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EDITORIAL

A plea for a comprehensive perinatal database

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"Those who cannot remember the past are condemned to repeat it".[1]
This familiar quotation is aptly applied to the status of maternity and neonatal care in New Zealand. Care for pregnant mothers and their babies has completely changed over the last ten years, yet there has been no adequate means of evaluating the effect of these changes. New Zealand unlike other countries has no method of remembering the past in this area. The government continues to make financial changes to the maternity system – changes that have significant impact on practice--but fails to assess the effect of these changes.

Health professionals and a few administrators have been calling for the establishment of a comprehensive perinatal database for over a decade. It is essential to monitor maternity care but there remains an appalling lack of government support for this.

There is public acceptance that New Zealand requires a method of monitoring its maternity system. The chair of the Maternity Services Review, which was conducted in 1999, specifically noted the following in her accompanying letter:

"The lack of complete and comprehensive data means that it is impossible to determine whether the changes in 1996 have had any impact on clinical outcomes. There are no clinical data available on which to recommend major structural or contractual changes..."

The then Health Funding Authority (HFA) saw fit to sideline the creation of the planned perinatal database that had been developed and supported by a committee of professionals in Obstetrics, Midwifery, Neonatology, and other allied groups. Barbara Browne from the HFA wrote the following in a letter that accompanied the release of New Zealand Mothers and Babies, 1999 (a report produced to demonstrate that New Zealand could analyse and report from the available National Maternity Data).[2]

"The HFA agrees on the importance of a Perinatal Information System (referred to as the Maternity and Newborn Information Unit in the above report) and that the activities of a Perinatal Epidemiology Unit would contribute greatly to informing the HFA's work in the provision of Maternity services. We wish to consider further the organization, form and function and the funding implications of such a Unit before making any decisions on its establishment."

In other words, the project was accepted as important but not supported by funding.

Since 1999, the organizational structure of the Ministry of Health has changed, and it is business as usual: nothing is being done to remedy a disgraceful situation and to monitor maternity care in New Zealand. New Zealand does not meet the WHO guidelines for data collection in the area of maternal and child health.

Australia in contrast has an internationally recognized and government funded Perinatal Epidemiology Unit. This small independent unit has a staff of statisticians and health professionals. The Australian Maternity data collection is a single postnatal collection of data, well funded, checked and audited. Reports are issued annually. Australia can remember its past.

What is required in New Zealand? There are already perinatal datasets but they are not used to audit practice. These are:

- National Minimum Data Set (NMDS)
- Perinatal mortality database
- Birth and death registrations
- Maternity mortality database
- Health Benefits database (HBL)

These datasets have substantial potential and could allow for cross referencing of information. However, at present, they are not consolidated, are collected by different government departments, are inadequately checked for accuracy and have little clinical input. As a result, there is ineffective analysis of available data. Audit varies between piecemeal and nonexistent.

Recently the government established an independent university affiliated group to monitor the cervical screening programme after gross deficiencies in the pre-existing programme were uncovered. Do New Zealand mothers and babies have to suffer a similar crisis before a similar system is established for maternity care?

New Zealand women and babies deserve a system that monitors their health care. Maternity care in New Zealand is largely government funded yet the care provided by hospitals and health professionals is not audited. New Zealand requires a Perinatal Epidemiology Unit, similar to that in Australia and other countries, that can independently monitor practice and changes in the provision of health care. Consolidation of available perinatal data in New Zealand and the following simple changes would enable significant improvement in the current situation. These improvements are:

- all datasets should be in electronic form
- a standard data dictionary should be established across datasets and between caregivers
- increased involvement of health professionals
- monthly audit of datasets for accuracy and completeness.

The benefits of a Perinatal Epidemiology Unit with a staff of health professionals, statisticians and epidemiologist's would include:

- early detection of deficiencies in maternity care
- independent annual reporting on perinatal events
- provision of benchmarks for health professionals to audit their practice
- monitoring of changes in provision of health care

We must know from whence we come, in order to know in which direction to go. And, as a society, the health and wellbeing of our youngest citizens dictates our future. Unless

we know what we are doing well, and what we are doing poorly, we cannot make appropriate changes to maternal and neonatal care. The creation of an adequate perinatal database is long overdue, and would improve the health of our mothers and babies.

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1. Santayana G. Life of reason, reason in common sense. New York: Scribner's; 1905. p284.
2. Health Funding Authority. New Zealand mother and babies 1999. An analysis of National Maternity Data. Wellington: HFA; 1999.

Embarrassed firms slash prices for AIDs drugs

AIDS patients in Ivory Coast will be the first to benefit from a price-cutting war among drug manufacturers, embarrassed by the recent outcry over the preventable deaths of millions of people and afraid of losing the potentially huge African market to copycat generics manufacturers.

Merck, one of the world's leading pharmaceutical companies, dramatically dropped the price of two antiretroviral drugs last week. Crixivan (indinavir sulphate), which costs about $6000 a year in the United States, is on offer to sub-Saharan Africa at $600 a year, and Stocrin (efavirenz) at $500. Merck says it will make no profit on the sale.

Ivory Coast's minister for AIDS, Assana Sangare, said last weekend that her country would buy discounted drugs from Merck, Bristol Myers Squibb and GlaxoSmithKline, bringing the cost of the kind of three-drug combination used to combat HIV/AIDS in the West down to $1200 a year.

The three drug companies, and two others, have in the past offered discounts of 85%, but have not named figures. There has been only a limited response. Most of Africa said the prices were still unaffordable.

Merck's more generous offer is seen as a response to the low prices offered by generics companies, which copy patented drugs. Cipla, the Indian generics firm, is willing to supply governments in the developing world with a cocktail of three AIDS drugs for $600, and to drop the price to $350 for the volunteer doctors of Médecins Sans Frontières. The same combination would cost more than $10 000 a year in the West.

The prices are still too high to allow more than a small number of people in desperately poor countries to be treated. But the significance of the Merck move is that it signals a downward spiral in drug prices.

Sarah Boseley. Guardian Weekly 15 21/3/01.

US employer agrees to stop genetic testing

A US freight railway company has agreed to stop requiring the genetic testing of employees who file claims for a wrist condition called the carpal tunnel syndrome. The US Equal Employment Opportunity Commission had filed a lawsuit against Burlington Northern Santa Fe alleging that the policy violated the Americans With Disabilities Act.

A railway worker who refused to provide a blood sample after filing an injury claim was threatened with dismissal, the commission said, in its first legal challenge against genetic testing by employers. A spokesman for Burlington Northern, Richard Russack told the US federal court that it would stop the testing for 60 days "to evaluate the situation."

The debate over biological screening in the workplace has intensified as scientists unravel the human genetic code, but the controversy has largely been theoretical so far. As a result of the lawsuit filed by the employment commission, Burlington Northern has become one of the first companies to acknowledge having used genetic testing on its employees, according to the commission's lawyers.

Concern that such tests could be used to weed out workers on the basis of their genetic predispositions to injury or disease has led 22 states to ban the use of genetic screening for making employment related decisions, according to a survey by the Washington Post.

The commission alleged that the blood sample that the employees were asked to submit was used to identify a genetic defect on chromosome 17, which some experts believe could predispose a person to forms of the carpal tunnel syndrome. The syndrome causes numbness and weakness in the wrist.

The commission also alleged that employees were not informed of the genetic test or asked to give their consent.

Scott Gottlieb. BMJ 2001; 322: 449.

Dolly's creator attacks plans to clone humans

The scientist who led the team that created Dolly, the cloned sheep, has attacked plans to clone humans, saying it would be "extremely cruel" for the mothers and children.

Since Dolly was born in 1997, scientists have cloned mice, cattle, goats and pigs. Dr Wilmut warned that these experiments had shown the technique to be deeply flawed. He said very few cloned embryos survived to birth, and many of these died shortly after. Survivors were often grotesquely large or had defects. "There is no reason to believe that the outcomes of attempted human cloning will be any different," he wrote.

He is sceptical of the Antinori-Zavos claim that decades of in-vitro fertilisation work helping infertile couples enabled them to screen cloned human embryos for defects before trying to implant them in the womb. A normal child has a 50-50 mix of its father's and mother's genes, prepared for their embryonic role in eggs and sperm over months and years. In cloning, the genes are almost entirely from one parent, and their calibration is done in minutes. No clinic can screen all an embryo's genes for problems, according to Dr Wilmut.

He referred to a cloned lamb born in December at his Roslin Institute near Edinburgh. "It could run about perfectly normally, but it hyperventilated all the time; it panted night and day. We tried to treat it, but in the end decided it was kinder to put it down. What would Mr Antinori do if he produced a cloned child like that?

"Attempting to clone a human would be extremely cruel for the woman and children involved, and there could be a backlash against valuable research into cloning to create cells for therapeutic purposes."

James Meek. Guardian Weekly 2001; April 5-11. p9.

ORIGINAL ARTICLES

The potential for improvement in outcome of children with intussusception in the South Island

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Abstract

Aims. To review the experience in the South Island to predict the extent to which the outcome in intussusception might be expected to improve by the introduction of management guidelines and access to a regional specialist paediatric surgical service.

Methods. Children with intussusception treated in the South Island during an eleven year period until 1998 were identified from hospital coding systems, the Southern Regional Health Authority and from departmental audit programmes. Details of management and outcome were analysed.

Results. Data proved difficult to obtain. There were 83 children identified with intussusception confirmed on enema or at surgery; 76 had an enema that was successful in 44. Delayed repeat enema and gas enema techniques were not used as frequently as might be expected. The operative rate was higher than that reported by other centres.

Conclusions. Current data, coding and audit systems have significant short comings, which limit availability of reliable outcome data. Increased awareness of the expanded indications for enema reduction, use of air (rather than barium) and delayed repeat enemas, and access to specialist paediatric surgical involvement appears to increase the non-operative rate. Implementation of guidelines for the management of intussusception might be expected to reduce by more than half the number of children undergoing surgery for this condition in the South Island.

NZ Med J 2001; 114: 441-3

Reduction of intussusception by barium or air enema can be successful in up to 90% of patients and is the preferred method of treatment as it has a lower morbidity,[1-4] shorter hospital stay[4,5] and costs less than surgical reduction.[6] The indications for attempting enema reduction have expanded in recent years, and where an enema has achieved only partial reduction a repeat (delayed) enema may be successful in a further 50% of patients.[7]

This study reviewed the experience in the South Island to predict the extent to which outcome in intussusception might be expected to improve by the introduction of management guidelines and access to a regional specialist paediatric surgical service.

Methods

Children with intussusception admitted to the eight public hospitals in the South Island of New Zealand in which surgery on children is performed, between June 1987 and December 1998, were identified from hospital record systems and departmental databases. The data were correlated with information provided by the Southern Regional Health Authority (SRHA) in 1997. The hospital case notes of all patients with a diagnosis of intussusception (confirmed on enema or at surgery) were reviewed and data collected using Access database. Three children with a clinical diagnosis of intussusception who improved without confirmatory radiological evidence of intussusception were excluded. Statistical analysis was performed using Student's T-test. These data were compared with studies from other regions during a similar time period.

Results

Complete data from some centres were difficult to obtain, and it is suspected that a number of children undergoing surgery without a prior enema were not identified. A total of 83 children were identified as having a diagnosis of intussusception confirmed by enema or surgery.

An enema was attempted in 76 children and was successful in 44 (57%). In two patients in whom there was suspicion of a pathological lead point, surgery was undertaken despite known complete reduction of the intussusception; one had no abnormality found at surgery while the other had a Meckel's diverticulum. A gas enema was attempted in 42 children and proved successful in 33 (79%), compared with 11 out of 34 (32%) using barium. Intussusception recurred in three children (7.1%) and was reduced with a repeat enema. Surgery was performed in one of these despite successful reduction, and in another due to further recurrences. The technique of delayed repeat enema was used in seven patients after September 1996 and was successful in four (57%); these children would otherwise have undergone surgery. The maximum pressure employed to reduce the intussusception was documented in only four patients. In five, barium was used to confirm reduction following an air enema. Seven children with intussusception were taken to theatre without a prior enema. One had a prolonged history (not now considered a contraindication to enema reduction) while a second was thought to be unsuitable for enema reduction for reasons (non-specific) that would not normally be considered contraindications. Three children had frank evidence of peritonitis (an absolute indication for surgery). In the remaining two, the reason for the surgery without a prior enema was not apparent from the case notes.

Surgery was performed in 34 children followed attempted enema reduction; 11 following air enema (nine failures and two recurrences) and 23 after failed barium enemas. The intussusception was found to be reduced already in 5/41 children who underwent operation (Table 1); manual reduction was possible in 32. In total, ten patients underwent bowel resection for:

Table 1. Summary of operative findings (n=41).

	No Enema	Prior Barium Enema	Prior Air Enema	Resection Performed
Already reduced	0	2	3	0
Manual reduction	6	20	6	7
Unable to reduce	1	1	2	3

- inability to reduce the intussusception (3);
- for presumed necrotic bowel - not always confirmed on histology (4);
- Meckel's diverticulum (1);
- following ileostomy for perforation secondary to barium (1);
- resection of a suspected lead point (dimple) not confirmed on histology (1).

The intussusception was reduced manually, after an unsuccessful air enema in six children. Following unsuccessful barium reduction the intussusception was found to be reduced already at surgery in three children and manual reduction was possible in 20 children.

The average length of hospital stay after enema reduction was 2.2 days and following laparotomy 6.5 days (Table 2). Morbidity occurred mainly following laparotomy. Prolonged ileus for longer than three days was recorded in ten patients post operatively and one child required transfer to a tertiary institution for post operative intensive care. Recurrences following enema reduction were three for air enema and one following barium enema. There was one perforation following barium enema reduction. There were no deaths reported in the series. The operative rate has decreased from 50% (29/58) before September 1996 to 16% (3/18) after that time (Table 3).

Table 2. Comparison of length of hospital stay following enema reduction and surgery.

	South Island (n=76)	Melbourne[8] (n=29)	Toronto[3] (n=246)
Post enema stay	2.2 days	1.2 days	Not specified
Post surgery stay	6.5 days	5.1 days	6.1 days
Operative rate	45%*	25%	19%
Period reviewed	11 years	18 months	5 years

*Despite complete reduction two patients had surgery due to suspected pathological lesion at the lead point.

Table 3. The success rate of enema reduction in the South Island related to introduction of a specialist paediatric surgical service.

		Barium		Air	
		Total Number	Success	Total Number	Success
Christchurch	Before	1	0	28	21
	After	0	0	13	11
Rest of South Island	Before	29	8	0	0
	After	4	3	1	1
Total	Before	30	8	28	21
	After	4	3	14	12

Discussion

Given that the reported incidence of intussusception is about 2-4:1000 live births,[9] identification of only 83 children over eleven years in the South Island which has a total population of approximately 930 000, suggests that not all patients were identified by this study. One would expect about fifteen cases per year. The study revealed significant limitations in the ability of hospital and health authority information systems to retrieve data. Similarly, radiological and surgical databases in the contributing institutions were often inadequate or non-existent. Specifically, we suspect that our data may have underestimated the number of children who had a laparotomy as the primary modality of treatment (i.e. no enema attempted, or diagnosis not suspected until surgery). It is also likely that some children who had an attempted enema reduction were not identified. The current data retrieval systems are better than they were ten years ago but still remain inadequate for the accurate audit of paediatric surgical practice. The routine collection of clinical indicator data for paediatric surgery (of which intussusception is one clinical indicator promulgated by the Royal Australasian College of Surgeons) by all institutions that treat children with surgical conditions would enable more accurate analysis of outcome.

As mentioned earlier, non-operative enema reduction is the treatment of choice for intussusception in the absence of peritonitis. Air enema has been reported to reduce intussusception in up to 90%, a higher rate than that reported with barium (60%-70%). The reported incidence of perforation with air enema is between 1%-2% and the recurrence rate is 5%-10%, similar to that with barium enema reduction.[8,10] In this series, air enema was successful in 79% compared with 32% when barium was used as the contrast medium. This reflects the greater ability of air to achieve reduction as well as the fact that the air enema was used mainly in the larger centres where there may have been access to radiologists with paediatric training and experience. The relatively low overall enema reduction rate may relate to several factors. First, unwillingness by surgical teams to request a therapeutic enema when there is a perceived (but not necessarily valid) contraindication to enema reduction. Second, inexperience of the radiologist in the management of this condition, with reluctance to persist with the procedure or increase insufflation pressures. Third, the use of barium instead of air. Fourth, non-use of a delayed repeat enema until after 1996.

In five children the intussusception was found to be reduced already at surgery after an attempted enema reduction, and in 33 the intussusception was reducible at surgery with manual reduction. This reflects failure of recognition of reduction with enema, and non-use of a repeat delayed enema in these children. Repeat enemas would be expected to be successful in over 50% of patients,[6] obviating the need for surgery in these patients. The delayed repeat enema technique was not used until late 1996. During the period reviewed, the indications for enema and type of enema employed (air rather than barium as the contrast medium of choice) have changed. It is possible that these factors and the availability of a specialist paediatric surgical service (for consultation or transfer) have contributed to the recent reduction in the number of children undergoing surgery.

This study identified seven patients who were taken directly to theatre with a presumptive diagnosis of intussusception without a prior enema. Some of these children may have avoided surgery had broadened indications for attempting an enema reduction been used. A further group of patients who underwent surgery without a pre-operative diagnosis of intussusception could not be identified with certainty, so were excluded from analysis. It is likely that there were a significant number of these patients, such that the rate of surgery reported here may be considerably lower than the actual rate. Ten patients underwent resection and anastomosis. Review of the operative notes indicates that about half may not have undergone bowel resection had the procedure been performed by a specialist paediatric surgeon, ie there was no full thickness bowel ischaemia or pathological lesion at the leadpoint, and the operative description and histology report showed the lesion to be the characteristic dimple of idiopathic intussusception that does not require resection. Post operative complications included wound dehiscence (2), peritonitis (1), small bowel obstruction (1) and anaesthetic

complications (1). One child required admission to intensive care after surgery. In addition to the advantages to the child of a higher rate of non-operative reduction, there are also economic advantages in avoiding surgery[3] since surgery extended the length of hospital stay by about four days (Table 4).

On the basis of this review, and despite significant shortcomings in the ability of hospital information services to retrieve accurate data, it would seem that there is still room for improvement in the management and outcome of children with intussusception in the South Island. The implementation of wider indications for attempted enema reduction, the use of air rather than barium, and adoption of a delayed repeat enema protocol would be expected to reduce further the operative rate.

Referral to a tertiary paediatric surgical centre seems appropriate where the initial non- operative management has failed, particularly if air enema facilities and expertise are not available locally. Even following an unsuccessful initial enema (often barium) in a rural centre, a delayed enema may also be attempted, provided the child remains in good condition and the intussusception was partially reduced with the first attempt. In the tertiary centre it is likely that another attempt at air enema reduction would precede any decision about surgery (provided there was no clinical evidence of peritonitis). Paradoxically, the sicker the child the more important transfer to a tertiary centre becomes with the additional capabilities (including paediatric anaesthesia) that they provide.

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1. Beasley SW, Lubitz L. A continuing quality improvement (CQI) approach to improving the results of treatment in intussusception. J Qual Clin Pract 1995; 15: 23-8.
2. Glover JM, Beasley SW, Phelan E. Intussusception: effectiveness of gas enema. Pediatr Surg Int 1991; 6: 195-7.
3. Stein M, Alton DJ, Daneman A. Pneumatic reduction of intussusception: 5 year experience. Radiology 1992; 183: 681-4.
4. Zheng JY, Frush DP, Guo JZ. Review of pneumatic reduction of intussusception: evolution not revolution. J Pediatr Surg 1994; 29: 93-7.
5. De Campo JF, Phelan E. Gas reduction of intussusception. Pediatr Radiol 1989; 19: 297-8.
6. Stein JE, Beasley SW, Phelan E. The cost benefit of changing protocols in the management of intussusception. Aust NZ J Surg 1997; 67: 330-1.
7. Saxton V, Katz M, Phelan E, Beasley SW. Intussusception: a repeated delayed gas enema increases the non-operative reduction rate. J Pediatr Surg 1994; 29: 1-3.
8. Kirks DR. Air intussusception reduction: "The winds of change" Pediatr Radiol 1995; 89-91.
9. Stringer MD, Pablot SM, Brereton RJ. Paediatric intussusception. Br J Surg 1992; 79: 867-76.
10. Poznanski AK. Why I still use barium for intussusception. Pediatr Radiol 1995; 25: 92.

Do preformatted charts improve doctors' documentation in a rural hospital emergency department? A prospective trial

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Abstract

Aim. To determine if the introduction of preformatted patient record charts improved documentation by doctors in a rural emergency department.

Methods. All medical records of patients who were discharged from the emergency department were collected and analysed for a period of two weeks (control). The preformatted patient charts were then introduced for a further two weeks, and analysed for the presence or absence of key content items

Results. After exclusions, 137 control charts and 96 preformatted charts were collected and analysed. It was found that, overall, there was a significant improvement in the number of the key items documented ($p<0.005$). There was a trend towards improvement in four parameters, but for three other key content items, there was a nonsignificant decline in documentation standards.

Conclusion. A structured proforma does improve documentation. However, the improvement is small and further studies are required before use of preformatted patient records for the undifferentiated emergency department patients can be recommended.

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The patient record is an integral part of patient care in emergency medicine. While the relationship between documentation and clinical outcome is not clear-cut, with many studies showing that the standard of medical record keeping cannot predict quality of care or patient outcome,[1-3] the standard of medical documentation is an important quality assurance issue. The medical record is also a source of information for third parties such as hospital administrators, malpractice lawyers and, most importantly, for other healthcare professionals involved in the patients' care.[4]

Problems that may occur with poor documentation in the emergency department include difficulty with the audit process, a breakdown in communication between patient care providers with respect to previous diagnoses and management plans, and also indefensible medical litigation and malpractice claims.

A number of studies have shown the value of preformatted charts in patients with a defined condition such as asthma,[5,6] head injuries,[7] psychiatric presentations,[8] obstetric and gynaecological problems,[4] and poisoning admissions.[9]

However, the use of a preformatted patient record in the undifferentiated emergency department patient has not previously been studied.

The objective of this study was to determine whether the use of preformatted patient charts in a rural emergency department improved medical record documentation by medical practitioners.

Methods

The study was carried out in the Emergency Department of Thames Hospital, a rural hospital with 56 beds and 8700 new emergency department attendances annually. This is a non-training department,

staffed mainly by casual medical staff of varying experience, and by local general practitioners. During the study period there were ten different physicians who worked on a shift basis in the Emergency Department, excluding the physician supervising the trial (AOC): any patient notes completed by this physician were not included in the trial. During the study period, there was no change in the medical staffing of the department.

This was a prospective trial involving the patient records of all patients presenting for emergency treatment over the period of one month, and who were not admitted to hospital. The treating doctors were unaware of the study being carried out, but blinding was not possible due to the nature of the trial. A brief orientation to the new preformatted chart was given to each doctor, but the reason for its introduction was not explained.

A preformatted emergency department chart was designed by the authors. This was designed using eight of the categories identified as key content items for a complete medical record by The American Medical Association Health Care Financing Administration and accepted by The American College of Emergency Physicians.[10] These, printed as headings on the preformatted charts were: the doctor's name and signature, the patient's presenting complaint, the clinical examination, any investigations carried out, an impression/diagnosis and the patients disposition. Space was left under each heading to allow documentation for that aspect of the patients' attendance in the medical record.

For the first two weeks of the study, the doctors in the department used the usual patient medical charts which included only the hospital name and a lined page for writing patients notes. These charts acted as the control group. For the second two weeks, the preformatted charts were used. Medical staff worked an approximately equal number of shifts during both periods of the study, and all eligible doctors were represented in both the control and study group chart periods.

Each evening, clerical staff in the Emergency Department photocopied the patients' notes, and the duplicate medical record was placed in a secure area for later analysis. The analysis was carried out on each chart by each of the authors, and each aspect required within the medical record was noted to be present or absent. After the study, all duplicate medical records were destroyed.

Charts excluded from analysis were those of patients seen solely by nursing staff, those who left without being seen, those seen solely by hospital consultants, and those who presented solely for prescription of usual medications.

Results

A total of 256 charts were collected, 141 control (non-preformatted) and 115 preformatted charts. After exclusions, final numbers eligible for analysis were 137 control charts and 96 preformatted charts.

Each chart was given a score out of eight, one for each of the key content items completed. The sum of the number of parameters filled in for each chart was used for analysis. The Mann Whitney U test was used for analysis because the data were nonparametric. There was a difference in the number of key content items completed between the control and preformatted charts: the median number of key content items completed by the doctors increased from seven to eight ($p=0.005$).

Further analysis of the data, using Fisher's exact test, analysing each of the key content items was then carried out (Table 1). This showed that the only statistically significant difference between the two groups was in the key content item of 'Doctor's Name' being completed. There was a non-significant trend towards improvement in four other key content items, but in three of the eight key content items there was a decline in documentation by the doctors after the introduction of the proforma (NS).

Discussion

The medical record is an essential part of patient care, and is often used as a quality assurance measure in emergency departments. In rural and nontraining emergency departments, where there are doctors of varying skill and experience, there is also wide variation in the completeness of documentation in the patient record. This study suggests that the introduction of preformatted charts did improve documentation overall as the number of key content items documented increased, but this improvement was not evident for all the key content items. The improvement was most noticeable in the naming of the attending doctor, an important point when it comes to quality assurance and also for follow up of patient complaints. There were other smaller improvements in documentation of the presenting complaint, history, and investigations. These differences, however, did not reach statistical significance.

Table 1. Completion of eight key items in medical records before (control) and after introduction of preformatted patient charts.

Key content item completed	Before proforma (contol) n (%)	After proforma n (%)	p value
Doctor's name	25 (18)	50 (52)	<0.0001
Doctor's signature	125 (91)	92 (96)	0.20
Investigations	127 (93)	93 (97)	0.31
Presenting complaint	111 (81)	83 (86)	0.29
History	125 (91)	90 (94)	0.47
Examination	127 (93)	87 (91)	0.46
Impression/diagnosis	90 (66)	57 (59)	0.33
Disposition	126 (92)	85 (89)	0.09

One area not documented well by the doctors on the control or the preformatted charts was the doctor's impression/diagnosis: this is one of the most important emergency medicine parameters and identifies an area for further study, since the reasons for this deficiency are not clear.

Study limitations include the relatively small sample size and the inability (due to the nature of the study) to blind either the doctors or the observers. The relatively short time period of the trial of one month did not allow medical staff to become fully accustomed to the preformatted charts, and this may have introduced some bias into the study. Increasing the time period of the trial, thus increasing the number of charts analysed, would increase the power of the study.

We suggest that further studies are warranted before recommending the implementation of preformatted charts for use in emergency departments of rural hospitals.

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1. Murphy JG, Jacobson S. Assessing the quality of medical care. The medical record versus patients' outcomes. Ann Emerg Med 1984; 13: 158-65.
2. Fessel WJ, Van Vrunt EF. Assessing quality of care from the medical record. N Engl J Med 1972; 286: 134-8.
3. Sanazaro PJ, Worth RM. Concurrent quality assurance in hospital care. N Engl J Med 1974; 298: 1171-7.
4. Humphreys T, Shofer FS, Jacobson S et al. Preformatted charts improve documentation in the emergency department. Ann Emerg Med 1992; 21: 534-40.
5. Robinson SM, Harrison BDW, Lambert MA. Effect of a preprinted form on the management of acute asthma in an accident and emergency department. J Accid Emerg Med 1996; 13: 93-7.
6. Teo S, Hansen R, Van Asperen P et al. Improving asthma documentation in a paediatric emergency department. J Paediatr Child Health 1995; 31: 130-3.
7. Wallace SA, Gullen RW, Byrne PO et al. Use of a proforma for head injuries in the accident and emergency department – the way forward. J Accid Emerg Med 1994; 11: 33-42.
8. Schnieden V, Good S. Use of a psychiatric proforma for accident and emergency officers. J Accid Emerg Med 1996; 13: 180-3.
9. Buckley NA, Whyte IM, Dawson AH et al. Preformatted admission charts for poisoning admissions facilitate clinical assessment and research. Ann Emerg Med 1999; 34: 476-82.
10. Anonymous. Documentation guidelines for evaluation and managegment services. American Medical Association, Health Care Financing Administration. J Ark Med Soc 1997; 94 (Supplement): 1-48.

Intracranial and spinal tuberculosis requiring neurosurgical intervention. The Wellington Hospital experience 1998-2001

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Abstract

Aims. To describe the Wellington Neurosurgical Unit's recent experience of managing tuberculosis between January 1998 and January 2001.

Methods. Patients with microbiologically confirmed tuberculosis of the central nervous system and whose management included surgery are described. Personal recall and review of the hospital records were used to extract relevant data.

Results. Five patients were identified. As well as involvement of the brain parenchyma, meninges, spinal cord or spinal column, all had evidence of tuberculosis elsewhere. All but one patient deteriorated neurologically after being started on antituberculous chemotherapy.

Conclusions. The number of patients presenting with neurotuberculosis appears to have increased recently in the Wellington region. The high proportion of paradoxical progression in our series is unusual. Neurosurgical intervention may be required for diagnosis, to treat hydrocephalus, or to relieve mass effect. Management is prolonged and often complex, and close co-operation is required between the neurosurgical team and a physician experienced in the management of tuberculosis.

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The incidence of tuberculosis (TB) is increasing in New Zealand due to poverty, overcrowding and immigration from endemic areas (Naing T, O'Hallahan J, Martin P, Crampton P. Poster presentation: TB into the New Millenium, Cairns, Australia, 2000 July). In the past, TB was seen rarely in the Wellington neurosurgical unit,[1] but it is rapidly becoming one of the most common serious intracranial and spinal column infections requiring neurosurgical intervention. We report our experience with five patients with proven intracranial or spinal TB who required neurosurgical intervention at Wellington Hospital in a three-year period.

Patients and Methods

Case 1. A 36 year old Indian woman who had lived in New Zealand for two years presented with cervical lymphadenopathy. Fine needle aspiration (FNA) of the lymph node revealed acid-fast bacilli (AFB), and cultures subsequently grew fully susceptible *Mycobacterium tuberculosis*. She was commenced on rifampicin, isoniazid, ethambutol and pyrazinamide but four weeks later they were discontinued because she developed hepatitis. Two weeks later she was readmitted for reintroduction of the medications. On the seventh day she became progressively ataxic, confused, drowsy, and had a generalised seizure. Computerised tomographic (CT) brain scan showed multiple ring-enhancing lesions in the cerebellum, right thalamus and frontal parafalcine regions bilaterally with surrounding oedema (Figure 1).

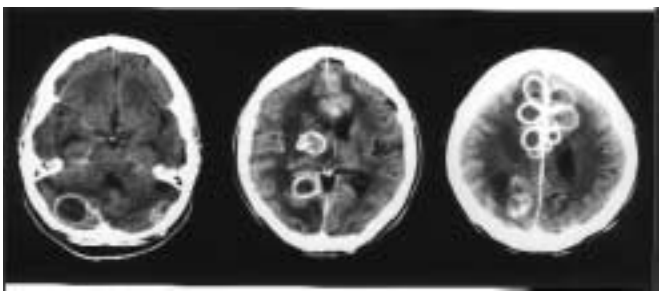


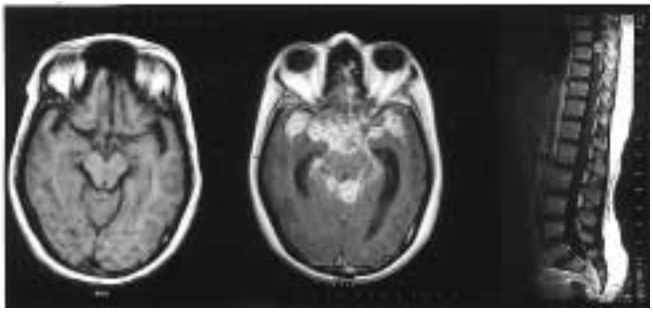
Figure 1. Case 1. Representative slices from contrast-enhanced CT head scan 7 weeks after presentation, at the time of onset of neurological symptoms. Multiple infra- and supra-tentorial tuberculous abscesses are present.

In the neurosurgical service she underwent diagnostic stereotactic aspiration of the largest lesion in the left frontal lobe. 2 mL of viscous green liquid material was obtained. AFB were demonstrated microscopically and culture yielded fully susceptible *M tuberculosis*. Her neurological condition deteriorated in spite of standard doses of rifampicin, isoniazid, ethambutol and pyrazinamide. She developed multiple cranial nerve deficits and a dense left hemiplegia. Three months after the commencement of treatment a CT head scan showed enlargement of existing abscesses and the development of new ones. High dose corticosteroids did not result in clinical improvement. Stereotactic re-aspiration of multiple abscesses yielded 20 mL of liquid material which was culture negative. Postoperatively her condition failed to improve and a further scan one month later showed no change in size of most lesions. Stereotactic re-aspiration of multiple brain abscesses again provided cultural-negative material but thereafter, her condition slowly improved. Chemotherapy was continued for two years, at the end of which time she had made a complete recovery. She remains on anticonvulsant medication. A post-treatment CT scan showed parasagittal calcification and gliosis, and one small area of enhancement in the right thalamus.

Case 2. A 35 year old Indian man with ankylosing spondylitis came to New Zealand twelve years ago. He presented to another hospital with pneumonia that failed to respond to standard antibiotic treatment. Inguinal lymphadenopathy was detected, an FNA of which demonstrated AFB, and cultures subsequently grew *M tuberculosis* susceptible to standard antituberculous drugs. A miliary pattern developed on chest x-ray. He was started on rifampicin, isoniazid, ethambutol and pyrazinamide but three months later he presented with focal seizures and signs involving his left leg. CT scan showed a multiloculated ring-enhancing right parietal mass lesion with surrounding oedema. He underwent craniotomy and excision of the lesion. Postoperatively there was worsening of left-sided hemiparesis but this improved over several months leaving mild weakness of ankle dorsiflexion. Histology revealed a granuloma with occasional AFB, but cultures were negative. Twelve months after surgery he remains well on antituberculous chemotherapy. Follow-up CT scan showed a small residual area of gliosis.

Case 3. A 36 year old Indian woman who had lived in New Zealand for seven years presented with headaches for several months' duration. She had neck stiffness but no neurologic focal signs and a CT head scan was normal. Lumbar puncture revealed a monocytosis but routine culture of the CSF and ligase chain reaction test (LCx, Abbott laboratories) for TB was negative. A diagnosis of either viral or partially treated bacterial meningitis was made, and she was treated with broad-spectrum antibiotics. Within a few days she became drowsy, required intubation and ventilation and focal neurological signs were noted, including paresis of the right abducens nerve and decreased sensation in the territory of the second division of the right trigeminal nerve. A chest x-ray now showed bilateral interstitial infiltrates. MRI scan was normal (Figure 2a), but repeat lumbar puncture showed a marked rise in CSF protein. She was commenced on rifampicin, pyrazinamide, isoniazid, ethambutol and cortico-steroids. Fully susceptible *M tuberculosis* was eventually cultured from both respiratory secretions and CSF. Ethambutol was then discontinued. She slowly improved but two months later developed headaches, drowsiness, generalised weakness, unsteady gait and diplopia. Repeat MRI showed intense basal meningeal enhancement, multiple parenchymal ring-enhancing lesions adjacent to the sylvian cisterns, and mild ventriculomegaly (Figure 2b). She was treated with intravenous methylprednisolone 1 Gm daily for three days then oral prednisone with

improvement in her neurological signs. However, two weeks later she became confused and drowsy. A third MRI scan showed progressive ventricular enlargement and a ventriculo-peritoneal shunt was inserted with substantial clinical improvement, but her left abducens nerve palsy and gait ataxia worsened whenever prednisone was reduced below 20 mg/day. Repeat MRI scan showed persistence of multiple tuberculomata and abscesses, but resolution of the diffuse basal meningeal enhancement. Ten months after starting treatment she described, for the first time, back pain and paraesthesia of both lower limbs. MRI of the spine showed marked cord compression by an intradural lesion at T8 (Figure 2c). She underwent laminectomy and excision of the lesion. Histology demonstrated a granuloma with giant cells but no caseation. No AFB were demonstrated and cultures were negative. She regained full sensation and her ataxia improved dramatically. She has mild diplopia on lateral gaze, and remains on low dose oral prednisone thirteen months after initial presentation. We will continue antituberculous medications for a total of eighteen months.



(a) (b) (c)

Figure 2. Case 3. Gadolinium-enhanced MRI head scans. (a) normal scan at presentation. (b) 2 months after starting treatment, showing paradoxical progression. (c) Gadolinium-enhanced MRI scan of the thoracolumbar spine showing an intra-dural enhancing granuloma causing cord compression at T7/8.

Case 4. A 27-year Indian woman, a recent immigrant, presented with neck pain and cervical lymphadenopathy of six weeks duration. A chest x-ray suggested miliary TB. Aspiration of cervical lymph nodes revealed AFB and *M tuberculosis* was cultured. Cervical spine x-ray and CT showed destruction of the right occipital condyle and right lateral mass at C1. There was atlanto-axial subluxation, with the space available for the cord reduced to 10 mm. The C1-2 subluxation was reduced, she was mobilised in a halo vest and antituberculous medication was commenced. The chest x-ray abnormalities rapidly resolved and three months later she underwent posterior occiput-to-C2 fusion using sublaminar wires and bone graft. She remained in a halo vest for a further three months and continued on antituberculous drugs for a total of eighteen months. Solid occipito-atlanto-axial fusion, was evident on x-ray six months after surgery.

Case 5. A 49 year old Tongan man who had lived in New Zealand for two years presented with back pain and progressive paraparesis of three weeks duration and scrotal swelling for four months. Examination revealed mild paraparesis, a sensory level at T6 and a painless epididymal mass. MRI of the spine showed partial replacement of the T5 and T6 vertebral bodies by enhancing material that was continuous with a paravertebral and extradural soft tissue mass impinging on the thecal sac. CT-guided FNA of the paraspinal soft tissue mass showed lymphocyte and plasma cells infiltrates and a granuloma: microbiological studies were not performed. A granulomatous process involving the spinal column and a painless epididymal mass was then considered suspicious of TB. A urologist, unable to exclude tumour, decided on unilateral orchidectomy which revealed necrotising granulomata, AFB, and fully-susceptible *M tuberculosis* on culture. Pyrazinamide, isoniazid, rifampicin and ethambutol were administered. His paraparesis worsened three months later and MRI showed increased cord compression. He therefore underwent T5-T6 costo-transversectomy, decompression of the cord and posterior instrumented fusion. Histology showed granulomata but no AFB, and cultures were negative. Postoperatively there was almost full recovery of neurologic deficits. Currently, no weakness is detectable but the patient reports some difficulty standing from the sitting position. Ethambutol was discontinued after susceptibility testing, and pyrazinamide was stopped after three months. He continued on rifampicin and isoniazid for a total of twelve months. MRI showed resolution of intraspinal and paravertebral disease but there remains a small focus of gadolinium enhancement in the T6 body which is static on serial imaging.

Discussion

Consistent with other countries New Zealand is experiencing an increase in the incidence of TB. Rates are highest in recent immigrants from Africa, Asia and the Pacific Islands, and in Maori.[1] It is apparent that poverty and overcrowding are important contributors.

Intracranial tuberculomata occur in 1% of patients with TB and are multiple in 10-30% of cases.[2-4] However, radiological appearances are not specific: bacterial abscess, primary and secondary brain tumours and neurocysticercosis may all produce similar appearances. Thus biopsy may be required for histology and microbiology, even if tuberculous granuloma or abscess is suspected. The positive and negative predictive values of the Mantoux test are poor under these circumstances. Chest radiographs suggest pulmonary TB in 30-80% of cases.[5] Lumbar puncture may not be safe in the presence of raised intracranial pressure. Even if CSF can be obtained, the findings may be non-specific.[5,6]

In some countries tuberculomata account for 10-20% of intracranial space occupying lesions.[7,8] Some authors suggest empirical treatment for 6-8 weeks if tuberculoma is suspected, with diagnostic biopsy only if lesions fail to improve.[7] Others advise immediate biopsy.[9,10] Histological examination of stereotactic biopsy specimens shows granulomata in 85% of cases[10] but AFB may not be seen and culture is not always positive, even in patients who respond favourably to empiric treatment. In all the cases presented here the diagnosis was simplified by the presence of disease outside the central nervous system.

Excision of a solitary tuberculoma may be indicated if the diagnosis is in doubt, or if there is dangerous mass effect. If the diagnosis is certain, we do not advocate early excision of a solitary lesion in an eloquent location, as medical treatment alone will suffice in most cases.

When multiple deeply situated lesions are present, aspiration or excision of one or more large lesions causing dangerous mass effect may be required, but excision of all lesions is neither feasible nor necessary. In Case 1, we eventually performed multiple lesion aspirations on two occasions. We would now generally favour a more conservative approach, and resist the temptation to repeatedly aspirate abscesses (as is commonly practised in the management of bacterial brain abscess), as medical treatment will eventually suffice in most cases. In the event of life-threatening mass effect due to multiple parenchymal lesions in eloquent brain, an alternative strategy is decompressive craniectomy.[11] Appropriate medical treatment is clearly paramount, with frequent monitoring of progress by clinical examination and serial imaging. In addition our experience in Case 3 suggests there should be a low threshold for imaging the entire neuraxis of patients with neurotuberculosis.

Case 3 illustrates the value of shunting for patients with progressive symptomatic hydrocephalus. A ventriculoperitoneal shunt does not apparently lead to dissemination of TB even in the active stage of infection as long as appropriate chemotherapy is administered concurrently.[12]

There is debate about the duration and content of antimicrobial therapy.[2,5,6,8,13] Because penetration of rifampicin through uninflamed meninges is poor, we recommend continuing treatment with pyrazinamide for the full course. Our patients received treatment for 12-24 months, given as directly observed therapy. In two cases there remain small foci of contrast enhancement after 12 and 24 months of treatment, but the significance of these persisting radiological abnormalities is unclear.

All but one of our patients deteriorated clinically after starting therapy. In Cases 1, 3 and 5, this was associated with a radiologically documented increase in size of the existing lesions or development of new lesions. Case 2 only became symptomatic from his cranial lesion three months after starting antituberculous treatment. The phenomenon of

paradoxical progression is recognised but is considered rare.[2-5,11,13,14] Paradoxical enlargement of lesions usually occurs in the first three months of treatment but has occurred in some cases up to nine months after commencing therapy.[2] The paradoxical response may represent a delayed hypersensitivity reaction to proteins released from dying mycobacteria.[3,4,11] It does not appear to be due to treatment failure, and in keeping with this, cultures in our patients were negative while the lesions were enlarging. We advocate a non-surgical approach for as long as possible, with surgery being considered only for relief of symptomatic hydrocephalus or dangerous mass effect.

Case reports suggest that patients with paradoxical progression show clinical and radiological improvement with systemic steroids.[2-4] A partial response to steroids was seen in Case 3, but there was little demonstrable effect in Case 1. All of our patients received systemic corticosteroids when commencing treatment. Their use clearly did not prevent paradoxical enlargement of lesions, although it is possible that they may have attenuated enlargement. Our experience has taught us that when reducing or stopping steroids, the patient should be observed very closely and there should be a low threshold for their reintroduction.

Tuberculosis should be on the differential diagnosis list in patients with destructive vertebral body disease. Failure to consider TB led to a delay in diagnosis in Case 5. A full discussion of the management of spinal TB is not possible here, but antituberculous drugs are the mainstay and surgery may be indicated for neurological deficit due to spinal cord compression or spinal instability.[15]

Management of these patients can be lengthy and complex. Close co-operation is required between a physician experienced in the management of TB and the neurosurgeon throughout the illness. Excellent recovery is possible even for patients who become moribund, and strenuous therapeutic efforts should be unrelenting.

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1. Bergin PS, Haas LF, Miller DH. Tuberculous meningitis at Wellington Hospital 1962-88. NZ Med J 1989; 102:554-6.
2. Afghani B, Lieberman JM. Paradoxical enlargement or development of intracranial tuberculomas during therapy: case report and review. Clin Infect Dis 1994; 19:1092-9.
3. Hejazi N, Hassler W. Multiple intracranial tuberculomas with atypical response to tuberculostatic chemotherapy. Acta Neurochir 1997;139:194-202.
4. Kumar R. Atypical response to chemotherapy in neurotuberculosis. Br J Neurosurg 1998; 12: 344-8.
5. Garcia-Monko JC. Central nervous system tuberculosis. Neurol Clin 1999; 17: 737-59.
6. Choudhury AR. Non-surgical treatment of tuberculomas of the brain. Br J Neurosurg 1989; 3: 643-53.
7. Al-Mefty O. Intracranial tuberculoma. J Neurosurg 1986; 65:572.
8. Gropper MR, Schulder M, Sharan AD et al. Central nervous system tuberculosis: medical management and surgical indications. Surg Neurol 1995; 44: 378-85.
9. Rajshekhar V, Chandy MJ. CT-guided stereotactic surgery in the management of intracranial tuberculomas. Br J Neurosurg 1993; 7: 665-71.
10. Mohanty A, Santosh V, Anandh B, et al. Diagnostic efficacy of stereotactic biopsies in intracranial tuberculomas. Surg Neurol 1999; 52: 252-8.
11. Teoh R, Humphries MJ, O'Mahony G. Symptomatic intracranial tuberculoma developing during treatment of tuberculosis: a report of 10 patients and review of the literature. Q J Med 1987; 63: 449-60.
12. Murray HW, Brandstetter RD, Lavyne MH. Ventriculoatrial shunting for hydrocephalus complicating tuberculous meningitis. Am J Med 1981; 70: 895-8.
13. Awada A, Daif AK, Pirani M et al. Evolution of brain tuberculomas under standard antituberculous treatment. J Neurol Sci 1998; 156: 47-52.
14. Lees AJ, Marshal J, Macleod AF. Cerebral tuberculomas developing during treatment of tuberculous meningitis. Lancet 1980; I: 1208-11.
15. Hayes AJ, Choksey M, Barnes N, Sparrow OCE. Spinal tuberculosis in developed countries: difficulties in diagnosis. JR Coll Surg Edin 1996; 41: 192-6.

The use of the Hospital Anxiety and Depression Scale (HADS) in patients with chronic obstructive pulmonary disease: a pilot study

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Abstract

Aims. To investigate the use of the Hospital Anxiety and Depression Scale (HADS) with recuperating chronic obstructive pulmonary disease (COPD) patients. To study prevalence rates and changes in clinically relevant anxiety and depression during rehabilitation.

Methods. Consecutive patients admitted to a non acute respiratory ward over a twelve week period were asked to complete a HADS questionnaire on three occasions. Nurses recorded basic demographic information on admission. Additional demographic, medical and psychiatric data were obtained by retrospective review of medical records.

Results. Of 93 consecutive inpatients, 79 (85%) completed the admission HADS. 72 patients were eligible to complete the day three HADS and 60 the discharge HADS. Clinically relevant anxiety (HADS score of ≥8) was indicated in 39 patients (50%) and depression in 22 (28%). HADS anxiety (p=0.05) and total scores (anxiety+depression) (p=0.03) decreased between admission and discharge. A larger proportion of patients scored within the normal or mild psychopathology range by discharge. More severe COPD (FEV_1% predicted) correlated with higher HADS anxiety scores (r=-0.39, p<0.001) and HADS depression scores (r=-0.34, p<0.005). Patients with a recorded history of anxiety (p<0.0001) and depression (p<0.02) had higher HADS scores. Females (n=37) when compared to males (n=42), recorded significantly higher HADS anxiety scores throughout (p<0.005).

Conclusions. Clinically relevant anxiety, indicated by higher HADS scores, was more common in patients with severe COPD, a past history of anxiety or depression and females. Anxiety and total mood improved during inpatient rehabilitation. The use of this instrument with New Zealand COPD patients may improve identification and treatment of anxious and depressed patients.

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Chronic obstructive pulmonary disease (COPD) is a slowly progressive lung disorder characterised by airflow obstruction.[1] In New Zealand hospitals, patients with COPD are the third largest group of respiratory inpatients and have the longest stay.[2]

Anxiety and depression may be overrepresented in COPD, but their true prevalence remains uncertain with few methodologically sound studies.[3] Both anxiety and depression have been associated with early withdrawal from COPD pulmonary rehabilitation programmes.[4-7] There is now strong evidence that pulmonary rehabilitation improves general functioning and reduces dyspnoea in moderate to severe COPD.[8,9] Commencing rehabilitation during the inpatient period may improve patient attendance and provide an opportunity to monitor mood. Attending rehabilitation may improve mood by enhancing self sufficiency and offering social support in daily activities.[8,10,11]

The Cardio-Respiratory Rehabilitation Ward based at Burwood Hospital in Christchurch, is a non-acute respiratory and cardiac facility. The Ward's multidisciplinary team focus on assessment and education in self management skills as patients recuperate. Patient assessments are recorded in the general medical files. During 1999 there were 235 patients admitted with a diagnosis of COPD. Patients were transferred from the acute hospital, when they were considered medically stable, responding to treatment and able to mobilize with one assistant.

With indications that rehabilitation may alter mood, this study aimed to investigate the use of the Hospital Anxiety and Depression Scale (HADS) with recuperating COPD patients and to study prevalence rates and changes in clinically relevant anxiety and depression during rehabilitation.

Methods

Procedure. This study was conducted in two parts. Consecutive patients admitted to the Cardio-Respiratory Rehabilitation Ward during a twelve week period in 1999 were asked to complete the HADS within six hours of admission. Nurses then recorded basic demographic information. Inpatients who had completed the admission HADS completed another HADS at day three and discharge. Further demographic, medical and psychiatric information was obtained by general medical file review. Psychiatric history (anxiety, depression and alcohol dependence) was obtained by reviewing yes/no questions about these disorders in the multidisciplinary assessment. The principle physicians in the study team determined operational definitions for the recorded medical information. The local Ethics Committee confirmed that as an audit no formal approval process was required.

Measure of Anxiety and Depression. The HADS is a fourteen item self report instrument for detecting and classifying severity of anxiety and depression in medical populations.[12] The measure was selected because it is short, sensitive, designed for repeated measures and is well validated in elderly, unwell populations.[13] Both HADS anxiety and depression scales have seven items and a scoring range of 0-21. Higher scores indicate more severe symptomatology. The authors of the HADS recommend a cut-off score of ≥ 8 for both scales to include all possible cases.[12]

Statistical Analysis. Data were entered and analysed using SPSS version 10. Comparisons were made using Student t-tests, repeated measures ANOVA, Chi- squared tests and Pearsons correlation coefficients.

Results

93 patients with COPD were admitted to the Cardio-Respiratory Rehabilitation Ward during the pilot project. Eight patients refused to complete the HADS and six were considered too unwell. 79 patients (85%) completed the HADS within six hours of admission. 72 patients were eligible to complete the day three HADS and 60 the discharge HADS. Only two of those who completed the admission HADS refused to complete subsequent HADS.

Patient characteristics. Table 1 shows patient admission characteristics for those with HADS scores above and below the defined cut off. 53% of this sample was male and 83% were retired. 42% were married and 39% lived alone. Chronic oral corticosteroid use (at least 5 mg daily for ≥ 3 months) was recorded in 35% of the sample. Fifteen percent (n=12) were taking benzodiazepines on admission. Oxazepam (n=4) and temazepam (n=3) were most frequently prescribed. Nine percent were on a tricyclic antidepressant and 5% were taking a selective seretonin re-uptake inhibitor. There were no significant differences between those taking and not taking psychotropic medications and HADS scores. Outpatient baseline lung function (recorded previous twelve months) indicated that 55% were in severe (FEV_1% <40), 23% in moderate (FEV_1% 40-59) and 22% in mild (FEV_1% 60-80) (British Thoracic Society) categories for COPD.[1] The mean PaO_2 was 66.7 mmHg and $PaCO_2$ was 41.6 mmHg.

Prevalence of anxiety and depression. 39 (50%) patients scored above the defined cutoff range (≥8) on the HADS anxiety scale and 22 (28%) on the HADS depression scale.

Characteristics associated with higher HAD scores. FEV_1% predicted both HADS anxiety scores ($r=-0.39$, $p<0.001$) and HADS depression scores ($r=-0.34$, $p<0.005$). Patients with more severe disease were more likely to have higher HADS scores.

There were significant differences in the HADS anxiety scores between those with and without a recorded history of anxiety (mean 10.0 yes vs 6.17 no, p=0.0001) or a history of depression (mean 9.63 yes vs 7.23 no, p=0.02). For HADS depression scores significant differences were found for those with a history of anxiety compared to those without (mean 6.44 yes vs 4.89 no, p=0.03). Females had significantly higher HADS anxiety scores (mean 9.16 admission, 9.15 day 3, 8.87 discharge) when compared to males (mean 6.81 admission, 6.58 day 3, 6.03 discharge) throughout admission (p=0.005). There were no significant differences between males and females in disease or demographic characteristics.

Mood changes during the rehabilitation period. Anxiety scores (p=0.05) and total scores (HADS anxiety+depression) (p=0.03) decreased between admission and discharge. HADS depression scores decreased however this difference did not reach statistical significance. The proportion of those scoring within the normal range for anxiety increased and those scoring in the severe range decreased from admission to discharge. For depression scores there was a decrease in those who scored within the moderate and severe range from admission to discharge.

Discussion

This study of 79 inpatients with COPD indicates that most were able and willing to complete the HADS which supports its clinical utility in this group of hospital patients. High rates of clinically relevant anxiety (50%) and depression (28%) were found.

Consistent with other research this study found that those with more severe disease and those with a previous psychiatric history had significantly higher HADS scores.[14-18] No other studies have found sustained higher levels of anxiety in female COPD patients. Our study demonstrated a statistically significant improvement in anxiety and total HADS scores during admission. There was an increase in those scoring within the normal range and decrease in severity levels for both anxiety and depression HADS scores.

This study is limited by the absence of a control group. However, it has provided some insights into those at risk of pathological anxiety and depression during admission with a rehabilitation focus. Recent studies indicate that anxiety and depression may be both underdiagnosed and undertreated in patients with COPD.[7] In our study fewer patients were

Table 1. Patient characteristics of HADS scores (n=79).

Variable	Total Population (n=79)	HADS Anx Scores		HADS Dep Scores	
		≤7 normal	≥8-21 anxiety	≤7 normal	≥8-21 depression
Age (years)	69.2 (8.9)	70.5 (8.7)	67.7 (9.1)	69.3 (9.6)	68.8 (7.3)
Total Hosp Stay (days)	12.3 (5.5)	13.2 (6.2)	11.4 (4.6)	13.1 (5.8)	10.4 (4.1)
Burwood Stay (days)	7.4 (4.1)	8.0 (4.5)	6.9 (3.4)	7.6 (4.2)	6.9 (3.6)
FEV1 (%predicted)*	43.2 (16.3)	46.7 (17.1)	39.5 (14.8)	45.7 (15.9)	37.1 (15.9)‡
Pack Years	37.2 (25.8)	36.1 (27.8)	38.2 (23.8)	35.2 (26.2)	42.3 (24.4)
Current Alcohol Use†	4.82 (8.6)	5.8 (9.8)	3.8 (7.1)	5.7 (9.6)	2.3 (3.8)

Values are means (SD). *Data from previous 12 months (most recent result). †Standard drinks per week (ALAC guidelines). ‡p=0.05.

taking anxiolytics (15%) and antidepressants (14%) when compared with possible anxiety (50%) and depression (28%) cases. The potential efficacy of non pharmacological treatments such as cognitive behavioural therapies for these disorders need further investigation.[19]

Table 2. Proportion of HADS severity classifications during inpatient stay.

HADS Scale	Admission	Day 3	Discharge
HADS Anxiety			
Normal	50.6	44.4	60.0
Mild	26.6	30.6	18.3
Moderate	15.2	20.8	18.3
Severe	7.6	4.2	3.3
HADS Depression			
Normal	72.2	65.3	76.7
Mild	21.5	29.2	23.3
Moderate	5.1	5.6	-
Severe	1.3	-	-

Values are percentages.

In conclusion, this study has shown that the HADS is a suitable questionnaire for use with New Zealand COPD inpatients. The use of the HADS may expedite identification and treatment of anxiety and depression for those on a rehabilitation programme. Health professionals should have a high index of suspicion for anxiety and depression in COPD patients with more severe disease, a past psychiatric history and in females.

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1. BTS Guidelines for the management of COPD. Thorax 1997; 52: S3-25.
2. New Zealand Health Information Service. http://www.nzhis.govt.nz
3. van Ede L, Yzermans C, Brouwer H. Prevalence of depression in patients with chronic obstructive pulmonary disease: a systematic review. Thorax 1999; 54: 688-92.
4. Wingate BJ, Hansen-Flaschen J. Anxiety and depression in advanced lung disease. Clin Chest Med 1997; 18: 495-505.
5. Lacasse Y, Goldstein RS, Guyatt GH. Respiratory rehabilitation in chronic obstructive pulmonary disease: summary of a systematic overview of the literature. Rev Clin Geron 1997; 7: 327-47.
6. Celli BR. Pulmonary rehabilitation for patients with advanced lung disease. Clin Chest Med 1997;18: 521-34.
7. Seung Kim HF, Kunik ME, Molinari VA et al. Functional impairment in COPD patients: the impact of anxiety and depression. Psychosom 2000; 41: 465-71.
8. Tier BL. Disease management of COPD with pulmonary rehabilitation. Chest 1997; 112: 1630-56.
9. Calverley P, Bellamy D. The challenge of providing better care for patients with chronic obstructive pulmonary disease: the poor relation of airways obstruction. Thorax 2000; 55: 78-82.
10. De-Coverley Vealem DM. Exercise and mental health. Acta Psychiatr Scand 1987; 76: 113-20.
11. Emery CF, Schein RL, Hauck ER et al. Psychological and cognitive outcomes of a randomized trial of exercise among patients with chronic obstructive pulmonary disease. Health Psychol 1998; 17: 232-40.
12. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatr Scand 1983; 67: 361-70.
13. Herrman C. International experiences with the Hospital Anxiety and Depression Scale- a review of validation data and clinical results. J Psychosom Res 1997; 42: 17-41.
14. Herrmann C, Brand-Driehorst S, Kaminsky B et al. Diagnostic groups and depressed mood as predictors of 22-month mortality in medical inpatients. Psychosom Med 1998; 60: 570-7.
15. Yellowlees PM, Aplers JH, Bowden JJ et al. Psychiatric morbidity in patients with chronic airflow obstruction. Med J Aust 1989; 147: 349-57.
16. Smoller JW, Pollack MH, Otto MW et al. Panic, anxiety, dyspnea and respiratory disease. Am J Resp Crit Care Med 1996; 154: 6-17.
17. Coyne JC, Pepper CM, Flynn H. Significance of prior episodes of depression in two patients populations. J Consult Clin Psych 1999; 67: 76-81.
18. Toshima MT, Kaplan RM, Ries AL. Experimental evaluation of rehabilitation in chronic obstructive pulmonary disease. Health Psychol 1990; 9: 237-52.
19. Telch MJ, Schmidt NB, LaNae T et al. Impact of cognitive-behavioural treatment on quality of life in panic disorder patients. J Consult Clin Psychol 1995; 63: 823-30.

Antismoking drug comes under scrutiny after deaths

The manufacturer of the antismoking drug amfebutamone (Zyban), GlaxoSmithKline, has insisted that no evidence exists of an increased risk of death with its use, after 18 deaths were linked with suspected adverse drug reactions. The Medicines Control Agency said that the contribution of amfebutamone to the deaths is unknown.

"It should be noted that patients may be required to stop smoking because of underlying diseases and these may well explain some of the reported deaths in patients taking Zyban," said a spokeswoman for the agency.

She added, "It is important to note that suspected reactions are not necessarily caused by the drug and may relate to other factors such as nicotine withdrawal, other illnesses, or other medicines taken concurrently."

Latest figures show that in addition to the 18 deaths there have been 3457 cases of adverse reactions. Most of these are minor-the most common being dry mouth, headache, and insomnia – but there have also been some involving seizures. About 270 000 patients in the United Kingdom have been prescribed the drug, and amfebutamone has been used by 22 million people worldwide.

The drug is described by GlaxoSmithKline as the first non-nicotine pharmacological treatment licensed for smoking cessation.

"It is important to note that suspected reports are not necessarily caused by the drug and may relate to other factors such as other illnesses, other medicines or more importantly smoking itself," said a spokeswoman for GlaxoSmithKline. "There is no evidence of an increased risk of death associated with the use of this medicine. It is, however, well documented that 1 in 4 smokers will die in middle age from a smoking related disease."

Roger Dobson. BMJ 2001; 322: 452.

Brain drain or OE? Characteristics of young New Zealanders who leave

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Abstract

Aims. To characterise the emigration patterns of young New Zealanders.

Methods. The 980 members of the Dunedin Multidisciplinary Health and Development Study participating in the "age-26" (1998-1999) assessment provided information about emigration behaviour, qualifications, aspects of physical and mental health and personality.

Results. 26% of the sample had moved overseas to live between the ages of 18 and 26, with the United Kingdom and Australia being the most common destinations. Compared to non-emigrants, emigrants had higher IQ scores, were better qualified, leaner and fitter, and had happier and less stress-prone personalities. Based on their planned return date, 63% of emigrants were considered to be on their OE overseas experience (OE, return in <5 years), 18% were defined as brain-drain emigrants (return in >5 years or never) and 18% were uncertain about their return. Brain-drain emigrants were more likely than OE emigrants to leave for better work opportunities, and they were also more likely to go to Australia. However, there were no differences in terms of qualifications, intelligence and personality between OE and brain-drain emigrants.

Conclusions. Most young New Zealanders in this cohort who left for overseas were embarking on their OE. Brain-drain emigrants make up a sizeable minority of emigrants, but appear to possess no more skills than those who plan or choose to return.

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There has been recent concern in New Zealand about the large-scale emigration of young, skilled New Zealanders.[1-4] This phenomenon has been dubbed the 'brain drain,' a term which connotes that intelligent and skilled New Zealanders who travel overseas do not return. The brain drain is viewed negatively for a number of reasons. These include concerns about the investment in the education of young New Zealanders being wasted when they move permanently overseas, and more specifically, that those most capable of contributing to New Zealand's economy are taking their talents elsewhere. Additionally, some fear that New Zealand's 'health' may be adversely affected because health professionals and health researchers appear to be over-represented among those leaving.[5-8]

In contrast, the long-standing New Zealand tradition of the 'overseas experience,' (OE), during which young New Zealanders spend a year or more working and travelling overseas before returning home, tends to be viewed positively. Individuals on their OE may gain experience and skills which help both them and New Zealand.[9-11] They may gain knowledge of other countries which helps to establish business links with those countries. They may also gain an appreciation of New Zealand's qualities as compared to other parts of the world. There is also evidence that OE can hasten personality maturation and enhance coping skills.[12]

There is very little empirical research into the emigration patterns of young New Zealanders. This study sought to fill the void. Specifically, we examined what distinguished (a) those who emigrated from those who did not, and (b) those who plan to stay overseas (brain drain) from those who plan to return (OE), in terms of their qualifications, childhood socio-economic status and intelligence, physical and mental health, and personality.

Methods

Participants were 499 male and 481 female (mean age 26.0 years) members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of the health, development and behaviour of 1037 children born in Dunedin during 1972-73.[13] 96% of the living sample (980/1019) participated in the 'age-26' assessment between March 1998 and July 1999. A small number of Study members failed to complete every assessment module.

Emigration behaviour. We identified those who emigrated between ages 18-26 years (emigrants: n=252, 26% of sample, 55% male) and those who did not (non-emigrants: n=670, 68% of sample, 50% male). We excluded from analyses those Study members who had left New Zealand before age 18 years, most of whom had moved with their parents (n=57, 6% of sample, 39% male). Among emigrants we distinguished three groups based on their stated return plans: those who have already come back or plan to return within five years (OE: n=152, 63% of emigrants, 54% male), those who are uncertain (uncertain: n=44, 18% of emigrants, 64% male), and those who do not plan to return for at least the next five years (brain drain: n=44, 18% of emigrants, 52% male). Emigrants were asked the following questions: "Where is the farthest you've moved to live?", "How old were you when you moved?", "Do you think moving has been a step forward for you, a step backwards, or hasn't made a difference?", and "Tell me if any of these reasons were why you moved overseas?" (response options listed in Table 1).

Qualifications and childhood socio-economic status (SES). At age 26 years, information was obtained about academic and trade qualifications. At earlier assessments, the 6-point Elley & Irving scale[14] was used to assess the SES of the study member's parents. Family SES was measured by averaging parental SES at birth and ages 3, 5, 7, 9, 11, 13 and 15 years, using the higher of the mother's or father's SES at each age. Higher scores on this scale reflect higher family SES.

Intelligence. At ages 7, 9, 11 & 13 years, study members were administered the Wechsler Intelligence Scale for Children (WISC-R[15]). The mean of the pro-rated total scores across these ages was used in analyses.

Physical health. At age 26 years a medical examination was conducted by either a GP or registered nurse and included measures of:

Body mass index (BMI), which was calculated by dividing each individual's weight (kg) by the square of their height (m). Measurements were taken twice in light clothing and stocking feet and the two readings were averaged. *Systolic blood pressure*, which was taken as the first Korotkoff sound (K1) using a Hawksley random-zero sphygmomanometer with a constant deflation valve. An average blood pressure score was calculated from three measures taken five minutes apart, with study members seated with the cuff on their right arm which rested at heart level. *Cardiorespiratory fitness*, was assessed during a 6-minute constant power submaximal exercise test on a friction braked cycle ergometer (Monark, Sweden). After a 2-minute warm-up at 50W during which heart rate response was gauged, the workload was then adjusted to elicit a steady-state heart rate in the range of 130-170 bpm. Study members cycled at this workload for a further 5-6 minutes with their heart rate assessed every minute. Maximal aerobic power (VO_2max) was predicted from the final heart rate, using a modification of the methods originally published by Astrand.[16]

Smoking status. Those who had smoked daily for a month or more in the year prior to the age 26 interview were considered smokers. The remainder were considered non-smokers.

Mental Health. At age 26 years data on mental health were collected in a private interview by using the diagnostic interview schedule,[17] whose procedures have been described elsewhere.[18] Using a reporting period of the past year, we assessed the following disorders according to the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV):[19] anxiety (which included any of social phobia, specific phobia, panic disorder, agoraphobia, generalised anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder), depression (major depressive disorder or dysthymia) and antisocial disorder.

Personality. At age 26 years, study members completed Form New Zealand of the Multidimensional Personality Questionnaire (MPQ)[20,21] which provides, for each person, a profile of scores on ten distinct personality traits: well being, social closeness, social potency, achievement, alienation, stress reaction, aggression, traditionalism, harm avoidance and control.

Statistical Methods. First, we compared emigrants to non-emigrants. Second, we performed comparisons between subgroups of emigrants, defined according to their return plans (OE; uncertain; brain drain). Chi-squared tests were used to compare groups on categorical measures (eg, reasons for leaving, attained tertiary degree) and analyses of variance tests with gender entered as a factor were used to compare groups on continuous measures (eg, personality scales, blood pressure). The statistical package SPSS 10.0 for Windows was used for all data analyses. Effects were considered statistically significant if $p<0.05$. Where a significant difference among emigrant subgroups was found, pairwise comparisons were conducted with Bonferroni adjustment to the alpha level.

Results

Emigration behaviour. 26% of the sample had moved overseas to live between ages 18-26 years. Most who left went either to Australia (90/252, 36%) or the United Kingdom (104/252, 41%). Those who left for Australia were more likely to report that they planned to stay overseas: about one in three of those who left for Australia were brain-drain emigrants compared to one in twenty of those who left for the UK and one in five of those who left for elsewhere ($p<0.001$). Put another way, although Australia only attracted 36% of all emigrants it was the destination of 66% of brain-drain emigrants.

The median age for leaving was 23 years, few (n=35, 14%) left before the age of 21, and a steady stream – 29, 39, 44, 50 and 52 – left at ages 21 through 25, respectively. Only three left at age 26 years. Most emigrants (87%) believed their move had been "a step forward", 12.6% believed it made no difference, and only one emigrant thought it had been "a step backwards".

Reasons for leaving. (Table 1). Almost all emigrants (91%) said they left to gain experience. Other commonly cited reasons were: a better lifestyle (59%), better work opportunities (58%), and to experience a big city (52%). Notably, very few left for low tax rates (7%) or to escape debts (2%). Brain-drain emigrants were more likely than OE emigrants to cite better work opportunities as a reason for leaving ($p<0.001$).

Qualifications, childhood socio-economic status (SES) and intelligence. Emigrants were significantly more likely than non-emigrants to have a tertiary qualification (Table 2). Emigrants also came from more advantaged backgrounds and scored higher on childhood measures of intelligence. There were no differences among emigrant subgroups in terms of their qualifications and childhood intelligence, although brain-drain emigrants had lower childhood SES than OE emigrants ($p<0.05$).

Physical health, smoking and mental health. Emigrants were leaner and fitter than non-emigrants, as indicated by their lower BMI and higher cardiorespiratory fitness (Table 3). A similar number of emigrants and non-emigrants were smokers. Among emigrants, brain-drain emigrants were less fit ($p<0.01$) and about 1.5 times more likely to smoke ($p<0.05$). Brain-drain emigrants were also slightly, though not significantly, more likely to meet DSM-IV diagnostic criteria for anxiety and depressive disorders.

Personality. The personality profiles of emigrants and non-emigrants showed consistent differences (data not shown, table available on request). Emigrants had significantly higher scores on the well-being and social potency personality traits and significantly lower scores on the alienation, stress reaction, aggression, traditionalism, harm avoidance and control personality traits (all $p<0.05$). This indicates emigrants tended to be happier, less stress-prone, less volatile and more thrill-seeking. There were no differences between emigrant subgroups on any personality traits.

Table 1. Reasons for leaving cited by the OE (already returned or plan to return within five years), brain-drain (plan to return within ten years, at retirement or not at all) and uncertain (uncertain about returning) groups. The % citing each reason is reported.

Tell me if any of these reasons were why you moved overseas:	OE (n=144)	Uncertain (n=44)	Brain-drain (n=44)
To gain new experiences, new culture, new language	92.4%	95.5%	81.8%
Better lifestyle, social life, climate	55.6%	56.8%	75.0%
Better work opportunities, better pay, more jobs	48.6%	65.9%	81.8%*
Big city - bright lights	53.5%	54.5%	45.5%
Education opportunities	20.1%	25.0%	36.4%
To get a fresh start from an old relationship or other problems	13.9%	25.0%	25.0%
To be with your spouse/partner	16.7%	9.1%	9.1%
Lower tax rates	6.9%	2.3%	11.4%
Transferred with your job	4.2%	9.1%	4.5%
To escape debts or an illegal past	1.4%	4.5%	2.3%

*emigrant subgroups differ, $p<0.001$.

Discussion

There were marked differences between emigrants and non-emigrants in terms of their skills, health and personality. Emigrants were better qualified, more intelligent and from more advantaged backgrounds; they were leaner and fitter; and they were happier, less stress-prone, less volatile, and more thrill seeking. This suggests that many of New Zealand's talented young adults are going overseas.

However, there were few differences between those who plan to stay overseas (brain-drain emigrants) and those who have returned or plan to return to New Zealand (OE emigrants). Brain- drain emigrants were no better qualified, no more intelligent, nor were they different in terms of their personality profile. They differed mainly in terms of their reasons for leaving, which were more career focussed (i.e., better work opportunities), and in terms of their destination, which tended to be Australia. This suggests that it is not the most talented who choose to stay overseas; the choice to stay overseas seems to be influenced more by the belief that better opportunities exist elsewhere, particularly in Australia. It is interesting, in this context, to note the increasing pay disparity between Australia and New Zealand.[22] This finding is consistent with the popular view of the brain-drain emigrant as someone who leaves New Zealand because it cannot provide them with good work opportunities.

Because of the nature of the sample in this study - a birth cohort of 980 young (26-year-old) New Zealanders – there are a number of issues we cannot address. For instance, we cannot address the claim that small but important sub-populations (eg, doctors, lawyers, scientists) are over-

Table 2. Tertiary qualifications, family socio-economic status (SES) and childhood intelligence scores of non-emigrants, emigrants, and emigrant subgroups.

	Non-emigrants (n=670)	Emigrants (n=252)	Emigrants subgroups OE (n=152)	Uncertain (n=44)	Brain-drain (n=44)
% with tertiary qualification	19.6	30.2*	28.3	36.4	25.0
SES means (SDs)	3.64 (1.10)	4.08 (1.10)†	4.16 (1.08)	3.98 (1.19)	3.64 (0.94)‡
Intelligence means (SDs)	105.5 (14.2)	110.8 (12.3)†	109.9 (11.9)	112.8 (13.0)	109.9 (11.6)

*differs from non-emigrants, p<0.05. †differs from non-emigrants, p<0.01. ‡emigrant subgroups differ, p<0.05.

Table 3. Physical health, mental health and smoking status of non-emigrants, emigrants, and emigrant subgroups.

	Non-emigrants (n=670)	Emigrants (n=252)	Emigrants Subgroups OE (n=152)	Uncertain (n=44)	Brain-drain (n=44)
Physical health measures means (SDs)					
Body mass index (weight[kg]/height[m]^2)	25.5 (4.6)	24.0 (3.3)*	24.0 (3.2)	23.9 (3.3)	23.8 (4.1)
Systolic blood pressure (Hg[mm])	116.6 (11.2)	117.0 (11.1)	117.4 (10.9)	116.6 (12.3)	116.9 (11.4)
Cardiorespiratory fitness (VO_2max./weight[kg])	43.5 (10.7)	46.9 (11.4)*	48.3 (11.8)	46.7 (10.8)	41.2 (8.7)†
Smoking status and mental health disorders					
Daily smoker	40.7%	38.5%	34.9%	38.6%	56.8%†
Anxiety	24.9%	23.8%	21.7%	20.5%	31.8%
Depression	16.2%	17.1%	14.5%	18.2%	27.3%
Antisocial disorder	4.8%	2.0%	1.3%	0%	4.5%

*differs from non-emigrants, p<0.001. †emigrants subgroups differ, p<0.05.

represented amongst those leaving for good,[7,23] nor can we address the claim that brain-drain emigration is on the rise.[3,4,8,24] It is also worth noting that our estimate of the prevalence of emigration may be low since there are likely to be some Study members who have yet to emigrate by age 26 years. Our estimate of brain-drain emigration may also be low, since a sizeable minority of emigrants (18%) were undecided about their return. However, it must be noted in this regard that our threshold for classification as 'brain drain' (ie, does not plan to return in the next five years) was not high, and some of those we classify as brain-drain emigrants may in fact return to New Zealand by their mid-thirties.

Nonetheless, at least 18% of emigrants (ie, 4.5% of 26-year olds in this sample) have left and do not plan to return to New Zealand within five years. While this represents a problem, it is unclear whether this degree of loss is excessive compared to other developed countries.[25] Further, it may be that the skills gained by those who leave and return compensate for the loss of skills of those who leave permanently.[11] However, this is no reason for governments and policy makers to be complacent and assume that most of those currently gaining skills and experience overseas will return for the benefit of New Zealand. Emigration 'peaks' tend to be associated with economic downturns[22] and it is important that those entrusted with the governance of the country ensure that New Zealand remains a place worth returning to.

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1. Ansley G. Brain drain here to stay. The New Zealand Herald 2001 Apr 5; Sect A:6 (col 4).
2. Hoby K. Open-letter ad a Roundtable ploy: minister. The New Zealand Herald 2000 Oct 10; sect A:3 (col 1).
3. Springall L. The brain drain: Are New Zealand's skills going down the gurgler? The Independent (NZ) 2000 May 3: 14-15.
4. Sell B. There's no reason to return say expatriate boffins: more funding needed for research. The New Zealand Herald 1999 Nov 17; Sect A:6 (col 1).
5. Letter from Australia: Thank you New Zealand (Editorial). NZ Med J, 2001; 114: 149.
6. Clausen V. Young doctors' debt 'causing brain drain'. Press release from the Auckland University Medical Association 2001 Jan 9.
7. Williams K. Brain drain sparks health fears. The Dominion 1999 Nov 11; p3 (col 2).
8. Alexander M. Brain drain leaves NZ in scientific lurch. The Sunday Star Times 1998 Jul 26; A:8 (col 1).
9. Venkataraman SV. IT recruitment expert scoffs at the brain drain. The National Business Review 2001 Apr 12; p42 (col 1).
10. McClinchy A. High-flyer refutes Kiwi 'brain drain' claims. The National Business Review 1999 Nov 5; p83 (col 1).
11. Davenport S, Bibby DM. Globalisation and localisation in the knowledge world: the small country as SME. Paper presented to Constructing Tomorrow Conference; 1998 Sep; Bristol, University of the West of England, as cited in Pool I, Honey J. Appendix III: The scientific workforce: Implications for New Zealand's future science infrastructure. Population Centre Discussion Papers 1998; 28: 193-207.
12. Andrews G, Page AC, Neilson MD. Sending your teenagers away – controlled stress decreases neurotic vulnerability. Arch Gen Psychiatry 1993; 50: 585-9.
13. Silva PA, Stanton WR, editors. From child to adult. The Dunedin Multidisciplinary Health and Development Study. Auckland: Oxford University Press; 1996.

14. Elley WB, Irving JC. Revised socio-economic index for New Zealand. NZ J Educ Stud 1976; 11: 25-56.
15. Wechsler D. Manual of the Wechsler Intelligence Scale for children–Revised. New York: Psychological Corp; 1974.
16. Astrand PO. Aerobic work capacity in men and women with special reference to age. Acta Physiol Scand 1960; 49: 2-92.
17. Robins LN, Cottler L, Bucholz K, Compton W. Diagnostic Interview Schedule for DSM-IV. St Louis MO: Washington University; 1995.
18. Newman DL, Moffitt TE, Caspi A et al. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. J Consult Clin Psychol 1996; 64: 552-62.
19. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed). Washington, DC: American Psychiatric Association; 1994.
20. Tellegen A, Waller NG. Exploring personality through test construction: development of the Multidimensional Personality Questionnaire. In: Briggs SR, Cheek JM, editors. Personality measures: development and evaluation. Vol 1. Greenwich, CT: JAI Press. In Press.
21. Krueger R, Caspi A, Moffitt TE. Epidemiological personology: the unifying role of personality in population-based research on problem behaviors. J Personality 2000; 68: 967-98.
22. Heeringa V. Pain means drain: economic downturn may be driving a brain drain. Unlimited 1999 Jun; 28-9.
23. Read E. Bold incentives to halt brain drain. The New Zealand Herald 2001 Mar 16; Sect C:7 (col 1).
24. Pool I, Honey J. Appendix III: The scientific workforce: implications for New Zealand's future science infrastructure. Population Centre Discussion Papers 1998; 28: 193-207.
25. Iqbal M. Brain drain: empirical evidence of emigration of Canadian professionals to the United States. Can Tax J 2000; 48: 674-88.

MEDICOLEGAL DIARY

The duty to report patients who are unfit to drive

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Practitioners have an obligation under section 18 of the Land Transport Act 1998, to take action when they attend a patient who is unfit to drive a motor vehicle. Where a practitioner considers that the mental or physical condition of a patient who holds a driver's licence is such that, in the interests of public safety, he should either not be permitted to drive, or the licence should be subject to limitations, and that the licence holder is likely to drive, then the doctor must give written notice of his opinion to the Director of Land Transport Safety. The notice must state the grounds on which the practitioner's opinion is based. Examples of the type of conditions that may affect a patient's fitness to drive include alcoholism, stress and epilepsy.

Once the assessment has been made that the patient is unfit to drive, the practitioner has no choice but to take action. Whilst there is no specific penalty imposed by the Act for failing to comply with this obligation, a practitioner who fails to notify the Director when he should have done so, is in breach of a statutory duty and leaves himself open to criticism. In serious cases, disciplinary action may follow. An example may be where a practitioner failed to give notice in respect of a patient who was clearly unfit to drive, and who caused death or serious injury to a third party. The doctor's failure to notify may well be considered conduct below an acceptable standard. Whilst personal injury caused by an unfit driver would likely be covered by accident compensation, there is potential for a practitioner to be held liable in negligence, to a third party, for failing to give notice regarding the unfit patient who caused damage to the third party's property.

There is anecdotal evidence that practitioners have refused to provide details of unfit drivers to the Land Transport Safety Authority, citing the Privacy Act. The Privacy Act (and the Health Information Privacy Code) does not allow a practitioner to refrain from complying with his statutory duty under section 18 of the Land Transport Act. Rule 11 (2) (d) of the Health Information Privacy Code allows a practitioner to disclose a patient's health information without the patient's consent, where it is neither desirable nor practicable to obtain the patient's authorisation, and where the disclosure of the information is necessary to prevent or lessen a serious and imminent threat to public safety, or the life or health of the patient or any other person.

Whilst the practitioner's obligation to disclose information under section 18 of the Land Transport Act is restricted to giving notice to the Director of Land Transport Safety, the discretion to disclose under rule 11 (2) (d) of the Code is much wider. Thus, for example, a practitioner who is concerned that a patient's heart condition is sufficiently serious that driving passenger vehicles would be hazardous, may be justified in informing the patient's employer, as well as the Land Transport Safety Authority, if he has been unable to persuade the patient not to drive. What the practitioner would not be entitled to do (as was done in one case[1]), would be to go public with his or her concerns, and initiate a petition in an attempt to prevent the patient from driving.

All practitioners should be aware of their obligation under section 18 of the Land Transport Act. However, general practitioners in particular, should be open to the possibility that their patients may be unfit to drive, and that such a finding places a positive duty on them to take action.

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1. Duncan v Medical Practitioners Disciplinary Committee 1986 NZLR 513.

Great excavations

The body of a medieval boy, recovered from a graveyard in London's East End, is likely to finally prove that venereal syphilis existed in Europe before the return of Columbus from the New World in 1493 – disproving the legend that his crew was responsible for introducing it to the continent.

This is a small part of the mass of knowledge of public health and medical treatment in the Middle Ages arising from the world's largest medical archeological exhumation from the period. A team of specialists from the Museum of London is now completing the recovery of the last of around 10 000 skeletons from a medieval graveyard beneath the cellars of Spitalfield market in London's East End, before it is demolished and the site redeveloped.

The skeleton of the boy, who was around 10 years old when he died of syphilis, is of particular interest because of the advancement of the tertiary stage of the disease. The skull is covered with the characteristic lesions, with complete destruction of the nose area and emergence of secondary dentition at 45 degrees to the normal.

The investigators are certain that the child must have been infected in the womb with the venereal syphilis form of treponematosis. Osteoarchaeologist Brian Connell explained: "The three forms of treponematosis that affect bone tissue are very difficult to separate in terms of bone lesions. The reason this [archeological find] is important is that of the three syndromes that affect bone, it is only venereal syphilis that has a congenital expression."

Nigel Glass. Lancet 2001; 357: 643.

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Experiences of Maori youth in the mental health system: a qualitative analysis. Kirsten Anderson, Nicola Brown, Kate Young.Department of Psychological Medicine, Dunedin Medical School, University of Otago, and Youth Specialty Services, Healthcare Otago.

This study aimed to examine the experiences of Maori youth in the Mental Health Service (MHS), focusing particularly on the care delivered by Youth Specialty Services (YSS) Dunedin.

A semi-structured interview was used to record the experiences of thirteen young Maori patients, randomly selected from a patient list at YSS. The definition of Maori was self-reported ethnicity. Interviews lasted 30 minutes and covered first impressions, feelings about treatment, confidentiality, day programme, interactions with friends, family and the wider MHS and ideas about the importance of being Maori with regard to mental health. Each interview was taped and transcripts were analysed using thematic analysis, particularly immersion/crystallization analysis, to identify emerging themes.

Of the thirteen interviewees, 12 were female and one was male. Ages ranged from 14 to 20 years. Eight participants were initially frightened about attending YSS, and the majority thought the questions were personal, probing and difficult to answer. However, follow-up interviews were generally described as positive:

"They didn't judge, just the whole feeling was just comfortable enough; of course, naturally it isn't going to be [comfortable], spilling your beans, but it was ok, they made you feel welcome and like there's nothing wrong with you and you're not inhuman."

The three people attending day program found it beneficial. Family and friends tended to be supportive of young people attending YSS:

"Like if I was to say I was coming here, they wouldn't turn around and go "oh you need help" or any [thing] like that... they'd be like, uh, what do you do there? They were being nosy about it, rather than putting it down."

However, experiences in the wider MHS were frequently described as difficult, particularly in emergency situations. Participants had difficulty responding to questions on how being Maori had altered their views of mental health and treatment. Participants spoke about how they thought the public viewed mental health and some made suggestions for raising mental health awareness.

This summer student project identified positive aspects of YSS, and discussed suggestions for improvements. Further discussion points, included: under-representation of young males in the study, participants' difficulties in articulating cultural influences on their mental health and care, and assumptions related to the ethnicity of patients.

Liposomes as delivery vehicles for antigens to dendritic cells: assessment by confocal microscopy. Rhiannon Braund, Melissa Copland, Margaret Baird, Thomas Rades, Nigel Davies. School of Pharmacy, and Department of Microbiology, Otago School of Medical Sciences, University of Otago.

Dendritic cells (DC) are important initiators of an immune response and this function can be utilised to produce an immunotherapeutic response to a specific antigen. Dendritic cells are showing promise in tumour immunotherapy but their potential role is currently hindered by poor antigen delivery to these cells. The use of antigen solutions for priming of dendritic cells usually results in a poor response whereas antigen presented in a particulate form is likely to be more effective. The presence of lectin-like receptors on the cell surface facilitates the binding and endocytosis of ligands with a terminal sugar. Antigen taken up via these sugar receptors appears to be more effectively presented in comparison to non-receptor mediated endocytosis. We have shown that, employing liposomes containing a trimannose-conjugated phospholipid, antigen delivered within mannosylated liposomes results in enhanced maturation of DC and subsequent T-cell stimulation. In the current study we used laser scanning confocal microscopy (LSCM) to visualise uptake of various liposome formulations by cultured human monocyte-derived DC.

Phosphatidylcholine liposomes containing fluorescently labelled ovalbumin (FITC-OVA) were prepared by hydration of phospholipid films followed by high-pressure extrusion through 800 nm membranes. Mannosylated liposomes were prepared as above, with the replacement of 20% of phosphatidylcholine with trimannose-conjugated dipalmitoylphosphatidyl-ethanolamine. Liposomes with a positive or negative charge were prepared by replacement of 4% of phosphatidylcholine with stearylamine or phosphatidylserine respectively. Human monocyte-derived DC were incubated with the liposome formulations for 2 hours after which excess formulation was removed by washing. The FITC-OVA liposome exposed cell suspension was dropped onto a poly-L-lysine coated coverslip and cells allowed to adhere for 20 min at 37ºC. The cells were then fixed in 3% paraformaldehyde for 15 min and washed prior to the addition of phytoerythrin conjugated MHC-II antibody. Following incubation, the coverslips were washed and mounted on microscopy slides. The slides were analysed using a Biorad laser scanning confocal microscope.

Analysis showed that fluorescence following incubation with negative, neutral or mannosylated liposomes, was a result of internalisation of the liposome formulation. Mannosylated liposomes were taken up and internalised to a greater degree than neutral or negatively charged formulations. Exposure of monocyte-derived DC to positively charged liposomes resulted in high cell-associated fluorescence but this appeared to be due to charge-mediated adherence of the vesicles to the cell surface. This study demonstrates that liposomes containing mannosylated phospholipid may be useful for the delivery of antigen to DC.

Once-a-week versus daily folic acid supplementation: effects on red blood cell folate concentrations in women of child-bearing age. Brooke Briars, Murray Skeaff, Charlotte Adank, C Tim Green, Department of Human Nutrition, University of Otago.

This study aimed to determine whether a once-a-week folic acid supplement is an effective alternative to a daily folic acid supplement at increasing red blood cell (RBC) folate concentrations in women of child-bearing age to above 905 nmol/L. A RBC folate concentration above 905 nmol/L is associated with the lowest risk of having a child with a neural tube defect.

Non-pregnant women with RBC folate concentrations between 300-905 nmol/L were recruited from the Dunedin public. 138 women were randomised to take either a daily 400 mg folic acid supplement, a once-a-week 2800 µg supplement, or a daily placebo for 12 weeks. Blood samples were collected at baseline, and at weeks 6 and 12 of the trial. RBC folate concentrations were measured using a microbiological assay, in which the microorganism, *Lactobacillus casei*, grows in proportion to the folate concentration in a blood sample. Compliance was measured by weighing the placebo and daily folic acid pills at each clinic visit and by counting the weekly pills.

108 women completed the trial with 97% compliance to the treatments. RBC folate concentrations did not change in the placebo group, but increased in a linear manner without reaching a plateau in each of the supplement groups. The mean (95% CI) RBC folate concentration at baseline was 625 nmol/L (594-658). At week 12 RBC folate concentrations had increased by 60% (47 to 75) to 1053 nmol/L in the daily supplement group and by 39% (28 to 52) to 913 nmol/L in the weekly supplement group relative to the placebo group. At week 12 the percentage of women achieving RBC folate concentrations above 905 nmol/L was 74% and 51% in the daily and weekly supplement groups respectively.

Once-a-week folic acid supplement can increase RBC folate to concentrations associated with a greatly reduced risk of having a neural tube defect affected pregnancy. It is possible that a once-a-week supplement, when taken for longer than 12 weeks, will increase the RBC folate concentrations above 905 nmol/L of all women of child-bearing age.

Understanding the protein interactions involved in lipoprotein(a) formation. EE Caygill, CYY Liu, RJ Sharp, M Byers, SPA McCormick. Department of Biochemistry, Otago School of Medical Sciences, University of Otago.

A major independent risk factor for developing atherosclerosis is high blood levels of the cholesterol-rich plasma lipoprotein, lipoprotein(a) [Lp(a)]. Lp(a) is formed when apolipoprotein(a) [apo(a)] becomes covalently bound by disulphide linkage to the apolipoprotein B (apoB) of a low density lipoprotein (LDL). Mutagenesis studies have shown that the apoB residue Cys-4326 is essential for this covalent interaction. However, a mutant apoB, lacking this residue still has the ability to non-covalently interact with apo(a). These studies have lead to the suggestion of a two-step model of Lp(a) formation, in which initial non-covalent interactions between apo(a) and apoB precede the formation of the disulphide bond. The residues responsible for these non-covalent interactions are yet to be characterised.

Analysis of the ability of two truncated forms of human apoB, apoB95 and apoB97, to Lp(a) has lead to the identification of a C-terminal sequence, amino acids 4331 - 4397, that is important in Lp(a) formation. However, mutagenesis of key residues in this area is not sufficient to prevent Lp(a) assembly, indicating that other apoB sequences are also involved in the initial non-covalent interactions of Lp(a) formation. To identify additional sequences involved in the non-covalent binding of apo(a) we analysed the ability of a new form of truncated human apoB protein, apoB90, to bind apo(a).

To determine if apoB90 could interact with apo(a) in plasma, we isolated plasma lipoproteins from apo(a)/B90 double transgenic mice by fast protein liquid chromatography. The lipoprotein containing fractions were analysed for apo(a) and apoB content by western blotting to determine the distribution of both proteins. Western blots showed apoB90 to be concentrated in the LDL containing fractions as expected. The apo(a) was also concentrated in the LDL containing fractions. Since free apo(a) is normally found in the high density lipoprotein (HDL) containing fractions our results suggest that the apoB90 is interacting with the apo(a).

We also investigated the ability of the apoB90 to compete with wild type apoB100 for binding to apo(a) in a competition assay. Increasing amounts of purified apoB90 were incubated with apo(a) and apoB100 plasma samples and were shown to inhibit the formation of Lp(a) and increase the levels of free apo(a) in the assay suggesting that apoB90 was binding to apo(a), therefore supporting our previous results.

These experiments have demonstrated that a secondary site of non-covalent interaction between apo(a) and apoB exists in the N-terminal 90% of the human apoB protein. Identification of the existence of this secondary site adds to the complexity of the non-covalent interactions between apo(a) and apoB that facilitate formation of Lp(a). Further studies will be required to identify its exact location within apoB.

Subcloning of a molecular chaperone from Mycobacterium tuberculosis. R Davis, S Clark, Department of Biochemistry, Otago School of Medical Sciences, University of Otago.

Mycobacterium tuberculosis trigger factor (TF) is a molecular chaperone. Chaperones are essential in protecting newly synthesised and unfolded proteins from inappropriate interactions. However, the mechanism by which TF works in vivo is still largely unknown. The aim of this project was to subclone the M tuberculosis TF gene into a plasmid for use in an in vivo assay of TF function.

The *M tuberculosis* TF gene was amplified by PCR, producing a DNA fragment of approximately 1.4 kb. This size corresponded to the known length of the *M tuberculosis* TF sequence. The PCR product was then ligated into an inducible bacterial expression plasmid (pET21d), and transformed into the Escherichia coli strain DH5α. Automated DNA sequencing of the ligated plasmid confirmed that the inserted DNA encoded the *M tuberculosis* TF. An additional plasmid was also constructed with TF cloned adjacent to a histidine tag (his-tag). Although this his-tag allowed for easy purification of the TF protein, it does not usually affect the activity of the protein to which it is attached.

The expression of TF from these new plasmids was tested by adding 0.4 mmol/L inducer, isopropyl-β-D-thiogalactoside (IPTG), to small bacterial cultures. This trial showed a protein of approximately 51 kDa (corresponding to the molecular weight of the TF protein) that was unregulated when inducer was added. Expression assays were then repeated with different concentrations of inducer (IPTG, 0 to 20 µmol/L) to determine the amount required to express the protein at normal physiological levels. There was a positive dose response relationship between the IPTG concentration and the level of expression of TF function.

In conclusion, the *M tuberculosis* TF gene was successfully subcloned into the plasmid pET21d. The next phase is to analyse the function of the *M tuberculosis* TF in E. coli. This will provide a simple assay to study *M tuberculosis* TF function in vivo without having to manipulate live cultures of the human pathogen.

Venous pressure differences between obese and non-obese patients with varicose vein disease. Chamila De Alwis, Jiang Perry, Ross Christie, Gerry Hill, Ian Thomson, Andre van Rij, Vascular Research Group, Department of Medical and Surgical Sciences, Dunedin School of Medicine, University of Otago.

The role of obesity in venous disease is not clear. Obese people have high intra-abdominal pressures compared to the non-obese. As high pressures in the abdomen reduce venous return and increase the venous volume in the leg, this may increase venous pressures and worsen the severity of venous disease in obese people with varicose veins. The aim of this study was to determine the effect of obesity on the severity of varicose vein disease.

20 subjects with varicose veins who had a range of body weights were randomly selected from a database of patients with known varicose veins. Venous pressures, venous volumes (with air plethysmography-APG) and venous velocities and vein diameter (with Duplex Ultrasound) were measured in the standing, sitting, lying and ambulating state. In the second part of the study, venous function was assessed using APG and Duplex scanning in 1405 patient legs in the vascular assessment unit. The severity of the venous disease in the legs was independent of each other. These were assessed as obese (229) and non-obese (1176) limbs by looking at the patient's body habitus. When 100 people were cross-checked with body mass index (weight/height^2), having obesity defined as BMI>30, 85% of the limbs were shown to be in the correct category and 10% were marginal. 5% of the subjects were in the wrong category, without any preference to a particular group.

Weight correlated with superficial femoral vein diameter in mm (0.501), ambulatory venous pressure in cmH_20 (0.448), venous filling index (VFI) in mL/s (0.490) and the ejection volume (EV) of the muscle pump in mL (0.381) with $p<0.05$. The relationships were not as closely associated with the BMI. The venous disease was more severe in the obese limbs ($p<0.001$) and ulcers were more common. Venous reflux was worse in the obese (VFI difference 0.80 mL/s (CI: 0.22-1.83, $p<0.005$)) but the muscle pump was more effective, EV difference being 13.4 mL (CI: 7.3-19.5, $p<0.005$) between the two groups. The residual volume was better in the obese; difference 7.46 mL (CI: 0.54-14.38, $p<0.005$). These effects were more apparent in females.

Excessive weight does affect the severity of venous disease even though the muscle pump is more effective in the obese. Venous reflux may be worsened by dilation of the major venous trunks in the lower limbs in obese patients with varicose veins.

The efficacy of transcutaneous bilirubinometry: a comparison with serum bilirubin in a New Zealand population. D Highton, P Thiagarajan, R Broadbent, Department of Women's and Children's Health, Dunedin School of Medicine, University of Otago.

Transcutaneous bilirubinometry is a non-invasive method of measuring serum bilirubin by analysing light reflected from the skin. The BiliCheck™ is a new transcutaneous bilirubinometer which claims to give more accurate results than previous machines. We aimed to determine the accuracy, precision and clinical efficacy of this new device by comparing it with the standard blood test for total serum bilirubin (TSB).

Transcutaneous bilirubin (TcB) readings were taken from babies who had blood taken to determine TSB. 112 of these readings were taken from 40 babies in the post-natal ward and Neonatal Intensive Care Unit (Dunedin Hospital). This consisted of 70 TcB readings using fresh calibration tips with the BiliCheck and 42 using reused tips. The paired TSB readings were measured on a Vitros DT60 II slide analyser. Data were excluded if the baby had an exchange transfusion or the blood specimen was haemolysed.

The agreement between matched TcB and TSB measurements was examined for accuracy and precision. We then used the data to create a screening test for hyperbilirubinaemia which, when positive, indicated that a TSB blood test was necessary. Three sets of accuracy results were calculated: 1) using only one fresh tip reading from one baby, 2) using all fresh tip data, 3) using all data. These accuracy results included the mean bias and limits within which 95% of the differences lay.

1) Mean bias 15.6 µmol/L (95% CI: 7.9 to 23.4), lower limit -26.7µmol/L (95% CI: -40.2 to -13.3), upper limit 58.0 µmol/L (95% CI: 44.6 to 71.5)
2) Mean bias 13.2 µmol/L (95% CI: 10.3 to 16.1), lower limit -27.1 µmol/L (95% CI: -32.1 to -22.2), upper limit 53.6 µmol/L (95% CI: 48.6 to 58.5)
3) Mean bias 10.6 µmol/L (95% CI: 8.6 to 12.7), lower limit -32.2 µmol/L (95% CI: -35.7 to -28.7), upper limit 53.4 µmol/L (95% CI: 49.9 to 57.0)

The precision appeared to decrease slightly at higher TcBs and was calculated to be within +/- 26 µmol/L in 95% of cases. The TcB readings were used as a screening test for TSB testing. This had a sensitivity of 100% (95% CI: 77% to 100%) and specificity of 69% (95% CI: 58% to 78%). This would have avoided 57/99 blood tests.

These results show that TcB measurements with the BiliCheck are a reliable measure of TSB in the population studied. These readings can form the basis of a screening test that eliminates the need for the majority of blood testing for TSB. However, this is a small study and further research is needed to confirm these results.

Competence-dependent bacteriocin sensitivity in Streptococcus gordonii. F-Y Keng, NCK Heng, JR Tagg, GR Tompkins, Department of Oral Sciences and Orthodontics, School of Dentistry, and Department of Microbiology, Otago School of Medical Sciences, University of Otago.

The bacterium *Streptococcus gordonii* is a common, benign component of the human oral microbiota, principally colonising tooth surfaces. *S. gordonii* strain Challis is distinctive in exhibiting a very high degree of natural competence for transformation (the ability to take up and express exogenous DNA). Furthermore, strain Challis is unusual in the expression of a high-molecular weight bacteriocin, designated STH1. Bacteriocins are antibacterial proteins which generally kill only closely

related strains. A functional relationship between bacteriocins and competence has not been previously investigated but it is conceivable that the bacteriocin functions to enhance transformation. We postulate that bacteriocin STH1 targets other competent Streptococcus strains that may be in competition with strain Challis for available DNA; therefore, bacteriocin sensitivity may be a competence-dependent characteristic.

The competence regulatory gene comE governs expression of competence-associated genes in *S. gordonii*. The comE gene of strain Challis was amplified by PCR and cloned into plasmid pUC19. The gene was disrupted by inserting the erythromycin resistance gene ermAM into the *HincII* restriction site. The *comE::ermAM* construct was then used to transform the bacteriocin-sensitive S. gordonii strain Wicky and mutants selected by erythromycin resistance. Transformants were screened for loss of inducible competence and the insertion verified by PCR amplification using *comE*-specific primers. The *comE* disrupted strain WCEF-1 displayed a growth rate comparable to that of the wild-type but was insensitive to bacteriocin STH1. In contrast, a mutant in which *ermAM* was inserted into *sspA* (which codes for a cell surface adhesin unrelated to competence) remained both bacteriocin-sensitive and competent.

These findings strongly suggest that bacteriocin sensitivity is competence-dependent and therefore the bacteriocin may function to enhance transformation of the bacteriocin producing strain by suppressing competing competent strains.

The reduction of CYP450 in the Swiss Webster mouse by acute Methylphenidate (Ritalin™). MJ Le Nedelec, RJ Rosengren, Department of Pharmacology, Otago School of Medical Sciences, University of Otago.

There have been many case reports of drug interactions with methylphenidate (MPH) suggesting it inhibits one or more of the cytochrome P450 hepatic enzymes. Therefore, the effect of MPH on the hepatic CYP450 content and catalytic activity of CYP1A2, CYP2E1 and CYP3A was studied.

Male Swiss Webster mice were treated with a single i.p. dose of MPH and total hepatic CYP450 was determined. MPH decreased CYP450 in a dose-dependent manner. MPH concentrations of 25 mg/kg, 50 mg/kg and 100 mg/kg reduced CYP450 to 64.5 ± 5.4% ($p<0.05$), 62.1 ± 5.1% ($p<0.05$) and 48.9 ± 10.0% ($p<0.05$) of control values respectively. The effect of MPH on various isoforms of CYP450 was then determined. CYP1A2 which is involved in the metabolism of caffeine, imipramine, and other tricyclic antidepressants (TCA) was not significantly decreased by MPH. MPH doses of 25 mg/kg, 50 mg/kg and 100 mg/kg resulted in catalytic activities of 94.3 ± 10.0%, 72.6 ± 7.8% and 76.4 ± 17.3% respectively. CYP2E1, which is involved in the metabolism of paracetamol, halothane and isoflurane, was reduced. MPH concentrations of 25 mg/kg, 50 mg/kg and 100 mg/kg reduced catalytic activity to 63.3 ± 11.4% ($p<0.05$), 51.6 ± 9.2% ($p<0.05$) and 51.8 ± 15.2% ($p<0.05$) respectively. CYP3A, which is involved in the metabolism of many of the benzodiazepines as well as some of the TCAs, was not effected by MPH. MPH 25 mg/kg, 50 mg/kg and 100 mg/kg resulted in catalytic activities of 67.6 ± 9.7%, 87.8 ± 7.7% and 80.6 ± 7.6% respectively.

The mechanism by which MPH is reducing CYP450 in the Swiss Webster mouse is not known at this time. Further studies using western immunoblotting will be carried out to confirm these results. Also, the effect of MPH on other CYP450 isoforms will be determined, along with the effect of chronic MPH.

Association of polymorphisms of cholecystokinin and synaptostagmin genes with bipolar disorder phenotypes. Marianne Lill, Elisabeth Wells, Peter Joyce, Robin Olds, Department of Pathology and Psychological Medicine, Dunedin and Christchurch Schools of Medicine, University of Otago.

Bipolar disorder (BPD) has a familial component, but no major predisposing genetic locus has been identified. BPD is possibly polygenic, with a heterogeneous array of predisposing alleles. BPD often occurs with comorbid mood and anxiety disorders. Patterns of comorbidity may potentially be used to identify genetically homogeneous subtypes of BPD based on the presence of comorbid disorders. This would allow easier identification of susceptibility alleles. This study investigated novel candidate genes in relation to phenotypic subtypes of BPD based on the presence of comorbid disorders.

The Familial Bipolar Disorder Database (FBDD) provides phenotypic information on patients and their relatives, allowing identification of probands suffering from BPD comorbid with other psychiatric conditions. Novel candidate genes were investigated for associations with BPD and BPD subtypes. Two genes investigated were cholecystokinin (*CCK*) and synaptotagmin (*SYT1*). *CCK* was chosen as it is a neurotransmitter in the central nervous system, thought to be involved in panic. *SYT1* is a synaptic vesicle protein involved in neurotransmitter release.

Genotypes were analysed using χ^2 tests and the transmission disequilibrium test (TDT/Sib-TDT) for CCK (n=510) and SYT1 (n=529). The T allele of CCK was found to show trends towards associations with BPD (p=0.048), phobia (p=0.026), BPD plus phobia (p=0.02) and mood disorder plus phobia (p=0.0094) before Bonferroni correction was conducted to correct for multiple analyses. The T/T genotype was associated with phobia (p=0.0029), panic (p=0.0021), BPD plus panic (p=0.0053) and mood disorder plus panic (p=0.0015). The L alleles of *SYT1* were associated with suicide attempts (p=0.004).

This study shows that panic and phobia are useful as phenotypic markers in genetic investigations of BPD. The CCK neurotransmitter system and *SYT1* are worthy of further investigation to identify their role in the pathogenesis of psychiatric disorders.

Isolation and characterization of vancomycin-resistant enterococci from chickens in New Zealand. Janet M Manson, Sandy Smith, Gregory M Cook, Department of Microbiology, Otago School of Medical Sciences, University of Otago.

Supplementation of animal feed with antimicrobial agents to enhance growth and prevent infection has been a common practise. Avoparcin is a glycopeptide antibiotic that has been used as a growth promoting agent for food animals. In European countries the use of avoparcin has created, in food animals, a reservoir of high-level vancomycin-resistant Enterococcus faecium (VRE), suggesting the possibility of transmission of VRE from food animals to humans via the food chain. The present study was conducted to determine the prevalence of faecal carriage of VRE in chickens (broilers) that had been given antimicrobial growth promotants (eg avotan, tylosin, etc).

Enterococci were isolated on bile-esculin azide plates. Minimum inhibitory concentrations (MICs) were determined for vancomycin, ampicillin and gentamicin using E-test strips and Mueller-Hinton agar. 500 enterococci were isolated from four broiler farms. One farm had used avoparcin for an extended period of time (>1 year). Faecal samples from broilers where avoparcin had been used revealed that 9% of the enterococci were VRE. All VRE had high level resistance to vancomycin and teicoplanin (MICs ≥256 mg/L). All VRE were susceptible to ampicillin and gentamicin. Ampicillin- and gentamicin-resistant enterococci were also recovered from the farm using avoparcin for >1 year. The frequency of ampicillin resistance (MICs ≥256 mg/L) and high-level gentamicin resistance (MICs>500 mg/L) was 15% and 1%, respectively. No ampicillin- or gentamicin-resistant enterococci were found from the three other farms studied (non-avoparcin users).

The pulsed-field gel electrophoresis patterns of the VRE isolates from different populations were quite heterogeneous. DNA-DNA hybridization using species-specific probes identified all VRE isolates as species of *E. faecium* (10%) and *E. faecalis* (90%). Ampicillin-resistant isolates were all *E. faecium* and the gentamicin-resistant isolates were all *E. faecalis*. Detailed molecular characterization of the VRE isolates demonstrated that they all contained the vanA gene. The mechanism of gentamicin and ampicillin resistance is unknown at the present time. This is the first report of VRE isolated from animal origins in New Zealand.

Forensic PCR analysis of bacteria recovered from bite marks. M Rahimi, NCK Heng, JA Kieser, GR Tompkins, Department of Oral Sciences and Orthodontics, School of Dentistry, University of Otago.

Conventional analysis of human bite marks requires a degree of subjective judgement and the conclusions are often challenged in court. Developments in molecular biological techniques can potentially overcome some of these difficulties but amplification of the aggressor's DNA is unsuccessful in a significant number of cases. Previous studies in our laboratory have demonstrated that oral streptococci can be recovered from experimental self-inflicted bite marks for up to 24 hours and that some bacteria remain even following washing with soap. The extreme genotypic diversity of the oral streptococci may facilitate matching bacteria recovered from bite marks with those from the teeth of the perpetrator.

This study adapted and assessed an arbitrarily-primed polymerase chain reaction (AP-PCR) approach to genotyping bacterial isolates for forensic purposes. The study sought to determine: (i) the frequency with which indistinguishable bacterial genotypes occur among different individuals; (ii) the number of distinguishable genotypes harboured by an individual, and (iii) whether an "unknown" perpetrator could be identified by comparing bacterial genotypes recovered from a bite mark with those from a database of "suspects" in a simulated crime situation. Bacteria were isolated from the lower incisors of volunteers by plating swabbed samples onto Mitis Salivarius agar. After appropriate incubation, bacterial colonies were replated onto tryptic soy agar and genotypically analysed by AP-PCR using the OPA-02 primer.

A total of 105 strains were recovered from eight volunteers. Specific bacterial genotypes were not shared among the tested individuals. Participants were found to harbour between 8 and 23 distinct streptococcal genotypes but either one or two genotypes accounted for more than 35% of isolates from each mouth. The "unknown" perpetrator was successfully identified by matching genotypes of bacteria recovered from the bite mark with those of only one of the eight "suspects". The study demonstrates the feasibility of a bacterial approach to bite mark analysis.

PICC lines for all? Radika Reddy, André van Rij, Julia Kennedy, School of Pharmacy, and Department of Medical & Surgical Sciences, Dunedin School of Medicine, University of Otago.

There are several different types of devices, which can be used to administer intravenous medication. However, intravenous medication is usually administered via peripheral cannulae (venflons) probably because they are cheap and relatively easy to insert. These need to be re-sited regularly to prevent thrombophlebitis and/or local or systemic infection. Patients who require long term i.v. therapy therefore experience several venepunctures during their stay in hospital.

An audit was done in Surgical Wards 4A and 4B of Dunedin Public Hospital to establish if it would be cost effective for patients with conditions that require long-term intravenous therapy, particularly antibiotic therapy, to have peripherally inserted central catheters (PICCs). These are long term catheters and only need to be inserted once. 232 admissions were audited. Patients were visited daily to see if their venflons had been re-sited and the number of attempts to insert. All intravenous medication administered through peripheral cannulae was recorded.

To compare the cost of insertion of peripheral venous cannulae and peripherally inserted central catheters, both types of insertions were observed and all items used were noted. The time taken to insert the peripheral venous cannulae and peripherally inserted central catheters was also noted and time was accounted for in the total cost. To account for time taken to insert a venflon, the median salary of a House Surgeon working 40-44.9 hours a week, was used. To account for time taken to insert a PICC, the median salary of a Medical Radiation Technologist and a staff nurse working a 40 hour week, was used.

The audit showed that the majority of the patients required i.v. therapy for less than 7 days. From the audit it was apparent that insertion of PICCs in patients who require i.v. medication will not reduce the cost in terms of the total number of venflons inserted.

Having PICCs inserted would most definitely improve patient care but the comparative costs and extra time required to organise insertion are barriers to their wider use. Patients who would most benefit from PICCs in terms of long term i.v. therapy are those with abdominal surgery, obstructive jaundice or bile infection, urological surgery such as those undergoing radical prostectomy or radical nephrectomy surgery and patients who have diverticulitis (drained).

An investigation of lipoprotein (a) levels and apolipoprotein (a) allele frequency in a New Zealand population. Ajay R Sud, Peter M George, Sally PA McCormick, Department of Biochemistry, Otago School of Medical Sciences, University of Otago.

Atherosclerosis, a major cause of death in Western society, is characterised by the progressive narrowing of the arteries. High concentrations of lipoprotein (a) [Lp(a)] are an independent risk factor for atherosclerosis. Lp(a) is formed when the apolipoprotein B (apoB) of a low-density lipoprotein (LDL) binds to apolipoprotein (a) [apo(a)].

Lp(a) concentrations are highly heritable and vary more than a thousand fold in human plasma. They are heavily influenced by the apo(a) gene, which generates a highly polymorphic protein comprising of 34 different apo(a)-isoform sizes. International population studies have shown an inverse correlation between Lp(a) concentrations and apo(a) size. It has been established that there are differences in Lp(a) concentrations and apo(a) size between different ethnic populations. We investigated the relationship between Lp(a) concentration and apo(a) size in a New Zealand population.

200 plasma samples from subjects attending the Christchurch Hospital Lipid Clinic were phenotyped for apo(a) using SDS poly-acrylamide gel electrophoresis and western blotting. A further 40 subjects not attending the lipid clinic were screened for Lp(a) concentrations and apo(a) isoforms. The relationship between the apo(a) size and Lp(a) concentration showed an inverse correlation. Relative to other normal Caucasian populations, the distribution of apo(a) size alleles from the lipid clinic sample pool was skewed towards the smaller isoforms. Lp(a) levels from this group were also of higher concentrations. This might be explained by the fact that most of the subjects attending the lipid clinic are deemed at risk of heart disease. Further analyses on the control subjects will ascertain whether this skewing effect is due to the source of the sample pool or indigenous to the general New Zealand population.

Most subjects exhibited a heterozygous expression of apo(a)-isoforms. We identified eleven distinct groups (total of 124 samples) that had the same apo(a)-isoform pattern. One of these groups consisted of potential null-alleles, since apo(a) could not be detected by apo(a) phenotyping. Analysis of Lp(a) levels within each group revealed a wide distribution. This suggests that other factors besides the apo(a) gene influences Lp(a) concentrations.