OECD countries.²⁰ In 1997, the Maori birth rate (94/1000) continues to be three times higher than the non Maori rate (33/1000) in this age group.²² While less than the rate in the USA, New Zealand's abortion rate is amongst the highest in OECD countries.²³ The high number of sexually active fourteen year olds in this study reporting more than five partners, gives cause for concern about the potential for spread of STIs. The reported higher number of lifetime partners may also give credence to the perception of a higher incidence of STIs and HIV in young Maori.²²

New Zealand is a culturally, socially and economically diverse country which is information-poor about differing sexual behaviours, attitudes and future aspirations of our young people. Whether these results can be extrapolated to

other areas of New Zealand with similar demographic profiles, needs to be determined.

While social and individual factors have been shown to affect the onset of sexual behaviour, it is important to note that sex education in schools is not associated with an increase in sexual activity.^{24,25} Studies reviewing the effect of condom provision in schools in the US, in association with sex and AIDS education programmes, have shown a delay in the onset of sexual activity and increase in the use of contraception.²⁶ From the results of this study, it would appear there is a need to urgently review the effectiveness and delivery of New Zealand's current sexual health education programme. Concurrently, research is needed into the differing influences and beliefs which affect the onset of sexual risk-taking behaviour in different groups of young people in New Zealand. This information can then contribute to the development of effective and acceptable sexuality education programmes, based both in schools and in communities. This is particularly important for young Maori.

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The effect on medical practice of disciplinary complaints: potentially negative for patient care

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Abstract

Aim. To explore the personal and professional effect on general practitioners (GPs) of receiving a complaint against them to the (former) Medical Practitioners Disciplinary Committee, when the complaint did not proceed to a formal hearing.

Methods. Ten GPs were interviewed by telephone, following an enrolment procedure that protected identities from the interviewer. Qualitative (thematic) analysis of in-depth interviews was used to categorise doctors' perceived effects of complaints on practice and to develop a theory on why such effects should occur.

Results. Receipt of a complaint had both short- and long-term effects on the doctor, and on their views of patients, society and the disciplinary process. There were immediate negative emotional responses that were

sustained in the long-term in a way that adversely effected doctor-patient relationships beyond the relationship with the original complainant. Doctors reported short-term changes in their practice of medicine, with reduced ability to work confidently and decisively. Doctors also reported altered practice in the long-term in the direction of defensive medicine, by withdrawing from providing some services and avoiding perceived at-risk activities.

Conclusion. The impact of a complaint on the self of the doctor suggests a shame response. There may be a need for the relevant professional college to establish a rapid response 'crash team' to minimize the negative personal and professional effects of a complaint, even when the complaint does not proceed to a formal hearing.

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Self-regulation is one of the most controversial defining characteristics of professions. Professions generally, and the medical profession in particular, has as one of its core values, a devotion to medical service to patients.¹ This means that complaints about medical care must be handled expeditiously in the interests of individual patients, and of the patient community generally. The implication is that health care overall is made better through the process of receiving reports of care that are perceived to be inadequate. We could find no evidence that this assumption has been tested.

The Health and Disability Commissioner's Act (1994),² introduced in 1996, changed the way complaints against medical practitioners were dealt with. Previously, complaints were considered by the Medical Practitioners Disciplinary Committee (MPDC). Between 1992 and June 1996, the MPDC received 1672 complaints across all medical disciplines (Personal communication, GJ Fraser, Secretary, Medical Practitioners Disciplinary Tribunal). Around 70% of the complaints were resolved informally, with negotiation between the agents of the doctor and the complainant, or dismissed when, in the opinion of the Chairman of the Committee, no grounds for the complaint were found. Of complaints proceeding to inquiry, the percentage upheld decreased from 67% in 1992 to 35% in 1996. The present study investigated the effects of complaints against GPs made under this system and dismissed without a formal hearing.

Although there are no published data on the effect of a medical disciplinary complaint in New Zealand, the United States literature suggests there will be significant immediate effects on the 'self' of the doctor.^{3,4} These include feelings of anger stunned and misunderstood, and intense feelings of anger and rage. The feelings of hurt and narcissistic injury

are thought to indicate an assault on one's sense of self and personal integrity. Doctors are reported as having difficulty initiating coping strategies, and may exhibit symptoms consistent with depressive and adjustment disorders, and exacerbation of underlying physical disorders, such as hypertension and ischaemic heart disease. Later effects include changes in practice behaviour, such as becoming phobic about certain patients, situations, or procedures, and a loss of the joy of practice.

From less litigious cultures, the Canadian literature reveals a reduction in the 'high-risk' activities of obstetrics and anaesthesia, and an increase in defensive medicine in response to the threat of litigation.⁵ The British and European literature suggests that the threat of litigation leads to defensive behaviours predicated by concern for the doctor-patient relationship.⁶

This study sought evidence of an impact of a complaint on the 'self' of the doctor, on the doctor-patient relationship, and on the doctor's practice of medicine. These notions are inextricably linked and fundamental to the practice of medicine. Cassel⁷ notes that in a therapeutic context, "... the treatment has been the doctors themselves, through the vehicle of... the doctor-patient relationship." Furthermore, in order to respond to the particular needs of a patient, a doctor needs to bring to the consultation, personal attributes that best meet the patient's needs.⁸ If the 'self' of the doctor is adversely affected by a complaint, the doctor-patient relationship, and therefore the delivery of care, may be impaired.

Methods

Given the paucity of data about the effect of a complaint in the New Zealand setting, a qualitative methodology was suited to this exploratory

study, allowing the discovery of major issues and themes.⁹ Methodological constraints included the confidentiality in which details of potential participants are held by the New Zealand Medical Council, the need to preserve the personal safety of participants, and the need for in-depth examination of responses at a psychological and emotional level. For these reasons, we collected no personal data (other than gender) or information about their practice (other than its urban or rural location).

The secretary of the (former) MPDC sent 30 letters of invitation on the researchers' behalf, to GPs who, within the last five years, had had a complaint made against them that did not proceed to an inquiry. Written replies from doctors agreeing to be interviewed were received from ten participants who provided their telephone numbers. WC interviewed all ten by telephone, using taped in-depth semistructured interviews lasting 60 to 90 minutes.

Interviews were transcribed and analysed using line by line inductive analysis as described by Strauss and Corbin.¹⁰ Emergent themes and sub-themes, along with the entire transcript were returned to participants for further input, before final analysis aimed at developing a theory of the effect on medical practice of a complaint that did not proceed to a hearing.¹¹

Ethical approval was obtained from the Otago Ethics Committee. Researcher bias was considered prior to study commencement. Relevant disclosure of WC's previous complaint experiences was made to the participants according to the circumstances of the interview. Pre-existing biases included a perception that complaints were unpleasant, recognition of increased wariness of certain types of patients, and that fresh criticisms of one's practice were viewed negatively, with a tendency to 'fear the worst'.

Results

Table 1 summarises characteristics of the participants and the complaints. Details that could compromise identity of participants have been omitted. All doctors were in active general practice at the time of interview. Initial analysis revealed three main thematic categories: (1) the immediate effect of the complaint; (2) the long-term effect of the complaint; (3) views of patients, society and the disciplinary process. Further analysis revealed effects on the person of the doctor, on the doctor's practice of medicine and on the doctor-patient and other relationships. Table 2 summarises key findings and the content of each theme.

Participant	Gender	Location	Complaint
Doctor 1.	Male	Urban	Complaint from a patient's relative of being impolite and not supporting the complainant's assertion that the patient was not being adequately cared for by other family members.
Doctor 2.	Male	Urban	Complaint of roughness while performing a chaperoned internal examination and smear on a patient.
Doctor 3.			Complaint from a colleague whom the participant had sought help for. Further details omitted to preserve confidentiality.
Doctor 4.	Male	Urban	Complaint from spouse of a patient who died after being attended for chest pain.
Doctor 5.	Male	Urban	Complaint of failure to diagnose. This case did proceed to a hearing, and was dismissed. It is included in the analysis of results, with quotations from this participant clearly labelled.
Doctor 6.	Female	Rural	Complaint about the doctor's attitude during a late night call-out, towards a patient described by the participant as "very demanding".
Doctor 7.	Female	Urban	Complaint about referring a patient with undiagnosed bleeding to a specialist colleague.
Doctor 8.	Male	Urban	Complaint from a patient about being denied access to their clinical notes for the purpose of altering and destroying parts of them.
Doctor 9.	Male	Rural	Complaint about the management of a patient with an acute abdomen.
Doctor 10.	Male	Urban	Complaint of improper conduct during a consultation with a middle-aged woman.

Immediate effects. 1. *The immediate impact on the person of the doctor.* Most respondents commented on their immediate and intense negative emotional response, in the days and first weeks following receipt of the complaint. They felt stressed, anxious, and angry. They reported feelings of guilt, of questioning of themselves,

and of their perception of 'self' related to functioning as a doctor.

"It makes you do a lot of soul searching. You look at yourself and think perhaps I was at fault, or, I'm a bad doctor because someone's complained about me. It creates self-doubt. You feel bad about yourself." (Doctor 6)

Table 2. Key findings.

1. Complaints that do not proceed to a hearing nevertheless have a profound impact on practice, and this is directly counter to the assumed purpose of the complaint procedures.
2. There were immediate and lasting effects on:
 - The 'self' of the doctor
 - The doctor's practice of medicine
 - The doctor's relationship with other patients
 - The doctor's relationship with family and colleagues
3. Doctor's views of patients, society, and the disciplinary process were altered by a complaint.
4. Those who have been through the process have ideas of their own about how more positive effects might happen.

Concurrently, the doctors assessed the validity of the complaint at an intellectual level, but the intellectualisation did not alter the intensity and negativity of the emotional response. Both anger and depression emerged rapidly; and they reported that sometimes their family members noticed the emotional changes first.

2. *The immediate impact on the doctor's practice of medicine.* Participants commented on a reduction in their ability to consult with speed and confidence, and on becoming less tolerant of the uncertainty that characterises much of medical practice.

"My decision making process was slowed down. I began to lose a degree of confidence in my ability to assess the situation accurately, and to make proper medical decisions." (Doctor 5)

This was despite the participants having considered their level of competence, and concluding that it had been satisfactory. As one respondent explained,

"Something like this shatters your confidence I suppose. It shouldn't, but it does." (Doctor 10)

3. *The immediate impact on the doctor-patient relationship.* When the complainant was a new or casual patient, respondents separated themselves from the patient and tended to be hostile in their comments. However, when the complaint came from a longstanding patient, the pre-existing relationship became more important.

"You think you have a good relationship with somebody. It is partly the destruction of that that is so upsetting. It was that people that I'd cared for and liked should do that to me. That was really the most offensive thing." (Doctor 7)

There was also an immediate effect on interactions with other patients, characterised by a loss of trust, indicating the two-way nature of the patient-doctor relationship.

"I found that in more subtle ways, how patients were presenting to me and how they were dealing with me was damaged. I found that I wasn't trusting them so much. I was looking at them thinking, 'there is something hidden here' or, 'they're not telling me something' or, 'they're setting me up you know.'"

(Doctor 5)

4. *The immediate impact on the relationship with spouse, family and colleagues.* Doctors looked for support from spouses and

sometimes from colleagues. The support had to have meaning for the involved doctor, it had to be specific, avoiding blanket affirmations, and it had to avoid negative judgmental responses or misinterpretations.

"I got a little bit of support from work. They said you know, 'You're a good doctor' and all that sort of thing that doesn't actually comfort you at all, because it doesn't alter what's happened." (Doctor 3)

Lasting effects

1. *The long-term impact on the person of the doctor.* All participants experienced changes in their perception of 'self', which they related directly to receiving a complaint. These involved emotional responses such as depression and anger, an alteration in their perception of themselves as doctors, and erosion of goodwill towards patients. This was expressed in a sense of fearfulness, of vulnerability, increased cynicism and a reduced sense of commitment.

"Perhaps I'm hypersensitive now. I think I'm a little more wary, a lot less naïve, a lot less trusting, and a lot more careful about saying things to anyone." (Doctor 3)

"I think they... erode your sense of commitment. A lot of it is the way the patient treats you that has made me feel less enthusiastic about medicine." (Doctor 6)

2. *The long-term impact on the practice of medicine.* The responses were characterised by strategies designed to reduce the perceived likelihood of a further complaint. 'Non-situation specific' responses were pervasive and included procedural issues such as note taking, and adopting more wary attitudes towards patients.

"It made me acutely aware that the rules and regulations impact on every part of your practice." (Doctor 8)

"You've got to be Mr Nice Guy all the time, no matter how much pressure is put on." (Doctor 3)

'Situation specific' responses illustrated the potential for the impact of the complaint to be carried forward into similar consultations with other patients.

"If I ever get some young woman who looks like this woman and is a similar age and has got similar symptoms, I just see (the complainant) in front of my eyes again. It's just awful. You know, it just reminds you so much." (Doctor 2)

The changes in practice included participants' perceptions that after the complaint: they referred earlier, investigated less, avoided 'at risk' activities such as emergency call-outs, and their decision making was based on avoidance of conflict with the patient.

3. *The long-term impact on the doctor-patient relationship.* After receiving a complaint, respondents tended to evaluate each patient as to their likelihood of complaining. This was articulated as changes in trust and in evaluation of the relationship with the patient.

Doctor 10 - *"You had trust and they trust. But I don't think that's good enough now."*

Interviewer - *"Do you think that trust has been lost?"*

Doctor 10 - *"No. I think that the trust is still there for 95% of the people. But you're not quite sure who the other 5% are. Casual patients. They're much harder aren't they? When a relationship is built up, they regard you as a person... A somewhat valuable person in their life."* (Doctor 1)

4. *The long-term impact on the relationship with spouse, family and colleagues.* The participants observed no adverse long-

term effects on spousal relationships. The main finding was of a heightened awareness of the impact of complaints on colleagues, although support could be qualified.

"It's made me very sympathetic to my colleagues who are involved in similar sorts of things. I have to say that it hasn't made me incredibly sympathetic to those of my colleagues who have been involved in things which they've been found guilty of." (Doctor 7)

Views of patients, society, and the disciplinary process

Several respondents noted that there had been a change in society's attitude towards the role of the doctor, over their practising lifetimes.

"We're in a time where the doctor has very few rights and the patient has all the rights, and basically we're there to be used and abused by the patients to a large extent." (Doctor 6)

"People tended to have a heck of a lot of respect for you as a doctor ... For the fact that your work was difficult and demanding, and [there was more] tolerance of things that may not have been quite perfect." (Doctor 1)

Several respondents felt that professional attitudes about practice were out of step with practising reality.

"You're not allowed to be a human being, you see. You're not allowed to make a genuine mistake, not allowed to do anything wrong." (Doctor 3)

The view that complainants were not like normal patients was widespread.

"It's not very often a normal, reasonably intelligent person makes a complaint. It's always someone who's a little bit wacky." (Doctor 1)

"He had some kind of antagonism towards doctors in general, maybe me in particular, and this was his chance. He wanted his pound of flesh of me for whatever reason." (Doctor 9)

The most pervasive finding about the disciplinary process was a feeling of being engulfed by a system about which the respondents had no experience, and over which they had no control. There was confusion about the process of a complaint. Respondents were emphatic that they needed feedback at the end of the process. The defense lawyers were highly valued, particularly with respect to their supportive role and the quality of their advice.

Discussion

This study investigated the effect of complaints that did not proceed to a formal disciplinary hearing. Although at the 'minor' end of the disciplinary spectrum, this study suggests that these events nevertheless had a substantial impact on the doctors and adversely affected their subsequent practice of medicine. Although unable to differentiate between self-reported and actual changes in behaviour, this study indicates significant changes that these participants believe they have made in their practice, and their accompanying attitudinal shifts.

The doctors interviewed were clear about the distinction between these complaints and 'true' wrong doing. The recent example of serial killings by a UK GP¹² is an extreme example that deserves to attract severe penalties, to punish offending doctors and protect patients. This study suggests that even in minor or unwarranted complaints, an unexpected and excessive amount of damage to other patients might result. Doctors carry with them, well into

their future dealings with other patients, the negative effect of an unfounded complaint.

Some effect on practice is expected following a complaint. The profession's regulatory processes are intended to ensure that doctors do change their practices. However, the change is expected to be positive, to remedy dangerous or disrespectful care, and to ensure that future patients benefit from the process. This study suggests there is doubt as to whether these assumed benefits necessarily accrue.

Reported short-term effects of receiving a complaint were consistent with doctors' experiences of the litigation process in other countries.^{3,4} For the participants in this study, there was a profound, negative, and sustained impact on the doctor-patient relationship and the doctor's practice of medicine. There was a negative impact on attitudes held towards patients seeking care, months and even years later. The authors propose that it is the effect on the person of the doctor that forms the basis of the changes seen.

The model of patient-centered medicine that guides current medical care,¹³ rests on the notion that it is not possible to remove the person of the doctor from any interaction with a patient. What doctors, as human beings, bring to the consultation inevitably affects the nature of their interactions with patients and, potentially, the outcome. This study has shown that important threats to the person of the doctor arise from the complaints process. These threats are initially characterised by a profound emotional response and a change in doctors' ability to function effectively in practice. Later changes towards patients are predicated by the situation of the complaint. Practice may become more defensive, characterised by a heightened sensitivity for the possibility of a complaint, and by withdrawal of services once offered.

The underlying emotional response of doctors on receipt of a complaint may be shame. Shame is more than guilt, it is "the feeling we have when we evaluate our actions, feelings, or behaviour, and conclude that we have done wrong."¹⁴ It is a global attribution; that is, it encompasses one's entire 'self'. The shamed person feels badly about the whole of themselves, not just the particular transgression. The respondents in this study showed evidence of having been shamed, not in their intellectual, but in their emotional responses, and this was expressed as residual anger or depression, indicating the impact of the complaint on their 'selves' as doctors.

The recommendations shown in Table 3 were developed from this study's findings. The goal of these recommendations is to minimise the negative impact of a complaint in general practice. The results indicate a need for an immediate, appropriate and co-ordinated response to meet doctors' needs for support throughout the disciplinary process. In our opinion, the responsibility for providing such support for GPs lies with the Royal New Zealand College of General Practitioners and the Medical Defence Societies. These organisations have a stated interest in the care of patients and their doctors. The

relevance of the findings to other disciplines appears intuitively sensible, but requires further investigation.

Table 3. Recommendations for initially dealing with a complaint.

- A 'Crash Team' consisting of a doctor and a lawyer is needed to provide an immediate response. The crash team doctor would be an experienced general practitioner, held in respect by the involved doctor, and specifically trained and supported in the role. The lawyer would be experienced in medical defense and be able to impart information, and to sensitively deal with the legal needs of the involved doctor.
- The involved doctor would invite the crash team to visit them within 24 to 48 hours of a complaint, with protected time available for the meeting. All dealings related to the complaint would be made through the crash team, including facilitating the doctor's access to appropriate health care.
- The responsibility for establishing the crash team probably is best taken by the Royal New Zealand College of General Practitioners and the medical defense insurers. Both groups have a stated and vested interest in the wellbeing of doctors.
- Crash teams need to be established on an appropriate geographical and population basis, and need to meet, train and share a commonality of purpose.

In our view, there needs to be a change in procedures for dealing with complaints made about GPs, in the interests of protecting future patients from the defensive medical practice that follows even unfounded complaints. The process we examined was so damaging to the GPs interviewed that the reverse of the assumed outcome (improved patient care processes) resulted in every case. If this finding is universal, or even common, some modification to procedures is essential.

No investigation has yet been made into the effects of current procedures. They, like the processes they replaced, were designed without knowledge of the adverse impact on the practice of the complained-about doctor in mind. Further, they are sufficiently like the earlier procedures to be likely to prompt similar responses. A thorough review of current practices and adjustment of minor complaints procedures is probably justified.

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Victor Hugo wrote belles-lettres beyond the age of 75, but nobody past middle age is free from the peril that the body will outlive the brain. Alzheimer's disease undisputably is the greatest scourge, but difficult to treat or prevent. In the past 15 years, improvements in brain imaging, notably magnetic-resonance (MR) techniques, have generated a growing interest in a different, generally less severe, but even more common, form of brain ageing. It is characterised not by primary loss of neurons but by rarefaction or even disappearance of myelin. These white-matter lesions, for which Hachinski coined the term leukoaraiosis, can be patchy or diffuse; they are associated with thickening of deep arterioles. That the lesions are mostly ischaemic has been consistently borne out by blood-flow studies and also by an association with classic vascular risk factors in many cross-sectional studies, and in a smaller number of longitudinal studies. With sensitive MR imaging, more than half of those over 60 years of age show some degree of leukoaraiosis.

Control of vascular risk factors may avert not only major complications such as stroke and cardiac death, but also mental slowing. Even mild degrees of intellectual dulling are important to prevent, because such a large proportion of the population is at risk. World leaders are no exception – the Yalta conference in 1945 might have ended differently had antihypertensive treatment been available at the time.

Frequency of microdeletions in the azoospermia factor region of the Y-chromosome of New Zealand men

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Abstract

Aim. To determine the frequency of microdeletions in the azoospermic factor (AZF) genes on the Y-chromosome of New Zealand men attending the Fertility Centre.

Methods. World Health Organisation criteria were used to classify men as normospermic, oligozoospermic, severely oligozoospermic, and azoospermic. Microdeletions were detected from DNA of semen samples by the sequence-tagged site polymerase chain reaction.

Results. Microdeletions were detected in 20% (3/15) of azoospermic men, 4% (2/50) of severely oligozoospermic men, 3.2% (2/62) of oligozoospermic men, and 0.7% (1/141) normospermic men. One azoospermic man had

multiple non-contiguous deletions. Overall, 5.5% of infertile men had at least one microdeletion in the long arm of the Y-chromosome. One severely oligozoospermic man and one oligozoospermic man had produced unassisted pregnancies.

Conclusion. New Zealand men attending a Christchurch fertility centre have a similar frequency of microdeletions in the Y-chromosome to other populations. Azoospermic men have a higher frequency of microdeletions than men with less severe spermatogenic failure. Men with microdeletions can have reduced fertility, but are not necessarily sterile.

NZ Med J 2000; 113: 468-70

It has long been proposed that some spermatogenesis factor is located on the long arm of the Y-chromosome since deletion of the distal long arm is associated with azoospermia.¹ This factor, essential for spermatogenesis, was called AZF (Azoospermia Factor).

Advances in molecular genetics have allowed development of methods to screen this region of the Y chromosome for small deletions that are not macroscopically visible. This has been made possible by identification of a series of short sequences spaced across the region of interest, referred to as *sequence tagged sites*.² Polymerase chain reaction (PCR) amplification of these regions, using commercially available primers, reveals whether each section of the Y chromosome is intact in a particular sample. This detailed mapping suggests that more than one gene that is essential for spermatogenesis is present in the AZF region. This area has been divided into three non-overlapping regions called AZFa, AZFb and AZFc,³ and recently a possible fourth region, AZFd.⁴

A number of recent studies have shown a significantly higher proportion of men with 'microdeletions' in the infertile population than among fertile men.⁵⁻¹³ Between 3-29% of infertile men have been shown to have microdeletions in the AZF region, compared to less than 1% of men with normal sperm counts.

Two gene families have been identified in the AZF region. Both have sequences suggesting they code for RNA binding proteins of unknown function. One, DAZ, exists in, at most, a few copies and maps to AZFc.¹⁴⁻¹⁸ The other, RBM, exists in multiple copies, although how many of these are transcribed into proteins is still unclear.^{19,20}

The aim of the present study was to correlate the frequency of detected microdeletions with fertility status in a New Zealand population of 269 men.

Methods

Semen samples were obtained from the Andrology Laboratory, New Zealand Centre for Reproductive Medicine. Ejaculates from azoospermic men had sufficient cells in the semen for DNA testing. The control samples were from normospermic men having semen analysis. They were predominantly partners of infertile women, but included male partners of couples with unexplained infertility. Written consent was obtained from

all men. Ethical approval for this research was obtained from the Southern Regional Health Authority Ethics Committee (Canterbury).

Semen samples produced by masturbation after 3-5 days sexual abstinence were used to minimise semen variability in volume, sperm counts and motility.²¹ Semen samples were stored in 100 μ L aliquots at -80°C until required.

Standard semen analysis was carried out by the Andrology Laboratory using World Health Organisation guidelines.²² Semen samples were from fifteen azoospermic men (complete absence of mature sperm in the ejaculated semen), 50 severely oligozoospermic men (less than 5 x 10⁶/mL), 62 oligozoospermic men (sperm counts less than 20 x 10⁶/mL), and 141 normospermic men (greater than 20 x 10⁶/mL).

Genomic DNA preparation. Frozen semen samples were thawed on ice and the sperm and cells in the seminal plasma were collected by centrifugation at 4500 x g min at 4°C. The pellet was suspended and lysed in 100 mL of lysis solution (100 mg/mL proteinase K, 10 mM DTT, and 1% (w/v) SDS) at 50°C for 16-20h. The lysates from 100-200 μ L semen were extracted by the standard phenol/chloroform procedure, and the DNA precipitated with ethanol.²³ The precipitated DNA was dissolved in 50 μ L of 10 mM Tris-1 mM EDTA, pH 7.5 and quantified by comparison with known concentrations of lambda DNA (Gibco, BRL) on an agarose gel.²³ DNA was also extracted from buccal cells by an alkaline lysis method.²⁴ DNA from peripheral lymphocytes was extracted by standard procedures.²³

Sequence-tagged site screening. The location of the AZF regions and the tag sites for the primers used are shown in Figure 1.²⁵ Primers were obtained from Research Genetics Inc. (Huntsville, AL). The male specific primers were further confirmed by using female DNA as a template for PCR before use in this study. These primers were chosen because they consistently gave positive results when tested with DNA from fertile men. Because PCR reactions do occasionally fail to amplify, each deletion was accepted as a true deletion only when three successive PCR reactions produced negative results and was supported by Southern blot analysis.²³

PCR was carried out in a DNA Thermal Cycler 480 (Perkin Elmer) or a PTC-100™ programmable thermal controller (MJ Research, Inc.). In each PCR reaction, either the SRY gene or CENP-C gene (centromere autoantigen centromere protein C gene)²⁶ was co-amplified as an internal control. A negative control using nanopure water instead of DNA was included in each experiment. PCR was carried out by standard procedures and products were analysed on agarose gels.

Results

The mean sperm counts were 102 (SD 97) millions/mL for men with normospermia; 9.9 (SD 4.5) millions/mL for oligozoospermia; 1.7 (SD 1.4) millions/mL for severe oligozoospermia. The mean sperm motility was 52% (SD 18) for men with normospermia; 44.2% (SD 18.6) for

oligozoospermia; and 37.7% (SD 25) for severe oligozoospermia. The mean age was 35.7 (SD 6.2) years for men with normospermia; 36.2 (SD 4.7) years for oligozoospermia; 34.7 (SD 4.7) years for severely oligozoospermia; and 39 (SD 13) years for azoospermia. Table 1 and Figure 1 summarise the microdeletions detected. Overall, 20% of azoospermic, 4% of severely oligozoospermic, 3.2% of oligozoospermic, and 0.7% of normal men had microdeletions. The semen characteristics and ages of the men with Yq microdeletions are summarised in Table 1. No amplification of any of the STSs was seen when DNA from a female was tested.

Table 1. Semen characteristics of men with Yq microdeletions.

Patient (age)	Sperm count (millions/mL)	Motility (%)	Morphology (% abnormal)	Diagnosis	STS loci																											
1454 (33)	0	N/A	N/A	Azoospermia	sY152 (AZFd) sY155 (AZFc) sY254 (DAZ) sY157 (AZFc) sY146 (AZFc)																											
3355 (42)	0	N/A	N/A	Azoospermia	sY134 (AZFb)																											
3484 (35)	0	N/A </tr <tr> <td>3313 (37)</td> <td>0.1</td> <td>40</td> <td>100</td> <td>S. oligoZS</td> <td>sY158 (AZFc) sY146 (AZFc) sY147 (AZFc)</td> </tr> <tr> <td>9501 (34)</td> <td>3.4</td> <td>23</td> <td>92</td> <td>S. oligoZS</td> <td>Y156 (AZFc)</td> </tr> <tr> <td>3332 (34)</td> <td>8.4</td> <td>33</td> <td>78</td> <td>OligoZS</td> <td>sY146 (AZFc)</td> </tr> <tr> <td>3642 (na)</td> <td>5.2</td> <td>22</td> <td>n.d.</td> <td>OligoZS</td> <td>sY135 (AZFb)</td> </tr> <tr> <td>95-22 (41)</td> <td>67</td> <td>57</td> <td>n.d.</td> <td>Normos</td> <td>sY156 (AZFc)</td> </tr>	3313 (37)	0.1	40	100	S. oligoZS	sY158 (AZFc) sY146 (AZFc) sY147 (AZFc)	9501 (34)	3.4	23	92	S. oligoZS	Y156 (AZFc)	3332 (34)	8.4	33	78	OligoZS	sY146 (AZFc)	3642 (na)	5.2	22	n.d.	OligoZS	sY135 (AZFb)	95-22 (41)	67	57	n.d.	Normos	sY156 (AZFc)
3313 (37)	0.1	40	100	S. oligoZS	sY158 (AZFc) sY146 (AZFc) sY147 (AZFc)																											
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95-22 (41)	67	57	n.d.	Normos	sY156 (AZFc)																											

N/A: not applicable; n.d.: not detectable; S. oligoZS: severe oligozoospermia; oligoZS: oligozoospermia; normos: normospermia.

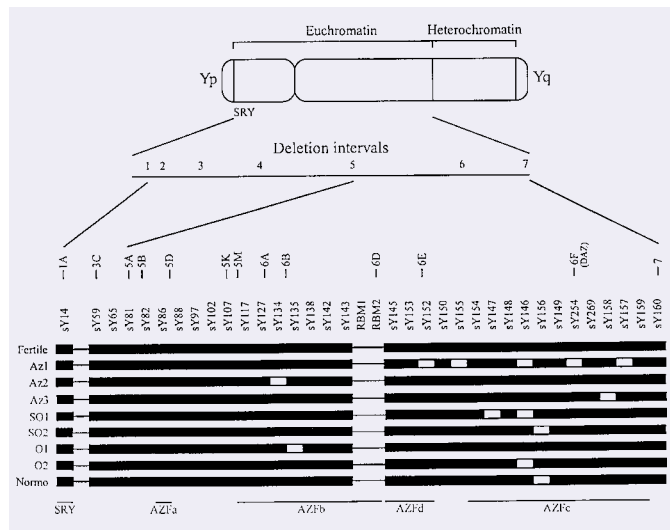


Figure 1. Microdeletions detected in seven infertile men and one fertile man. The Y-chromosome is shown at the top, with the short arm on the left (Yp) and the long arm on the right (Yq). The deletion intervals, 1-7, are indicated below. Each of these intervals is divided into sub-intervals denoted by a letter after the interval number. The order of the STSs and the approximate location of AZFa, AZFb, AZFd and AZFc are indicated.^{2,5} Those STSs tested and found to be present are depicted as a solid thick line. The STSs tested, but not producing PCR products of the expected size, are depicted by open rectangles. The thin lines indicate regions of the Y-chromosome not tested in this study. Az, azoospermic; SO, severely oligozoospermic; O, oligozoospermic; Normo, normospermic; SRY, male specific sex determination gene.

One oligozoospermic man and one severely oligozoospermic man had produced unassisted pregnancies, followed by normal deliveries. The normospermic man with a

microdeletion had not produced any pregnancy at the time of the study, although he had had normal rates of fertilisation in four IVF cycles.

Discussion

This is the first report of a study of the frequency of Y-chromosome microdeletions in a New Zealand population. Microdeletions were detected in AZFc in 13% of azoospermic men, 4% of severely oligozoospermic men, 3.2% of oligozoospermic men, and 0.7% normospermic men. Overall, 5.5% of the infertile men had at least one microdeletion. The frequencies of microdeletions are within the range reported by other studies (Table 2). The high variability between reported studies is likely due to different criteria being used for the selection of infertile men. Not all the studies apply the WHO guidelines,^{3-6,12,15,27} and in some cases, the sample sizes were small. Microdeletions have been reported in normospermic man in two previous studies, although the frequencies were much lower than those of the infertile groups (Table 2). In one study, 0.8% of normospermic men had microdeletions in AZFc.⁴ In a second study, 2% of normospermic men had microdeletions in AZFb.⁸ It is possible that some detected microdeletions are in fact neutral polymorphisms, where a different and less common DNA sequence is present, so the region does not amplify with the standard primers.

One of the azoospermic men in the present study had five non-contiguous microdeletions, including the DAZ locus. This man had normal levels of FSH and testosterone. Previous studies have also identified men with non-contiguous deletions within an AZF region.^{6,15} There is no absolute relationship between the level of FSH and impaired spermatogenesis. Although men with elevated FSH levels tend to have impaired spermatogenesis, many azoospermic or severely oligozoospermic men have normal FSH levels.

The DAZ and RBM genes encode testis-specific RNA binding proteins. It has been speculated that these proteins may be involved in the regulation of testis-specific RNA splicing, the regulation of protein synthesis in spermatogenesis, or RNA transport and storage.^{12,28,29}

Consistent with the general trend, the present study shows that men with severe spermatogenic failure have a higher frequency of microdeletions than less severely affected men. Although there have been attempts to relate the location of microdeletions with the extent of a man's sperm production, what appears to be the same microdeletion can be found with quite different degrees of sperm production.^{4,8,30}

Having a microdeletion in the AZFc regions does not preclude the ability of a man to produce functional spermatozoa. On testicular biopsy, even azoospermic men are often found to have small foci of active spermatogenesis. The advent of intracytoplasmic sperm injection has made it possible for men with very few sperm to father children. The concern that sons of men with Y microdeletions will inherit their fathers' infertility (as they must inherit his Y chromosome), has been shown to have a sound basis. Father-son transmission of Y microdeletions has been demonstrated in several cases.^{5,8} However, this transmission can also occur without the intervention of ART, as shown by the recent report of a father with four infertile sons.³⁰ Father and sons have apparently identical microdeletions. Our two cases of pregnancies occurring without treatment, also suggest the opportunity exists for Y microdeletions to be propagated without ART. In these last cases, paternity has not been unequivocally established, but both couples were in long term stable relationships, and there is no reason to suspect the husband is not the child's father.

A causal relationship between the presence of microdeletions in AZF and infertility has not been

Table 2. Comparison of prevalence of microdeletions in fertile and subfertile men.

Overall %	Azoospermic % (N)	Severely oligozoospermic	Oligozoospermic % (N)	Normospermic % (N)	Reference
3.2	C	C (370)	nd	nd	3
5.5	20 (15)	4 (62)	3.2 (50)	0.7 (141)	This study
6	6.7 (105)	nd	3.6 (28)	0 (32)	7
7	23 (26)	1 (30)	9.5 (42)	2 (200)	8
10	16 (50)	nd	1.5 (136)	0 (100)	9
13	13 (89)	nd	nd	nd	15
18	21 (19)	nd	14 (14)	0 (10)	5
18	20 (50)	10 (10)	nd	0 (16)	6
20.5	C	C (278)	nd	0.87 (920)	4
21	6.8 (44)	3.5 (86)	0 (72)	0 (101)	11
29	37.5 (16)	22.7 (22)	nd	nd	27

N, sample size; C, azoospermic and severely oligozoospermic men were combined; nd: not detected.

established. However, it is suggested by cases where *de novo* mutations are demonstrated, with male relatives having no microdeletions and normal fertility.¹² The relationship between genotype (which regions of the chromosome are deleted) and phenotype (the extent of sperm production) is not straightforward, but may be influenced by environment, and the presence of a fertility gene does not necessarily mean it is being expressed.

Infertile male patients should be counselled about the possibility that they may be harbouring Y microdeletions, which will almost certainly be passed on to their sons. The son is then likely to have impaired fertility also, although the severity of this cannot be predicted. Many couples are happy to accept the chance their children may face the same problems they do, but some will prefer to be screened for microdeletions, and only proceed with fertility treatment if they are unaffected. That decision is theirs to make, but it should be an informed decision.

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Recently the BMJ received the following anonymous letter:

“Dear Sir,

I am a graduating student of Royal Free and University College, London Medical School. During the finals of clinical exams, I was witness to one of the most ugly scenes in my short but eventful life. One of my colleagues had, in a brazen attempt to obfuscate the examiners, made use of her Oxford Clinical Handbook during her long case. Unfortunately (or fortunately) for her, she was caught red handed. The deed was not looked on kindly by the authorities, especially when she attempted to extricate herself by claiming she had also done this in a previous examination and not been caught – thereby (or so she believed) justifying her act... My colleagues and I were convinced that she would receive her comeuppance.

After meeting the disciplinary board, however, she was allowed to pass her exams without further ado. Fair play and honesty – two virtues I have always believed in – have been made monkeys of again. In future, perhaps we should all do as she did. After all, look where it's got her.”

We rang the medical school, and the sub-dean confirmed that the facts in the letter were correct, except that the student did not say that she had used a book in a previous examination. The examining committee had decided to allow her to graduate but had held back distinctions and prizes that she might have won. She had been an exemplary student, and there was no indicating that she had done this before.

Richard Smith. *BMJ* 2000; 321: 398.

Concealing clinical uncertainty - the language of clinicians

Robert Logan, *Medical Director, Hutt Valley Health, Lower Hutt.*

NZ Med J 2000; 113: 471-3

Uncertainty, though inevitable in medical practice simply because of the biological uniqueness of individuals,¹ is largely ignored in the rationalist training of doctors.² This paper explores their use of words in response to uncertainties inherent in their work.

Because of the power, autonomy and authority of the language in which medical knowledge is expressed,³ it is easy to overlook the variation in meaning of words according to context and usage,⁴ which contrasts with the precision of mathematical symbols and numbers. The influence of language on clinicians' thought and communication in medicine is largely unrecognized, but is so powerful that it has been likened to an infectious virus,⁵ and even considered capable of toxic effects on medical thought and practice.⁶ The diverse meanings and symbolism⁷ of words result in varying interpretations of patients' symptoms⁸ and even quite simple descriptive words used in communication between physicians', prompting the conclusion that whilst individuals understood what they meant, communication between them was almost meaningless.⁹ Difficulties and potential errors in translating what are in effect the different languages¹⁰ of patients' and doctors' are, therefore, inevitable.

Probability - certainty based on the past

Although probability from the Latin root 'to approve of', signifying the degree of belief in presented evidence, has acquired a variety of meanings, reflecting the increasing influence of rationalism augmented by the eruption of statistical thinking in the nineteenth century, it is unrealistic to assume that clinicians' thinking will not reflect at least some of the apparent irrationality of illness. Beliefs in probabilities based on intuition and experience which are inevitable, even for the most ardent rationalists, should be recognised as such, rather than obscured by specious argument and misuse of language. The word 'probability' is applied in a number of ways which include the prediction of future outcomes for groups, risks for individuals, and as an indicator of statistical uncertainty. All carry the implication of an absolute truth somehow intrinsic to the data which ignores the fallibility of induction,¹¹ clinicians' own lack of knowledge and the uncertainty inherent in biological diversity.

Security of the mean

Preoccupation with mean values, particularly when endowed with compelling adjectives, not only obscures the uncertainty of individual responses, but risks the imputation of abnormality to deviance from the normality of the mean. For example, the vain and potentially dangerous attempts of some patients during exercise testing to achieve a 'target heart rate', ignores the wide variation of normal heart rate responses. A belief in the inherent power of drugs which overlooks the unique role of each consumer, can lead to unrealistic and even pejorative labelling of the more extreme deviants from the mean as, for instance, 'non responders'. The fault lies not with the patient, but in the doctor's failure to recognise that Mr and Miss Average are statistical creations, not reality!

Certainty through p

The authority of p which epitomizes belief in the power of statistics, particularly when based on large numbers, has been enhanced by a popular misinterpretation which obscures doubt with false certainty. The assumption that $p < 0.05$ means there is a 95% probability that the null hypothesis is incorrect ignores the fact that the p value is calculated on the assumption that it is true:¹² p cannot, therefore, be a direct measure of its falsity. Despite the conviction with which decreasing p values are quoted, they cannot indicate degrees of superiority of one treatment over another, only cast greater doubt on the null hypothesis. The frequency and conviction with which its authority and objectivity are expressed belie its arbitrary nature, dependence on study data and manipulation by experimental methodology.¹³ Nevertheless, the power of p to influence clinical practice, particularly when presented in a respected journal may be considerable, even if unwarranted.¹⁴ The subjectivity frequently intruding following statistical analysis which traditionally has ignored pre-test data, is obscured by words implying objectivity: expected results not quite achieving conventional significance levels are 'trends' and unexpected findings dismissed as 'statistical fluke' or 'equivalent'. P is only a guide which may reduce some of the uncertainty in the (vain) search for truth, but is not a substitute for it, even when considered in the context of pre-test probability.

Risk - the dice are different shapes

The concept of risk arose in association with games of chance. Unlike probability, which is based on past experience, it is directed to prediction of future events. Despite that, the two are inter-changed, perhaps because probability appears to offer greater security, without the same implications for an adverse outcome! The relative certainty of predicting the outcome of the roll of dice is of limited relevance to individual patients for whom, to extend the metaphor, their shapes not only differ but are also hidden. Clinicians generally deny their ignorance of such variables, basing assessment of risk on the apparent certainty of group data and linear prediction, which ignores the unforeseeable in biological systems. Then there is the added, but important, variable of the patients' view of risk: what is considered a small numerical risk by one may be unacceptable to another, whilst others may regard it as meaningless to discuss something which for them, is either 100% or zero.

Understandably, therefore, risk is dressed up with adjectives such as absolute and high, which create moral and intellectual imperatives and inhibit questioning. The popular relative risk, though meaningless without quantification, can mislead the unwary. Even quite small absolute differences between treatments may be magnified by eager researchers and the pharmaceutical industry to imply a major therapeutic effect. Likelihood ratios and NNT (number needed to treat), which inversely reflects therapeutic gain, quantify risk but still offer only limited guidance in the individual case. The authority of the odds ratio which

approaches that attributed to p is questionable simply because it is subject to considerable variation through changes in the magnitude of compared outcomes.¹⁵ Not surprisingly, the many ways of expressing risk have led to misinterpretations even by experts, with embarrassing consequences in the media.¹⁵

The frequent implication of a causative role for risk factors, rather than one merely of association, provides doctors with an unjustified confidence in explaining or predicting illnesses, which reflects historical belief in determinism.¹⁶ The reassurance which their identification offers is revealed by the frequent unease of both doctor and patient when none can be identified! Attribution of risk factors with pejorative or moral implications, such as obesity or smoking, may reinforce the certainty of the doctor, at the expense of implying weakness of character or fault on the part of the patient, or even reinforcing belief in divine punishment.¹⁷

The power of diagnosis

Within all that has been written about the diagnostic processes and disease classification, sight should not be lost of the authority and certainty which the term diagnosis conveys. By providing security for the doctor and therapeutic reassurance for the patient,¹⁸ it has acquired the icon status of a definitive truth, rather than a working hypothesis with constant reluctance often to challenge its validity. Concepts of diagnosis may differ according to their clinical context, so that whilst on one hand the essentialist regards all illness as resulting from diseases, the nominalist descriptive perspective does not require identification of an underlying cause, as with chronic fatigue syndrome.¹⁹ The potential influence of such differences may be important in communications between clinicians in different specialities.

Since medical training continues to emphasise the imperative of reaching a disease based diagnosis, despite the limitations of doing so, it is not surprising that clinicians use words to create the impression of diagnostic certainty, though many are no more than tautologies, such as atrial fibrillation or an authoritative restatement of symptoms, particularly in Latin, - for example, sore throat becomes 'pharyngitis'.

The useful shorthand of acronyms is reinforced by the assurance they convey because of their apparent precision, which belies what may be widely diverse meanings. For instance, 'PID' which may mean prolapsed intervertebral disc or pelvic inflammatory disease and 'Syndrome X', either a cardiac or metabolic syndrome, neither of which has an identifiable underlying pathology. Some diseases, such as chronic obstructive lung disease, have multiple acronyms - CORD, COAD, COPD. One has to wonder about the possible misinterpretation of GORD, which for the uninitiated, means gastroesophageal reflux disease! There is a danger that the clumping of signs and symptoms, with or without resorting to acronyms, in terms such as nephrotic syndrome, LVF or CCF may become substitutes for a pathological diagnosis, with consequent failure to seek an underlying cause.

The certainty of inferences

Labeling results of tests as 'positive' or 'negative' without considering their clinical context including pre-test probabilities, implies unrealistic predictive powers. Particular care is required to be taken when translating one specialist language to another. For example, the tendency of radiologists to report x-ray appearances in terms of pathology, for example describing multiple shadows as

metastatic deposits and bilateral hilar shadowing on chest x-ray as left ventricular failure, can mislead the unwary clinician. Normal coronary arteries are only 'normal' as far as their angiograms are concerned.²⁰ Clinicians themselves are not immune from such extrapolations which may influence their diagnostic reasoning - for example describing inspiratory chest pain as "pleuritic" or "pericarditic".

Obscuring uncertainty with emotion, hyperbole and dogma

Dogmatic injunctions involving 'should' and 'must', coupled with the emotive words and phrases such as 'critical' and 'high risk' prompt action, rather than the recognition and consideration of any doubt. Though a grand title such as 'evidence based medicine' has a perfectly reasonable basis,²¹ it may, like so many ideals, be distorted to become a suppressive dogma²² which subordinates the needs of individuals to what is 'right' or 'best'. The debate over its validity exemplifies the power of words, particularly when presented as an authoritative title, to influence clinicians in ways which obscure clinical uncertainty.²³ Absolute risk carries the convincing connotation of absolute truth, despite being an oxymoron which only compounds the deceit of its application to individuals. Endowment of diagnostic tests with authoritative phrases such as 'gold standard' convey a quite unrealistic impression of their accuracy and relevance.

Failure to define clearly the meanings of the apparently simple words 'good' and 'best' with reference to patients' welfare are often overlooked as contributors to clinicians' uncertainty, though they may vary greatly, reflecting diverse needs and concerns arising from different perceptions, concepts of illness and ethical attitudes.²³

Words play a part in the assertion of power over others, whether for good or bad, in responding to uncertainty.² Lewis Carroll identified their potential power:

"When I use a word it means just what I choose it to mean, neither more nor less". Humpty Dumpty.

"The question is, if you can make a word do that". Alice.

"The question is which is to be master, that's all". Humpty Dumpty.

The therapeutic potential of the power conveyed by clinicians' language to provide security in the face of doubt and perplexity¹⁸ may be misused and even abused to obscure their own uncertainty: for example, contrast optimal informed consent with the patient's submission to treatment which they 'must have'.

Conclusion

Despite the nihilistic views of Wittgenstein,⁴ words will continue to be essential for communication between doctors and with their patients. Clinicians should be as critical of how they use them as they are of clinical data²⁴ and constantly mindful of the potential for jargon to mislead and confuse. Words such as probability and p value are merely aids to decision making, rather than substitutes for clear thinking.

Besides recognizing that the languages of medical knowledge and those used in clinic practice and in communication with individual patients differ,²⁵ clinicians must be aware of the importance of patients' perceptions and concerns when trying to explain concepts such as probability and risk. A greater recognition of the potential power of language to influence clinicians' deliberations, and even to increase uncertainty through attempts to obscure it, should engender greater honesty and indeed some humility, rather than what at times may appear as arrogance to patients and colleagues.

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MEDICOLEGAL DIARY

Blowing the whistle on bad practice

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On 1 January 2001, the Protected Disclosures Act 2000 will come into force. The Act's purpose is to protect 'whistleblowers' (those employees who disclose information about serious wrongdoing in, or by, an organisation). The Act will apply to all people, including health professionals, who work in either the public or private sector.

It was the Neil Pugmire case at Good Health Wanganui in 1994 that led to the introduction of the legislation. Pugmire, a psychiatric nurse, nearly lost his job when he disclosed, to a Member of Parliament, information about the danger posed to the community in freeing a paedophile patient from Lake Alice Hospital. Good Health Wanganui claimed that Pugmire's disclosure was in breach of his obligation as an employee not to misuse confidential information belonging to his employer.

In light of this year's high profile medical cases, including the Fahey case and the Gisborne Cervical Cancer Inquiry, it is likely the Act will have particular significance for those working in the health sector.

The Act allows an employee to disclose information about serious wrongdoing by his or her employer, or in the organisation. Serious wrongdoing includes an act, omission or conduct that constitutes a serious risk to public health or public safety. It also includes gross negligence or gross mismanagement by an employee of a Health and Hospital Service. The employee who makes the disclosure will be entitled to have his or her confidentiality protected, and will be protected from any disciplinary, civil or criminal proceedings.

The 'whistleblower' is required to first make the disclosure through the internal channels available in the organisation. Where there is some urgency to the matter, or where there has been no action taken by the organisation within 20 days, or where the head of the organisation is, or may be involved, in the serious wrongdoing, then disclosure can be made to an 'appropriate authority'. An appropriate authority will include, but is not restricted to, the Health and Disability Commissioner, the Medical Council and the Commissioner of Police.

What does this mean for health professionals and managers? For management, it means that there must be widely-publicised internal procedures for receiving and dealing with information about serious wrongdoing in, or by, the organisation. Information about alleged serious wrongdoing must be dealt with promptly and seriously.

For health professionals, the Act provides a mechanism for raising genuine concerns about bad practice, without breaching an obligation of confidence and without, at least in theory, jeopardising career advancements. Any conduct, either systemic or by an individual, whether clinical or otherwise, which places any person at serious risk, can be disclosed and action will need to be taken. So the Act should provide employees with far more confidence to disclose the type of wrongdoing seen in both the Fahey case and the Gisborne pathology case, hopefully at a sufficiently early stage to minimise the effects of that wrongdoing.

There are, however, some potential downsides to the new legislation. There is always the danger of aggrieved or misguided employees making false or baseless allegations, which can be hugely damaging in the period before the allegations are proved to be untrue. There is also the danger that 'whistleblowers' will in fact be discriminated against in their daily employment.

Concerns have also been expressed that there is no provision for a 'whistleblower' to take his or her concerns to the media. Media groups have argued that the Act could lead to the suppression of information that should become public. Others may feel that the media is not the right place for complaints to be investigated.

If managed correctly, the Act should prove to be a positive step towards the openness that is necessary to limit the kind of medical scandals which have been all too frequent recently.

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