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This Issue in the Journal

Holding a mirror to society? The sociodemographic characteristics of the University of Otago’s health professional students
Peter Crampton, Naomi Weaver, Andrea Howard

The sociodemographic profile of health professional students is important because, in part, these characteristics influence future career choices in terms of place of practice and types of populations served. Overall, students in eight health professional programmes at the University of Otago in 2010 were largely from outside the Otago region and were either New Zealand citizens or permanent residents. Female students were slightly over-represented. In 2010 the majority of health professional students self-identified as being within the New Zealand ‘European and Other’ ethnic category (65.0%), 34.2% as Asian, 6.3% as Māori, and 2.3% as Pacific. A large proportion of health professional students came from well-off socioeconomic areas and only 3.4% of students had attended secondary schools with a socioeconomic decile of less than 4. If the University is to fully achieve its mission to serve the needs of society then ongoing effort is required to refine its selection processes, within the constraints and limitations of the available selection tools, and its targeted student support mechanisms.

Students’ perceptions of the Undergraduate Medicine and Health Sciences Admissions Test (UMAT)
Divya Dhar, William R G Perry, Phillippa Poole

The majority of medical students in New Zealand do not see UMAT as an acceptable test of non-cognitive attributes. Most students find it to be too costly and many students believe it is too stressful. The degree of weighting placed on UMAT as a selection criteria by a medical school has a positive correlation with students' perception of whether UMAT is too costly and stressful. UMAT needs to be further validated and used by medical schools with caution as a selection method.

Using real-time ultrasound to teach living anatomy: an alternative model for large classes
Mark D Stringer, Lynda J Duncan, Latika Samalia

Ultrasound is a safe, non-invasive and versatile imaging tool widely used in clinical practice. Several studies have reported using ultrasound to supplement teaching clinical anatomy to medical students but most have tried to teach basic ultrasound skills in small group settings. Delivered in this way, teaching with ultrasound is labour intensive and needs considerable resourcing. We describe our cumulative experience of a single one-hour ultrasound demonstration of 'living anatomy' to a large class of third year medical students. More than 80% of students found that the session stimulated and improved their understanding of anatomy.
Time to “refine” clinical ward assessments? Or time to retrain?  
Depak K Patel, Stephen Child

This study asked doctors at different levels to “rate” the performance of a simulated clinical interaction on a 3-minute video. Despite watching the same video, there was a wide variation in scoring by participants which may be of concern if assessments are used to affect a doctor’s career.

ACE inhibitor fetopathy: a case series and survey of opinion amongst New Zealand paediatricians, obstetricians, neonatologists, and nephrologists  
Maneesh Deva, Tonya Kara

The use of ACE (angiotensin converting enzyme) inhibitor medicines are not recommended throughout pregnancy due to potential damaging effects to the developing fetus in the womb. Despite this, women continue to receive ACE inhibitors both in New Zealand and overseas and studies have shown cases of associated harm to infants. We describe three New Zealand infants with potential renal (kidney-related) complications (including hypertension, renal failure and death) following their exposure to ACE inhibitors during pregnancy. We also surveyed doctors on how they counselled pregnant women about ACE inhibitors.

Sexual health, risks, and experiences of New Zealand university students: findings from a national cross-sectional study  
Rebecca Psutka, Jennie Connor, Kimberly Cousins, Kypros Kypri

In a 2009 study of university students across New Zealand, we found frequent risky sexual behaviour, with 20% university students reporting 3 or more partners over the last 12 months, just over half reported using a condom last time they had sex, and about one-third had been drinking alcohol at last sex. Approximately 5% of students reported an unintentional pregnancy at some time in their life. Of particular concern was our finding that those with more sexual partners in the last 12 months were less likely to report using a condom at last sex. The prevalence of multiple partnerships in combination with low condom use puts students at risk of sexually transmitted infections and unintentional pregnancies.
The value of the interview in medical student selection

John D Fraser

“It has been said that democracy is the worst form of government—except for all the others that have been tried” (Winston Churchill). The same can be said for the selection process into medical school.

Most university professional degrees require some form of selection but none experience the same level of scrutiny and hand-wringing as do our country’s two medical programmes. Of course medicine is a prestigious career and quite naturally it attracts large numbers of eager students convinced that they have the right stuff to become good doctors. A large number of them genuinely do have the right stuff, but sadly only 10% ever get the opportunity, leaving the other 90% disheartened and considering plan B.

How we identify that 10% and the qualities we look for in our medical students has long been the subject of hot debate. Two articles in this issue of NZMJ further examine our current process, focusing on two semi-quantitative approaches that are applied to assess personal attributes and cognitive and non-cognitive skills.

In the first paper, Poole et al report on the findings of a working party commissioned to examine the selection interview at the University of Auckland which constitutes 25% of the final grade.

In a second article, Dhar et al reports on the student perception of the Undergraduate Medicine and Health Sciences Admission Test (UMAT) which constitutes 15% at Auckland and 33% of the final admission grade at Otago.

The first article is interesting as a point of differentiation between Auckland and Otago while the second article provides a first-time perspective of how students view the standardised UMAT test—the answer is not well!

First off, let’s be clear that both medical schools still use the grade point average (GPA) as the principal selection tool, constituting 60% of the final grade at Auckland and 66% at Otago. At Auckland the scores from UMAT and the interview only apply to a sub-group of students who exceed a high GPA score. At this stage the students know they have a 50% chance of selection. So what’s the added value of the interview and UMAT and are they both fair? Although the former question is partially answered, the later remains debatable even though the students themselves say that UMAT is not fair.

The Auckland Working Group commissioned by my predecessor Prof Iain Martin was charged with determining the value of the interview and recommending whether (a) it should continue and (b) if so, in what form?
The Working Group admits that the interview for the most part has variable reliability but still recommends retention, citing multiple positive aspects. First it provides the student with an opportunity to “sell themselves” at the end of a relatively brutal and impersonal first year.

Even unsuccessful students strongly support the interview as an opportunity for personal engagement. Each student goes into the interview knowing that there is a “must-have” category where selection is guaranteed for those with exceptional personal qualities (notwithstanding the fact that they have a high GPA). Even though only a handful of interviewees achieve this category, and likewise even fewer are deemed to be at the other end of the scale, this remains a positive incentive for students.

The vast majority score in the three middle categories so for them the comparative effect of the interview is minimal. It does provide, as Poole et al highlights, a point of distinction for entry into Auckland Medical School, a sense of involvement by the student, a sense of involvement by the community as interviewers and a sense that selection is not just about exam performance.

The biggest reason for not continuing with the interview is cost. With rising student numbers, it is becoming a logistical headache to organise 450-plus interviews each year. One seriously considered alternative was choosing a larger group based on GPA and then selecting by lottery. This meets both the excellence and the fairness criteria, but seems contrary to the goals of a school dedicated to selecting students of good character and maturity. Under this scheme, the “must-haves” would have much less of a chance. Auckland will continue with the interview for the foreseeable future.

The UMAT is a different beast. A standardised test organised by the Australian Council of Education Research, it provides a benchmarked assessment for all medical students across Australasia. Despite its widespread use, there is very little data to show that it is an effective method for ranking students, particularly in the area of non-cognitive social skills.

In the article by Dhar et al the simple question is asked—what do the medical students think about UMAT? The answer appears to be a resounding thumbs-down. The students consider the test to be high cost and stressful. More worrying is that commonplace rehearsal (at considerable cost to the student) does increase success. Those students who cannot afford to rehearse are immediately disadvantaged. In the study, 21% of medical students reported sitting the test more than once and 70% indicated that they got higher marks in the subsequent test.

It is not surprising therefore that a profitable cottage industry has sprung up where current medical students offer to train new students in UMAT for a fee. Entrepreneurial it may be, but strongly discouraged and difficult to stop. Clearly UMAT has encouraged undesirable behavior. To counter this, students can now only sit UMAT once and it must be in the year of application to medical school.

These two studies highlight the importance of ongoing review and being able to justify the use of more than one assessment tool for selection. Like democracy, no selection system is perfect but it is important to ensure that the system chosen meets the needs of the programme and is fair and equitable to all students.
Competing interests: None.

Author information: John D Fraser, Dean, Faculty of Medical and Health Sciences, The University of Auckland

Correspondence: Professor John Fraser, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland 1142, New Zealand. Email: jd.fraser@auckland.ac.nz

References:


The challenges of selecting students

Peter Crampton

The Universities of Otago and Auckland in New Zealand produce well-trained and sought after health professional graduates, as attested by the ease with which they obtain good jobs overseas. Does the excellent reputation of our graduates overseas mean the two universities admit the right mix of students in order to meet the needs of New Zealand communities? This in turn raises further questions about what traits are desirable in aspirant health professionals for the New Zealand health workforce and, more pressingly, how to identify or measure those traits.

Three papers in this issue of the *Journal* explore different aspects of admission to health professional programmes. Poole and colleagues shed light on the recent decision by Auckland to retain an interview for admitting students to their medical programme; Dhar and colleagues report medical student perceptions of the general cognitive test, Undergraduate Medical Admissions Test (UMAT); and Crampton (me) and colleagues provide an overview of the sociodemographic characteristics of students admitted into Otago’s eight health professional programmes. The three papers contribute to an already large literature on admissions processes. Sadly, despite the large amount written on the subject, there are still no gold standards and most admissions tools are contested to a greater or lesser extent.

Medical schools want to select students who are academically high performers. As noted by Poole and colleagues, grade point average (GPA) is the most reliable tool for predicting future academic performance as, not surprisingly, past academic performance predicts future academic performance.

Schools also want to select students who are committed, altruistic, excellent communicators, trustworthy, honest, ethical and so on. Some of these traits are hard to teach and therefore need to be part of the selection criteria: hence the use of UMAT and interviews.

In selecting medical students, Otago and Auckland use similar, but not identical, processes. For example, both universities use GPA and UMAT. One of the main differences between the two is the presence of an interview for all applicants to Auckland but only for those Otago applicants who apply under the ‘Other’ category.

Poole and colleagues report that a working party set up to examine the place of the Auckland interview found that “the Auckland interview in its current format is not particularly valid or reliable in terms of its ability to predict future success at medical school, but at least it is not as resource-intensive as initially thought.” Despite this, the working party recommended retaining the interview because it offers a range of benefits such as community engagement, strong student support, the ability to select in diversity, and the ability to select out those students who don’t actually want to be there. The working party also suggested a number of possible approaches to improve the validity and reliability of the current interview.
General cognitive tests, such as UMAT, are designed to test traits other than straight academic performance. UMAT was developed in Australia and is used widely in Australian medical schools as well as in both New Zealand medical schools. The test has three components: logical reasoning and problem solving, understanding people, and non-verbal reasoning.

Dhar and colleagues report, for the first time, the perceptions of New Zealand medical students of the test. They surveyed all 2043 medical students at Otago and Auckland in 2009, obtaining a 65% response rate. The majority of respondents did not think that UMAT is an important test for selecting medical students because they were not convinced that it judges the non-cognitive attributes required of a doctor and 67% of them thought that it is not a fair test. Students also reported finding the test stressful and about half of all students spent sometimes hundreds of dollars doing preparatory courses and buying UMAT books in an effort to improve their performance.

While students are not necessarily the best judges of the performance of admissions tools, nevertheless these results are alarming as they convey a lack of confidence in UMAT amongst students and also suggest that UMAT places an additional financial burden on applicants to medical school. The two universities will need to think carefully about these findings.

In addition, student diversity is important. Crampton and colleagues state Otago’s view that, in order for health professional programmes to meet the needs of New Zealand society, “ideally the make-up of health professional classes should be equivalent to holding a mirror up to society”. Selecting in diversity—gender, ethnic, rural/urban, socioeconomic—presents challenges.

The reality is that students enrolled in the eight health professional programmes at Otago are not a perfect mirror on society. While noting that nearly 16% of the 2012 medical class are Māori, nevertheless overall both Māori and Pacific students are under-represented in health professional classes, as are students from socioeconomically disadvantaged backgrounds. There are many factors which contribute to this under-representation.

Both Otago and Auckland have affirmative pathways for Māori and Pacific students and students from rural backgrounds, and Crampton and colleagues identify a range of other strategies in use at Otago to select in and support students from a diverse range of backgrounds.

It is essential that the admission policies used in New Zealand’s health professional programmes continue to be researched and debated. These debates should provide the opportunity for input from New Zealand’s diverse communities, health professional groups, policy makers and other stakeholder groups. For these reasons I welcome the publication of these three papers.

**Competing interests:** I am coauthor of one of the three papers which form the subject of this editorial.

**Author information:** Peter Crampton, Pro-Vice-Chancellor, Division of Health Sciences, University of Otago, Dunedin

**Correspondence:** Professor Peter Crampton, Pro-Vice-Chancellor, Division of Health Sciences, PO Box 56, University of Otago, Dunedin, New Zealand. Email: peter.crampton@otago.ac.nz
References:


Holding a mirror to society? The sociodemographic characteristics of the University of Otago’s health professional students

Peter Crampton, Naomi Weaver, Andrea Howard

Abstract

Aim To describe the sociodemographic characteristics of students accepted into eight health professional programmes at the University of Otago.

Methods Student data were obtained from the University of Otago’s central student records system. Data were obtained in anonymous, summary form. New Zealand population data were obtained from Statistics New Zealand. Descriptive statistics were calculated.

Results In 2010 health professional students at the University of Otago were largely from outside the Otago region (88.1%). 59.6% were female and 84.8% were either New Zealand citizens or permanent residents. Within the domestic student cohort, 65.0% of students self-identified as being within the New Zealand European & Other category (compared with 75.3% of the national population), 34.2% as Asian (compared with 11.1%), 6.3% as Māori (compared with 15.2%), and 2.3% as Pacific (compared with 7.7%). A large proportion of students came from high socioeconomic areas and only 3.4% of students had attended secondary schools with a socioeconomic decile of less than 4.

Conclusion Schools and Faculties within the University of Otago’s Division of Health Sciences do not achieve the sociodemographic mirror of society we hope for, and we strive to improve both our selection processes, within the constraints and limitations of the available selection tools, and our student support mechanisms. We will continue to refine these policies and work with other key stakeholders in better preparing school leavers for health professional programmes.

The University of Otago’s Division of Health Sciences aims to produce health professionals equipped to meet the needs of society; this is at the heart of the social contract between the University and society.

The University strives to train health professional graduates who reflect and are responsive to the diversity within society. The sociodemographic profile of health professional students is important because, in part, these characteristics influence future career choices in terms of place of practice and types of populations served. The overarching admissions policy of the University’s Division of Health Sciences states:

Ideally the make-up of health professional classes should be equivalent to holding a mirror up to society. In order to achieve this we aim to attract and support the most academically able students from a wide variety of backgrounds. The gender, ethnic, socioeconomic and rural/urban composition of our graduates should, more or less, reflect the diverse communities in Aotearoa.
The above statement reflects recent international consensus and calls to action from inter-country working groups. The Australian Medical Council also recognises the importance of encouraging and prioritising student diversity in its guidelines for the accreditation of medical schools (which apply to medical schools in New Zealand):\(^{10}\)

In Australia and New Zealand, inequalities remain in the health status of various social and cultural groups. Medical schools have a responsibility to select students who can reasonably be expected to respond to the needs and challenges of the whole community, including the health care of these groups. This may include selection of students who are members of such groups. The medical curriculum should also provide opportunities for cultural education programs, and opportunities for training and provision of service in under-serviced communities.

We believe indigenous health and Pacific health are areas of special responsibility because of New Zealand’s history, demographic makeup, and location as a Pacific nation. In the case of Māori health and Māori education, New Zealand’s universities have a dual obligation to honour the contractual obligations defined in the Treaty of Waitangi and the responsibility to correct the inequitable health and education outcomes experienced by Māori populations.

The University’s Division of Health Sciences adopts the following principles in the selection of students into its health professional programmes. Each of these programmes aims to select students who:

- Are committed to and capable of academic excellence;
- On balance reflect the gender, ethnic, socioeconomic, and rural/urban composition of society; and
- Are committed to serving the needs of individuals, families and communities in New Zealand or overseas.

The purpose of this study is to describe the current sociodemographic characteristics of the University’s health professional students in order to a) evaluate performance against our goals, b) inform policy development within the University, and c) to provide a benchmark against which to measure change.

**Methods**

**Health Professional Programmes**—All students (domestic and international) accepted into the following eight health professional programmes in 2010 were included in the study (Table 1).

**Table 1. Eight professional programmes included in the study**

<table>
<thead>
<tr>
<th>Professional programme</th>
<th>School-leaver entry pathway</th>
<th>Tertiary entry pathways</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Dental Surgery (BDS)</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Dental Technology (BDentTech)</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Medical Laboratory Science (BMLSc)</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Medicine and Bachelor of Surgery (MBChB)</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Oral Health (BOH)</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Pharmacy (BPharm)</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Physiotherapy (BPhy)</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bachelor of Radiation Therapy (BRT)</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
**Data sources**—Student data were downloaded from the University of Otago’s central student records system (which contains routinely collected data). Data were obtained in anonymous, summary form. University student data are a mix of verified and unverified fields. Age and sex are verified by the sighting of birth certificates, and data are complete for these fields. Ethnicity data are complete but unverified, and home area statistics are unverified with 0.7% missing for the student population. Home area data were analysed only for domestic students (not international).

Home area statistics are collected by the University in a student’s first year of study only, and are derived from the contact address provided by students when they first enrol.

Student citizenship was classified into the following categories: New Zealand citizens; New Zealand permanent residents; Tokelau/Niue/Cook Island citizens; Australian citizens; international citizens. For University purposes, based on the allocation of funding by the Tertiary Education Commission, domestic students are those students who are New Zealand Citizens, or New Zealand Permanent Residents, or citizens of Tokelau, Niue, Cook Islands, or Australia.

New Zealand population data were sourced from 2011 estimates provided by Statistics New Zealand.11–

**Ethnicity Classification/definitions**—When students enrol at the University of Otago, they can nominate up to three ethnicities they identify with; these ethnicities are self-declared. Students can change which ethnicities they associate with at any point in time. Ethnic groups were aggregated into the following four categories: Māori; Pacific; Asian; New Zealand European and Other. As students can nominate more than one ethnicity the sum of ethnicities in the student population is greater than 100% of students. The ‘Asian’ category, as used in the New Zealand health sector, includes students from East, South and Southeast Asia but excludes people from the Middle East and Central Asia. This category has acknowledged shortcomings because of the ethnic diversity within the category.14

The ‘New Zealand European and Other’ category includes students who identified as New Zealand European plus students who did not fall into any of the other categories. The proportion of New Zealand European within the ‘New Zealand European and Other’ category was approximately 97% for the University population and 94% for the Health Sciences population. Other includes students who identify as Middle Eastern, Latin American and African.

**Socioeconomic deprivation**—Socioeconomic deprivation was measured using the NZDep2006 (NZDep) index of socioeconomic deprivation for small areas.

NZDep is an area-based measure combining nine variables from New Zealand’s 5-yearly census that reflect eight dimensions of deprivation.15–18 Each NZDep index is created for small areas built from one or more contiguous meshblocks. Meshblocks, containing around 90 people, are the smallest geographical units defined by the central government statistics agency, Statistics New Zealand. The small areas were constructed with, as far as possible, at least 100 people usually resident. In 2006, for example, only 4% contained fewer than 100 people, while 76% contained fewer than 200 people, and just 3% had more than 300 people. The NZDep indexes were created from the proportions of people in each census-specific small area with each of nine characteristics related to deprivation.

The NZDep scale runs from 1 to 10 where, for example, a value of 10 indicates that the meshblock is in the most deprived 10% of small areas in New Zealand. At a national level, the number of people in each NZDep category is roughly equal. The level of diversity increases as the geographic unit of measurement becomes smaller.

In order to link the student and NZDep datasets, the meshblock associated with the home residence of students was attached to individual records in the University’s student dataset (domestic students only). The corresponding NZDep value for each domestic student’s home address was then added.

**School socioeconomic scores**—The Ministry of Education uses a school rating scale to indicate the extent to which it draws its students from low socioeconomic communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socioeconomic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students. A school decile does not indicate the overall socioeconomic mix of the students attending a school or measure the standard of education delivered at a school.19 It is not possible to calculate decile information for students who went to correspondence school or an overseas school.
Results

Geographic location of home area—Auckland is home for 33.4% of the New Zealand population; in 2010 15.0% of the University of Otago’s student population came from Auckland, and 22.0% of the professional programme population came from Auckland (Table 2). The four regions of Auckland, Canterbury, Otago and Wellington made up around 70% of both the University student population and the professional programme student population.

Table 2. Geographic location of domestic students’ home areas (2010 year)

<table>
<thead>
<tr>
<th>Region</th>
<th>% of NZ population</th>
<th>% of University population</th>
<th>% of Health Sciences Professional Programme population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>3.6</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Auckland</td>
<td>33.4</td>
<td>15.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>6.3</td>
<td>5.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Waikato</td>
<td>9.4</td>
<td>3.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Gisborne</td>
<td>1.1</td>
<td>0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>3.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Taranaki</td>
<td>2.5</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Wanganui-Manawatu</td>
<td>5.3</td>
<td>2.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Wellington</td>
<td>11.1</td>
<td>11.7</td>
<td>14.0</td>
</tr>
<tr>
<td>Tasman</td>
<td>1.1</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Marlborough</td>
<td>1.0</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>West Coast</td>
<td>0.7</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Canterbury</td>
<td>13.0</td>
<td>15.4</td>
<td>22.7</td>
</tr>
<tr>
<td>Otago</td>
<td>4.7</td>
<td>27.4</td>
<td>11.9</td>
</tr>
<tr>
<td>Southland</td>
<td>2.2</td>
<td>8.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.0</td>
<td>0.7</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Sex—When compared with the New Zealand population females were over represented at the University of Otago in general, and professional programmes in particular (Table 3). The programmes with the sex distribution most similar to the New Zealand population were the Bachelor of Dental Technology and the Bachelor of Medicine and Surgery.
Table 3. Sex (2010 year; domestic and international students)

<table>
<thead>
<tr>
<th>Population</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ</td>
<td>49.0</td>
<td>51.0</td>
</tr>
<tr>
<td>NZ 18–24 year old</td>
<td>51.4</td>
<td>48.6</td>
</tr>
<tr>
<td>University of Otago students</td>
<td>43.0</td>
<td>57.0</td>
</tr>
<tr>
<td>Health Science Professional Programme students</td>
<td>40.4</td>
<td>59.6</td>
</tr>
<tr>
<td>BDS students</td>
<td>43.2</td>
<td>56.8</td>
</tr>
<tr>
<td>BDentTech students</td>
<td>47.3</td>
<td>52.7</td>
</tr>
<tr>
<td>BMLSc students</td>
<td>35.0</td>
<td>65.0</td>
</tr>
<tr>
<td>MB ChB students</td>
<td>45.1</td>
<td>54.9</td>
</tr>
<tr>
<td>BOH students</td>
<td>12.9</td>
<td>87.1</td>
</tr>
<tr>
<td>BPharm students</td>
<td>39.6</td>
<td>60.4</td>
</tr>
<tr>
<td>BPhty students</td>
<td>35.5</td>
<td>64.5</td>
</tr>
<tr>
<td>BRT students</td>
<td>14.1</td>
<td>85.9</td>
</tr>
</tbody>
</table>

Citizenship—Programmes with the smallest proportion of New Zealand citizens were the Bachelor of Dental Technology, the Bachelor of Dental Surgery and the Bachelor of Pharmacy (Table 4). The Bachelor of Dental Technology had the highest proportion of New Zealand permanent residents. All types of citizenship in the table, except for international, are eligible for government funding and therefore considered to be domestic students.

Table 4. Citizenship status (2010 year; domestic and international students)

<table>
<thead>
<tr>
<th>Population</th>
<th>NZ citizen (%)</th>
<th>NZ permanent resident (%)</th>
<th>Tokelau Niue Cook Islands (%)</th>
<th>Australian citizen (%)</th>
<th>International (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Otago students</td>
<td>76.9</td>
<td>9.1</td>
<td>0.03</td>
<td>1.6</td>
<td>12.4</td>
</tr>
<tr>
<td>Health Science Professional Programme students</td>
<td>73.1</td>
<td>11.7</td>
<td>0.04</td>
<td>1.4</td>
<td>13.8</td>
</tr>
<tr>
<td>BDS students</td>
<td>62.7</td>
<td>13.0</td>
<td>0.00</td>
<td>1.7</td>
<td>22.6</td>
</tr>
<tr>
<td>BDentTech students</td>
<td>62.4</td>
<td>24.7</td>
<td>0.00</td>
<td>1.1</td>
<td>11.8</td>
</tr>
<tr>
<td>BMLSc students</td>
<td>73.3</td>
<td>18.3</td>
<td>0.00</td>
<td>0.0</td>
<td>8.3</td>
</tr>
<tr>
<td>MB ChB students</td>
<td>74.3</td>
<td>8.3</td>
<td>0.08</td>
<td>1.5</td>
<td>15.7</td>
</tr>
<tr>
<td>BOH students</td>
<td>69.0</td>
<td>14.7</td>
<td>0.00</td>
<td>1.7</td>
<td>14.7</td>
</tr>
<tr>
<td>BPharm students</td>
<td>64.3</td>
<td>21.4</td>
<td>0.00</td>
<td>1.3</td>
<td>13.0</td>
</tr>
<tr>
<td>BPhty students</td>
<td>87.7</td>
<td>7.5</td>
<td>0.00</td>
<td>1.2</td>
<td>3.6</td>
</tr>
<tr>
<td>BRT students</td>
<td>95.8</td>
<td>4.2</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Ethnicity—In 2010, Māori, Pacific and New Zealand European students were under-represented, while Asian students were over-represented in Otago’s health professional programmes (Table 5).

Māori students were also under-represented in the wider University of Otago student population, Health Sciences population and each of the professional programmes. The professional programme with the highest proportion of Māori students was the MB ChB.
When assessing Māori participation it is more accurate to compare with the domestic student population as there were very few international students who identified as Māori.

Pacific students were also under-represented in the wider University student population, Health Sciences population, and each of the professional programmes. The professional programme with the highest proportion of Pacific students was the MB ChB. A significant minority of Pacific students were international students, so there is validity in comparing Pacific students with both the total student population and the domestic student population.

New Zealand European and Other students were slightly over-represented in the wider University student population, but under-represented in the Division of Health Sciences, and in each of the professional programmes except the Bachelor of Physiotherapy and the Bachelor of Radiation Therapy. In the Bachelor of Dental Technology only 24.7% of students identified as New Zealand European and in the Bachelor of Pharmacy, only 37.5% of students identified as New Zealand European.

Asian students were over-represented in the wider University population, Health Sciences population and each of the professional programmes. Nearly 50% of international students at the University in 2010 were from Asian nations; however the over-representation in the Division of Health Sciences, and in the professional programmes, was still apparent when the analysis was restricted to domestic students.

The Bachelor of Dental Technology had 73.1% of all students, and 72.0% of domestic students who identified as Asian, and in the Bachelor of Pharmacy the corresponding figures were 63.0% and 57.5% respectively. The Bachelor of Dentistry also had a high proportion of Asian students, with figures of 56.5% for all students, and 49.6% for domestic students.

**Socioeconomic deprivation**—At a national level, the number of people in each NZDep category is roughly equal; however for all eight professional programmes there was a preponderance of students from areas of low deprivation (Figures 1–8). This pattern was least pronounced in the Pharmacy and Medical Laboratory Science programmes (Figures 1 & 2).

The socioeconomic pattern for Māori (Figure 9) and Pacific (Figure 10) students differed markedly from the pattern for students who identified as European and Other (Figure 12), with a greater proportion of Māori and Pacific students recording home addresses in socioeconomically deprived neighbourhoods.
### Table 5. Ethnicity (2010 year; domestic and international students)

<table>
<thead>
<tr>
<th>Population</th>
<th>Māori (%)</th>
<th>Pacific (%)</th>
<th>Asian (%)</th>
<th>NZ European and Other (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ</td>
<td>15.2</td>
<td>7.7</td>
<td>11.1</td>
<td>75.3</td>
</tr>
<tr>
<td>NZ 18–24 year old</td>
<td>17.0</td>
<td>8.8</td>
<td>13.8</td>
<td>60.4</td>
</tr>
<tr>
<td>University of Otago students</td>
<td>7.6</td>
<td>3.1</td>
<td>17.2</td>
<td>78.9</td>
</tr>
<tr>
<td>University of Otago domestic students</td>
<td>8.7</td>
<td>3.3</td>
<td>12.8</td>
<td>83.8</td>
</tr>
<tr>
<td>Health Science Professional Programme students</td>
<td>5.4</td>
<td>2.2</td>
<td>41.1</td>
<td>57.8</td>
</tr>
<tr>
<td>Health Science Professional Programme domestic</td>
<td>6.3</td>
<td>2.3</td>
<td>34.2</td>
<td>65.0</td>
</tr>
<tr>
<td>students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDS students</td>
<td>4.1</td>
<td>0.7</td>
<td>56.5</td>
<td>44.2</td>
</tr>
<tr>
<td>BDS domestic students</td>
<td>5.3</td>
<td>0.9</td>
<td>49.6</td>
<td>50.9</td>
</tr>
<tr>
<td>BDentTech students</td>
<td>1.1</td>
<td>4.3</td>
<td>73.1</td>
<td>24.7</td>
</tr>
<tr>
<td>BDentTech domestic students</td>
<td>1.2</td>
<td>4.9</td>
<td>72.0</td>
<td>25.6</td>
</tr>
<tr>
<td>BMLSc students</td>
<td>1.7</td>
<td>1.7</td>
<td>38.3</td>
<td>63.3</td>
</tr>
<tr>
<td>BMLSc domestic students</td>
<td>1.8</td>
<td>1.8</td>
<td>36.4</td>
<td>65.5</td>
</tr>
<tr>
<td>MB ChB students</td>
<td>6.4</td>
<td>2.5</td>
<td>36.1</td>
<td>62.4</td>
</tr>
<tr>
<td>MB ChB domestic students</td>
<td>7.6</td>
<td>2.7</td>
<td>27.0</td>
<td>72.2</td>
</tr>
<tr>
<td>BOH students</td>
<td>5.2</td>
<td>3.4</td>
<td>37.9</td>
<td>55.2</td>
</tr>
<tr>
<td>BOH domestic students</td>
<td>6.1</td>
<td>4.0</td>
<td>32.3</td>
<td>59.6</td>
</tr>
<tr>
<td>BPharm students</td>
<td>3.4</td>
<td>2.3</td>
<td>63.0</td>
<td>37.5</td>
</tr>
<tr>
<td>BPharm domestic students</td>
<td>3.9</td>
<td>2.4</td>
<td>57.5</td>
<td>43.1</td>
</tr>
<tr>
<td>BPhty students</td>
<td>6.3</td>
<td>1.8</td>
<td>16.9</td>
<td>81.3</td>
</tr>
<tr>
<td>BPhty domestic students</td>
<td>6.6</td>
<td>1.6</td>
<td>15.3</td>
<td>83.1</td>
</tr>
<tr>
<td>BRT students</td>
<td>8.5</td>
<td>0.0</td>
<td>22.5</td>
<td>77.5</td>
</tr>
<tr>
<td>BRT domestic students</td>
<td>8.5</td>
<td>0.0</td>
<td>22.5</td>
<td>77.5</td>
</tr>
</tbody>
</table>

### Figure 1. Bachelor of Pharmacy students by NZDep
NZDep (index of socioeconomic deprivation)

Figure 2. Bachelor of Medical Laboratory Science students by NZDep

![Bar chart showing the proportion of Bachelor of Medical Laboratory Science students by NZDep index of deprivation.]

NZDep Index of Deprivation
1 = Least Deprived 10 = Most Deprived

Figure 3. Bachelor of Medicine and Bachelor of Surgery students by NZDep

![Bar chart showing the proportion of Bachelor of Medicine and Bachelor of Surgery students by NZDep index of deprivation.]

NZDep Index of Deprivation
1 = Least Deprived 10 = Most Deprived
Figure 4. Bachelor of Dental Surgery students by NZDep

Figure 5. Bachelor of Physiotherapy students by NZDep

Figure 6. Bachelor of Radiation Therapy students by NZDep
Figure 7. Bachelor of Oral Health students by NZDep

Figure 8. Bachelor of Dental Technology Health students by NZDep

Figure 9. Māori Health Science professional programme students by NZDep
School socioeconomic scores—Students from schools with a decile rating of less than 4 (socioeconomically disadvantaged) were under-represented in the University population, the Health Sciences population and the professional programme population (Table 6).
Figure 12. New Zealand European and Other Ethnicity Health Science professional programme students by NZDep

Table 6. School socioeconomic score* (2010 year; domestic students)

<table>
<thead>
<tr>
<th>Population</th>
<th>Decile &lt; 4 (%)</th>
<th>Decile between 4 and 7 (%)</th>
<th>Decile &gt; 7 (%)</th>
<th>Decile unknown (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Otago students</td>
<td>3.5</td>
<td>29.8</td>
<td>43.0</td>
<td>23.7</td>
</tr>
<tr>
<td>Health Science Professional Programme students</td>
<td>3.4</td>
<td>27.1</td>
<td>50.9</td>
<td>18.6</td>
</tr>
<tr>
<td>BDS students</td>
<td>2.7</td>
<td>19.9</td>
<td>51.7</td>
<td>25.7</td>
</tr>
<tr>
<td>BDentTech students</td>
<td>4.3</td>
<td>17.2</td>
<td>58.1</td>
<td>20.4</td>
</tr>
<tr>
<td>BMLSc students</td>
<td>10.0</td>
<td>38.3</td>
<td>43.3</td>
<td>8.3</td>
</tr>
<tr>
<td>MB ChB students</td>
<td>2.4</td>
<td>26.0</td>
<td>50.7</td>
<td>20.8</td>
</tr>
<tr>
<td>BOH students</td>
<td>6.9</td>
<td>32.8</td>
<td>37.9</td>
<td>22.4</td>
</tr>
<tr>
<td>BPharm students</td>
<td>3.4</td>
<td>29.7</td>
<td>47.7</td>
<td>19.3</td>
</tr>
<tr>
<td>BPhty students</td>
<td>4.2</td>
<td>32.5</td>
<td>55.7</td>
<td>7.5</td>
</tr>
<tr>
<td>BRT students</td>
<td>7.0</td>
<td>31.0</td>
<td>62.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*1 (lowest socioeconomic level schools) — 10 (highest socioeconomic level schools).

Discussion

The analysis shows that in 2010 students studying in health professional programmes at the University of Otago were largely from outside the Otago region (88.1%), and were either New Zealand citizens or permanent residents (84.8%). Female students were over-represented (59.6%). It is important to note that the distribution of citizenship by programme is significantly influenced by government funding decisions.

Within the domestic student cohort, the majority of students in the professional programmes self-identified as being within the New Zealand European and Other
category (65.0% compared with 75.3% of the national population). To a lesser extent, students also identified as Asian (34.2% compared with 11.1%), as Māori (6.3% compared with 15.2%), and as Pacific (2.3% compared with 7.7%).

A large proportion of students came from socioeconomically advantaged areas and only 3.4% of students had attended secondary schools with a socioeconomic decile of less than 4. The increased number of students living in areas categorised as NZDep 9 is probably due to some students, particularly those who are permanent residents, listing Dunedin North as their ‘home’ address.

It is clear that at the University of Otago, in New Zealand and around the world, health science faculties struggle to achieve a balance of students which reflects the ethnic and socioeconomic reality of the societies they serve.\textsuperscript{20–24} In historical terms this is understandable as universities have traditionally been elitist educational institutions which have developed within the context of socially and ethnically stratified societies.

Furthermore, there are disparities in access to quality high school educational opportunities for some sectors of our population. Health professional selection policies and student support policies should attempt to counter some of these historical and social forces.

The University of Otago has a range of strategic policies and processes aimed at ensuring we play our part in modifying the historic imbalances within the health professional student programmes, the wider health sector and indeed society. These policies broadly fall into two categories: those aimed at attracting and recruiting students from diverse backgrounds, and those aimed at responding to the specific learning needs of vulnerable student groups (for example, those from low decile schools).

The University’s Division of Health Sciences has adopted a number of policies to assist with attracting and recruiting students from diverse backgrounds. In an attempt to broaden access to the health professional programmes, the University has a common First Year Health Science programme.

This programme allows students to further improve their knowledge base in subjects appropriate to the study of health professional programmes. This enables students from diverse educational and societal backgrounds to compete more appropriately for places in health professional programmes. However, this approach to levelling the playing field is offset to some extent by the differences in preparation of students at secondary school, and the competitive and academically challenging nature of this course of study.

Therefore, part of the ongoing solution is ensuring that all key stakeholders, including as the Ministry of Education, Ministry of Health, Tertiary Education Commission and the University, work together to continue to improve educational outcomes for all young people, from a range of backgrounds and at all levels.

Various further strategies have been adopted by the University to redress the imbalances of our student cohorts including a school-leavers’ bridging programme for Māori and Pacific students taught by the University’s subsidiary Foundation Studies.
This approach is showing early success, as are similar programmes for medical students in the UK.\textsuperscript{25}

The University also runs several science outreach programmes focused towards keeping secondary school students active in, and inspired by, the field of science. For example, a series of ‘Science Wananga’ aims to engage and inspire Māori students by making science relevant and positive for them through stimulating, hands-on science projects that are relevant to their local area. The Science Wananga are undertaken in a number of communities by Māori and non-Māori University staff and postgraduate students.

The University has also recently established the Otago University Advanced School Sciences Academy, which is tasked with enhancing experience and knowledge of research science to motivated young rural students and students from low decile schools.

The ways in which students are selected into restricted health professional programmes are debated.\textsuperscript{22} Tests of cognitive ability dominate, but alongside these various other methods are advocated including, amongst others, aptitude tests, psychological tests, student interviews, and random selection.\textsuperscript{22,26,27} Presently, the University’s selection processes identify students who have the aptitudes (as measured by the Undergraduate Medicine and Health Sciences Admission Test\textsuperscript{28} (UMAT) in most cases) and academic ability (as measured by grade point average) to successfully complete its long and demanding programmes.

Amongst students who meet the aptitude and academic threshold other selection decisions are made to ensure that we are honouring our commitment to produce health professionals equipped to meet the needs of society. For example, across all of our professional programmes, Māori and Pacific students who meet the admissions criteria are given priority. As well, student interviews are used for Dentistry and Physiotherapy.

While there are still too few Māori and Pacific applicants above the academic threshold to match the demographic make-up of society, progress is nevertheless being made. For example, the proportion of Māori students in the 2012 second year medical school class was 15.7%. This proportion reflects the demographic characteristics of the broader society in which they will enter as future Doctors.

Also, in the medical programme special consideration, as part of a government initiative, is given to students from rural backgrounds and there is the ability to provide special entry for those with a demonstrable commitment to pursuing a career in mental health.

The graduate and ‘other/alternative’ category entry pathways available in most professional programmes provide further opportunities for ‘selecting in diversity’ from a pool of academically able students.\textsuperscript{29} Recent evidence, however, from the UK suggests that graduate entry pathways have had little effect on the socioeconomic profile of UK medical students.\textsuperscript{25,30} In 2010, approximately 20\% of those who were offered a place within the eight health professional programmes at Otago entered via these categories and did so having completed a prior degree.
The Division of Health Sciences has also adopted policies aimed at responding to the specific learning needs of vulnerable student groups. For example, specific leadership roles have been defined and created in most of the professional programmes to support Māori students and similar roles have been created for Pacific students.

The Division recently established the Pacific Islands Research and Student Support Unit and the Māori Health Workforce Development Unit. These Units are responsible for setting the high-level strategic direction in their respective areas as well as developing and providing programmes which support the specific learning needs of their students. Programmes are wide ranging and cover areas such as secondary school and community engagement, successful transition from secondary school to University and targeted support in the Health Sciences First Year course.

This study is based on analyses of routinely collected student data. The data are considered to be of high quality and the proportion of missing data is small. As detailed in the methods section, the data are a mix of verified and unverified fields and, as a consequence, there may be some error in the home address field. It is not possible to quantify the magnitude of any such error.

The above analysis shows that the Schools and Faculties within the University of Otago’s Division of Health Sciences do not achieve the perfect mirror of society we hope for, and we strive to improve both our selection processes, within the constraints and limitations of the available selection tools, and our student support mechanisms. We will continue to refine these policies and work with other key stakeholders in better preparing school leavers for health professional programmes.

Competing interests: None known.

Author information: Peter Crampton, Pro-Vice-Chancellor, Division of Health Sciences, University of Otago, Dunedin; Naomi Weaver, Planning and Institutional Research Analyst, University of Otago, Dunedin; Andrea Howard, Director, Policy and Programmes, Division of Health Sciences, University of Otago, Dunedin

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Correspondence: Professor Peter Crampton, Pro-Vice-Chancellor, Division of Health Sciences, PO Box 56, University of Otago, Dunedin, New Zealand. Email: peter.crampton@otago.ac.nz

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5. Global Consensus for Social Accountability of Medical Schools. Global Consensus for Social Accountability of Medical Schools: Global Consensus for Social Accountability of Medical Schools, 2010. [http://healthsocialaccountability.org/]


Students’ perceptions of the Undergraduate Medicine and Health Sciences Admissions Test (UMAT)

Divya Dhar, William R G Perry, Phillippa Poole

Abstract

Aim Medical schools are still evaluating the place of general cognitive tests in medical student selection. This study explored medical student perceptions of UMAT, and how they prepared for taking the test.

Method Medical students at The University of Auckland and University of Otago in New Zealand were invited to complete a mixed-modality survey.

Results Students had reservations, with 56% reporting UMAT is not an important test for medical students’ selection and 67% that it is not a fair test. Eighty-one percent believe it is a stressful or very stressful test. The degree of importance or stress related to the weighting of UMAT in selection decisions. More than half of students spent more than $100 on books and $400 on courses to prepare for UMAT, in addition to the costs of sitting the test.

Conclusion At present, the majority of medical students in New Zealand who responded to the survey do not see UMAT as an acceptable test of non-cognitive attributes. It is costly to students and also stressful.

Medical schools are under increasing pressure to select medical students who will cope with the rigorous curriculum, have traits desirable in a good doctor and represent the society they serve. Whilst doing so, there is an expectation of transparency and acceptability of the selection process, given the large numbers of worthy candidates, yet limited places.

Amongst others, personality and ability to reason have long been seen as important traits for doctors. Various tools have been used to attempt to measure these traits including structured interviews, references, personal statements and personality tests. Although these have face validity, with the exception of the Multiple Mini Interview, none is particularly reliable.

The Undergraduate Medicine and Health Sciences Admission Test (UMAT) is used widely across Australasia as a tool to select entrants to undergraduate medical programme. In New Zealand, selection for medical school entry occurs after one year at university or prior degree.

UMAT was introduced as part of the selection process in NZ in 2003. All domestic applicants must sit UMAT, however it is given less weighting in making ranking decisions than prior academic achievement determined by an academic score. Developed by the Australian Council for Educational Research, the UMAT comprises three parts: Section 1 (logical reasoning and problem solving), Section 2 (understanding people) and Section 3 (non-verbal reasoning).
The UMAT website states that it’s an aptitude test “designed to assess general attributes and abilities gained through prior experience and learning; … these abilities are considered important to the study, and later practice, of professions in the health sciences.”\textsuperscript{10} The test can be taken only once a year (July), in dedicated test centres.

Despite its extensive use, research to date is sparse. A 2011 study suggested that it held limited predictive validity for subsequent academic performance.\textsuperscript{11} Anecdotally, UMAT is associated with high stress, pressure to attend coaching and purchase preparatory material, and take the test more than once in the hope that scores increase. There is one report from Australia that included student perceptions on the benefit of coaching for interview and UMAT, but none on what medical students think of UMAT, how students prepare, or the cost of this preparation.\textsuperscript{12}

This study aimed to explore NZ medical student perceptions of UMAT and its effect upon them. In particular we were interested in students’ perceptions of UMAT, their preparation, and its associated costs and impact.

\textbf{Methods}

\textbf{Study design}—We developed a 35-question survey to investigate medical students’ perception of UMAT. It was reviewed by university academic staff and the New Zealand Medical Students’ Association (NZMSA) executive. The study was approved by the Human Participants’ Ethics Committee at the University of Auckland and the University of Otago Human Ethics Committee.

In November 2009, all medical students who were enrolled at the University of Auckland or the University of Otago were invited to complete the questionnaire. Students were informed of the online questionnaire via student email lists, or had the opportunity to fill out a paper version at the end of class congregations. They were asked to complete only one questionnaire.

The online version was hosted on the NZMSA website. Both versions were completed anonymously and took about 10 minutes. Response modes included yes/no options or choice of descriptor from a 4 or 5 point Likert scale. The only discrepancy between versions was in selecting ethnicity: students could only select one ethnic category online, whereas students completing the paper version could select more than one group. If more than one ethnicity was listed, this was prioritised in the order Māori, Pacific Island, Asian, then European/Other.

We performed a posthoc analysis to compare the paper responses with the online responses in order to assess whether the method of response may have introduced bias.

\textbf{Perception}—Importance of UMAT in selection was tested using binary logistic regression. The responses were grouped into two categories (Not at all/Not very or fairly/very/extremely). All demographic data were incorporated as explanatory variables. Additional variables were whether UMAT reflected cultural values and whether UMAT tested for non-cognitive attributes required in doctors.

Fairness of UMAT was tested using binary logistic regression. It used the same explanatory variables as above including the additional variables.

The stressfulness of sitting UMAT was tested using an ordinal logistic regression. The five Likert categories were reduced to four with ‘Not at all’ and ‘Not really’ grouped together. It used the same explanatory variables as above.

Responses to the question about the value of each section in selecting medical student were combined into one chi square analysis.

\textbf{Preparation}—Costs of preparation were tested using an ordinal logistic regression. For cost, the outcome was grouped into 0, $50-$200, $250-$650, $750+. It used the same explanatory variables as above, with the addition of the student rating of importance, fairness and stress.

The effect of re-sitting was tested using a chi square test to determine if the results in the best section increased on taking the UMAT test more than once.
Results

A total of 1325 of 2043 students responded (65%) with a mean age of 22. Of these, 398 (30%) responded online. There were 569 responders out of 847 students at The University of Auckland (67%) and 756 out of 1196 students from University of Otago (63%). Demographic data are presented in Table 1.

Table 1: Demographic distribution of respondents

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
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<td></td>
</tr>
<tr>
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<tr>
<td>Other</td>
<td>305</td>
<td>23</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>76</td>
<td>6</td>
</tr>
<tr>
<td>Pacific</td>
<td>47</td>
<td>4</td>
</tr>
<tr>
<td>Asian</td>
<td>418</td>
<td>32</td>
</tr>
<tr>
<td>European/Other</td>
<td>784</td>
<td>59</td>
</tr>
<tr>
<td>Entry type</td>
<td></td>
<td></td>
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<tr>
<td>School or First Year University</td>
<td>835</td>
<td>63</td>
</tr>
<tr>
<td>University graduate</td>
<td>265</td>
<td>20</td>
</tr>
<tr>
<td>Māori and Pacific Scheme</td>
<td>80</td>
<td>6</td>
</tr>
<tr>
<td>International student</td>
<td>80</td>
<td>6</td>
</tr>
<tr>
<td>Rural entry scheme</td>
<td>93</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>146</td>
<td>11</td>
</tr>
<tr>
<td>Year level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBChB 2</td>
<td>392</td>
<td>30</td>
</tr>
<tr>
<td>MBChB 3</td>
<td>298</td>
<td>22</td>
</tr>
<tr>
<td>MBChB 4</td>
<td>179</td>
<td>13</td>
</tr>
<tr>
<td>MBChB 5</td>
<td>230</td>
<td>17</td>
</tr>
<tr>
<td>Trainee Intern</td>
<td>220</td>
<td>17</td>
</tr>
<tr>
<td>BMEdSci/BHB Honours</td>
<td>6</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Method of response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online</td>
<td>398</td>
<td>30</td>
</tr>
<tr>
<td>Paper</td>
<td>927</td>
<td>70</td>
</tr>
</tbody>
</table>

Of the 1325 respondents, 1221 (92%) had sat UMAT. The following results are based on this population of 1221 respondents.

Perception—4% believed that UMAT was extremely important for selection, 8% said it was very important, 31% said it was fairly important, 56% said it was not or not really important. Otago students were more likely to think it important (P<0.03).

When asked “Were there any aspects of your UMAT test(s) that you feel reflected cultural values?” 28% answered “yes”. Of these, 76% replied “yes” to the question...
“Were they culturally appropriate for a New Zealand context.” Thirty percent said that what they perceived to be the likely correct answer was against their cultural belief.

In response to “Do you think the UMAT test is a fair test?” 67% of students replied “no.”

Respondents noted high stress associated with the process of UMAT, with 40% and 41% finding it to be stressful or very stressful respectively. There was evidence of an influence of medical school with University of Otago students reporting higher levels of stress (P<0.01).

When asked how well it assessed non-cognitive attributes required as doctors, 3% said very much, 26% somewhat, 17% neutral, 31% not really, and 23% said not at all. Those more supportive that it assessed non-cognitive attributes were less likely to consider it unfair (P<0.001).

There were differences (P<0.001) in how students perceived the value of each UMAT section in selecting students for medical school. Responses are presented in Figure 1.

Figure 1. How valuable each section is in selecting students for medical school (percentage of respondents)

Perceived value of each UMAT section in selecting students for medical school

Preparation—21% of students reported sitting UMAT more than once; of these, 70% reported gaining higher marks in a subsequent test.

Students were asked to indicate in which section they performed the best. Thirty-six percent of students said that Section 2: ‘Understanding people’ was their best; 33% Section 1: ‘Logical Reasoning and Problem Solving’; and 27%, Section 3: ‘Non-verbal Reasoning’. There was strong evidence that the best section depended on
whether or not they re-sat (P<0.001) with Section 3 more likely to be the better section for those who did so.

Thirty-one percent sat a UMAT course prior to their examination, and 7% took more than one course. Of those who sat a course, 52% spent between $0–$400, 46% between $400–$800, and 2% greater than $800.

Thirty-two percent read books to prepare them for UMAT. Books did not incur cost for 37% of students. There was a cost of between $0–$100 for 13% of students, between $100–$200 for 45% of students, and more than $200 for 5% of students.

Those who sat UMAT preparatory courses were asked if they believed it helped with each section. Forty-nine percent believed it did so for Section 1, 34% for Section 2, and 3% for Section 3.

With respect to money spent on UMAT courses, there was evidence of an influence of ethnicity (P<0.001), age (P<0.007), and perceived stress (P<0.001). Asian students, and those who were younger, or feeling more stressed spent more.

Method of response—There was no difference between student responses with paper versus online questionnaires in the reporting of costs (p=0.0586), stress (p=0.5377) or fairness of UMAT (p=0.5351). The only response that showed a significant effect (p=0.002) was importance, with those responding online considering UMAT was less important in selecting medical students than those responding via paper.

Discussion

This study is among the first to assess students’ perceptions of the general cognitive test, UMAT. It indicates that the majority of New Zealand medical students who responded to this survey are unconvinced that UMAT is an important test for selecting medical students. This seemed to be for two reasons: first that they were ambivalent that it judged the non-cognitive attributes required of a doctor. Second, it may not be a fair test.

Further, we found there was a difference in how students perceived the three UMAT sections. Section 3 was felt to be the least valuable in selecting medical students and often stated as the worst section, yet also was the one most felt they improved on if they re-sat the test. This is consistent with a 2008 study that showed a mild increase in marks for Section 3 after coaching and re-sitting.\textsuperscript{12} By contrast, students in the present study did not think that preparatory courses helped them with Section 3. The explanation for this discrepancy is not clear, but does raise the possibility that questions in Section 3 are relatively unfamiliar, with the best way to address this being self-directed learning, after they have been seen once in the test setting.

The responses may reflect general uncertainty as to what UMAT measures, as there have been so few predictive validity studies to date. Additionally, it could be argued that students within a programme may not be in a position to judge how well UMAT measures traits important for medical practice. Against this is that a third of the respondents were from later years of the programme and will be learning and being assessed on attributes important in medical practice.

Our data suggest the weighting of UMAT in the selection process is an important influencing factor in students’ perception of stress and how important it is. Over 80%
of students feel that UMAT was stressful or very stressful. Of those who felt it was stressful, it is more likely that these students were from the University of Otago. Furthermore, those who believe it is important are also more likely to be from University of Otago. A conclusion is that this is due to UMAT having a weighting of 34% percent in University of Otago selection compared to only 15% percent at The University of Auckland.

The paper highlights the cost associated with this admissions test: about half of students spent more than $400 on courses and more than $100 on books. A fifth sat UMAT more than once. UMAT may be a convenient tool to diversify the pool of applicants; however the costs associated may prove to be a barrier to students already disadvantaged socioeconomically, educationally, or by distance.

A quarter of students indicated that the UMAT test had a cultural dimension, but most were of the view that this was aligned with the cultural values in New Zealand. While a minority felt the likely correct answer was at odds with their own values, this is difficult to interpret as the correct answers are not known.

These findings underscore the need to ensure selection tests are developed and validated with a view towards the setting in which they are to be used.

Strengths of the study are the relatively high numbers and return rate for a student survey, and that it was a national study with similar return rates between the two universities. The distribution by gender, ethnicity, English as first language and age was generally reflective of the medical school populations in NZ.

The students who did not sit UMAT were mainly international students, along with several domestic graduates and school leavers. There is internal consistency of the responses, in particular, that more stress was seen in the Otago students for whom UMAT was a higher stakes test. As most medical schools now use a combination of academic achievement and general cognitive tests, as in our study, the results are likely to have relevance in other settings.

Weaknesses of this study are methodological. Students were able to take the survey online or in the hard-copy format. Although students were asked to sit this survey only once, we cannot guarantee this took place as surveys were completed anonymously. Most completed a paper survey at the end of a class, making it hard to respond more than once in that format.

We argue that any bias from students completing more than one survey is not large: first, a minority (30%) responded on line; second, there were slight differences in the demographic details of the responders; finally, we observed a fairly similar pattern of responses between those done on paper and those on-line, with only one of 30 comparisons suggesting any interaction caused by the response method (p=0.04).

The study was retrospective and reliant on students’ recollection of events. It is possible that responses reflect more negatively on UMAT given the frequent debates amongst medical schools as to its validity. Results would be strengthened if we had been able to validate student perceptions with the UMAT scores achieved. However, we could not identify students and did not have access to their UMAT scores.

It is not known how NZ students perceive the other selection tools used in determining who will be offered a place in medical school; hence it is difficult to
judge whether UMAT has undue stress in an inherently stressful process. Nonetheless, we believe schools need to be mindful of the extra stress and cost of sitting UMAT, and seek to minimise this, especially as its validity is uncertain.

The fairness of allowing results from re-sits also needs to be considered, given this may potentially disadvantage students from lower socioeconomic backgrounds. It is notable that recently, the UMAT consortium changed the policy of use of test scores so that 2012 UMAT scores can be used for admission only in the year following the test; i.e. for 2013 but not for 2014.  

Future studies could explore qualitative angles in an attempt to better explain the perceptions outlined in this study. A study of the student view as to how best to select medical students may be in order.

In conclusion, this is the first study the authors are aware of that primarily investigates students’ perceptions of UMAT. At present, the majority of NZ medical students have reservations about the acceptability of UMAT as a test of non-cognitive attributes. UMAT is costly to students and also stressful; this seems to relate to the degree of weighting.

These findings are a stimulus to medical schools to continue to validate UMAT, including the way it is used in selection decisions, and to promulgate this information to current and prospective students.

**Competing interests:** None known.

**Author information:** Divya Dhar, Resident Medical Officer, MPA Candidate, Harvard University, Cambridge, MA—and MBA Candidate, University of Pennsylvania, Philadelphia, PA, USA; William R G Perry, General Surgical Registrar, Canterbury District Health Board, Christchurch—and Consultant, World Health Organization; Phillippa Poole, Associate Professor, Department of Medicine, Faculty of Medical and Health Sciences, The University of Auckland

**Acknowledgements:** We thank Professor Tim Wilkinson (University of Otago), Joanna Stewart (University of Auckland), New Zealand Medical Students’ Association, and New Zealand Medical Association for their assistance; and students of the two universities for their survey participation.

**Correspondence:** Dr Divya Dhar, 12 Speyside Crescent, Dannemora, Auckland 2016, New Zealand. Email: divya@nzmsa.org.nz

**References:**

Using real-time ultrasound to teach living anatomy: an alternative model for large classes

Mark D Stringer, Lynda J Duncan, Latika Samalia

Abstract

**Aims** Ultrasound is a safe, non-invasive and versatile imaging modality used widely in clinical practice. Several studies have reported using ultrasound imaging to supplement teaching of clinical anatomy to medical students but most have attempted to teach basic ultrasound skills in addition to normal sonographic anatomy. These small group teaching sessions are labour intensive and need appropriate resourcing of equipment and personnel. We report experience of an alternative approach suitable for large classes with more limited resources.

**Methods** A single 1-hour ultrasound demonstration of 'living anatomy' of the abdomen, pelvis and neck was conducted using a young female model as the subject. Scans were performed by an experienced sonographer with images projected on to a large lecture theatre screen; medical student interaction was encouraged by two clinical anatomists.

**Results** Anonymous evaluation of 152 returned questionnaires (≥ 63% response rate) showed that more than 80% of respondents considered the session had stimulated and improved their understanding of anatomy.

**Conclusions** Whilst this method of teaching anatomy using ultrasound does not offer hands-on experience, it does provide students with an introduction to the clinical utility of ultrasound and, by focusing on anatomic findings rather than the acquisition of technical imaging skills, reinforces the learning of clinical anatomy.

Several studies have reported on the use of ultrasound to teach anatomy to medical students.1–9 Three of these were published as abstracts only,4–6 three focused on echocardiography,3,7,9 and all except two7,9 attempted to teach students to acquire basic sonographic imaging skills as well as anatomy.

Although the vast majority of students in all studies evaluated ultrasound as a useful learning tool for reinforcing anatomy and enjoyed the practical hands-on experience, some limitations were noted including large group size restricting access to equipment1,2 and the limited availability of places (less than 20% of the class cohort in two studies).4,7

Using ultrasound to reinforce anatomy appears to be educationally worthwhile but equipping medical students with basic ultrasound skills to achieve this, whilst a laudable goal, has some drawbacks. It is labour and resource intensive requiring time, appropriate numbers of trained supervisors, and sufficient equipment to teach small groups. There is also the potential danger of sending the wrong message: ultrasound imaging is highly operator dependent and it often takes months or even longer to become proficient. It is arguable just how much "...students acquire the skills to
perform and interpret ultrasound..." in short sessions where they are also focusing on learning normal anatomy. This concern also has an ethical dimension since it is possible that a student who volunteers to be examined might be prompted to do so because of a personal health concern and be falsely reassured by a "normal scan". Unless ultrasound imaging is vertically integrated into the curriculum allowing students enough time and exposure to develop their skills it is unlikely that these obstacles will be overcome.

Ivanusic et al (2010) reported using an alternative approach consisting of a 1-hour echocardiography demonstration performed by an expert examining a student volunteer with images projected to the remainder of the student group. This was highly rated by the students who commented that it reinforced lecture material in a stimulating way and demonstrated clinically relevant anatomy. Recently, Griksaitis et al (2012) reported a similar but shorter (30 minute) class demonstration to teach cardiac anatomy; they took the precaution of screening the student volunteer prior to the demonstration.

As in many other institutions, we use modern imaging techniques (computed tomography [CT], magnetic resonance imaging [MRI], endoscopy videos etc) to supplement and reinforce the teaching of clinical anatomy. In 2008, we introduced a single ultrasound demonstration session to third year medical students. The popularity of this session encouraged us to retain it and this report describes our experience to date.

**Methods**

A single 1-hour ultrasound demonstration of living anatomy was delivered to third year medical students (class size = 240–260) in 2008, 2009, and 2011 (in 2010 an abdominal body painting session was trialled in its place). In 2008, attendance was entirely voluntary but, after positive student feedback, the demonstration became a scheduled class activity.

The session was timed to coincide with the end of a regional and clinical anatomy module which is in the latter part of the academic year and precedes the students moving to ward-based learning in years 4 and 5 of the curriculum. An experienced medical sonographer (LD) gives a brief introduction on the properties of transmitted sound waves, image orientation, the safety of ultrasound and its advantages, limitations, and clinical applications.

The sonographer then demonstrates selected anatomy in the abdomen, pelvis, and neck in a consenting young, slim, female volunteer (a paid actress). The actress is scanned in the week prior to the demonstration in order to exclude pathology and to ensure that she is comfortable with the scanning process. She is instructed to attend the demonstration with a full bladder and having fasted overnight (the demonstration is held at 9 am). Sonographic images are projected on to a large lecture theatre screen (Figure 1). Two clinical anatomists (MDS and LS) provide commentary and encourage interactive questioning from the student audience.

High resolution ultrasound images are obtained using an ACUSON Antares™ Premium Edition machine (Siemens Medical Solutions, CA, USA) equipped with a CH2-6 curvilinear transducer (2.86–3.33 MHz) for abdominal imaging and a VF13-5 linear transducer (10 MHz) for scanning the neck and anterior abdominal wall. The scanning sequence begins with the pelvis, after which the model takes a break to empty her bladder, and then scanning continues with the abdomen and neck. Table 1 lists the structures that are demonstrated. Colour Doppler is used to show blood/fluid flow (Figure 2) and typical arterial and venous waveforms.
Figure 1. Organisation of the ultrasound demonstration session. Sonographic images are projected on to a large lecture theatre screen (lighting is reduced to enhance viewing).

Table 1. Anatomical structures demonstrated by ultrasound

<table>
<thead>
<tr>
<th>Region</th>
<th>Structures demonstrated</th>
</tr>
</thead>
</table>
| Pelvis | - uterus (including the endometrium and phase of the menstrual cycle) and cervix  
- ovaries (with follicles)  
- rectouterine pouch  
- bladder (including ureteric peristalsis and urine flow into the bladder)  
- external iliac and femoral vessels (emphasising the surface marking of the latter) |
| Abdomen | - rectus abdominis muscle and rectus sheath with epigastric vessels (the inferior epigastric artery being traced from its origin from the external iliac artery near the deep inguinal ring)  
- liver (right and left lobes, portal vein, hepatic artery and veins) and diaphragm  
- gallbladder and extrahepatic bile ducts  
- spleen  
- kidneys (including measurement of length)  
- pancreas  
- abdominal aorta (including origin of the celiac trunk and superior mesenteric arteries) and inferior vena cava  
- renal vessels  
- gut peristalsis (and the difficulties of imaging the normal appendix) |
| Neck | - carotid sheath  
- thyroid gland |
At the end of the first ultrasound demonstration in 2008, students were invited to complete an anonymous questionnaire evaluating the session using a five-point Likert scale to grade responses, with responses ranging from grade 1 (excellent) to grade 5 (very poor). Questionnaires were collected by a student representative and analysed independently by the University of Otago Higher Education Development Centre.

Results

152 questionnaires were returned, a response rate of at least 63% (attendance in 2008 was voluntary and the maximum possible class size was 240). Ratings are summarised in Table 2. Overall, responses were extremely favourable, with more than 90% of respondents considering that the session had stimulated and improved their understanding of anatomy.

Free text comments were overwhelmingly positive and included statements such as "a good introduction to using ultrasound", "good to have combination of different backgrounds of demonstrators", "awesome to see organs in the living body", "puts anatomy in context", and "good to get the exposure to a clinical technique we haven't seen much of yet". There were a few negative comments such as "everything looks like shades of grey", "the class size was too big to encourage questions", and "I couldn't see where the probe was on the subject".

Finally, a few students commented that they would like to see the heart, a pregnant patient, or a male subject. As a measure of the success of the session, third year medical students voted it the best teaching innovation for 2008.
Table 2. Summary of student responses to the evaluation questionnaire (n = 152)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Grade 1 &amp; 2 (very positive and positive)</th>
<th>Grade 3 (neutral)</th>
<th>Grade 4 &amp; 5 (negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overall, how valuable was this session for you?</td>
<td>95%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2. Did this session stimulate your interest in anatomy?</td>
<td>91%</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>3. Did the session improve your understanding of abdominal/pelvic anatomy?</td>
<td>82%</td>
<td>14%</td>
<td>4%</td>
</tr>
<tr>
<td>4. Did you like the interactive style of presentation?</td>
<td>94%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>5. Was the session well organised?</td>
<td>95%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>6. Do you think this approach is useful as an aid to learning the clinical relevance of anatomy?</td>
<td>97%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>7. Would you like to see this session repeated within future Regional &amp; Clinical Anatomy modules?</td>
<td>98%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>8. What did you like best about the session?</td>
<td></td>
<td>Free text responses (see text)</td>
<td></td>
</tr>
<tr>
<td>9. What did you like least about the session?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Any other comments</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Using ultrasound imaging to supplement other methods of teaching anatomy offers several opportunities. Firstly, it allows anatomy to be visualised in real time enabling students to appreciate dynamic aspects such as blood flow, peristalsis, and how anatomy may be influenced by respiration, posture, and body fat. Secondly, it underlines the clinical application of anatomical knowledge, particularly when structures are demonstrated by an expert who is using the same technique in everyday clinical practice. Thirdly, it complements standard anatomy teaching by emphasising clinical aspects such as renal length which often receive little attention when learning anatomy. Finally, it may help to emphasise the importance of human anatomical variation.

We deliberately introduced this session after students had completed the bulk of their anatomy learning in anticipation of them integrating the clinical real-time sonographic imaging with their existing knowledge gained from dissection, prosections, models, body painting, radiography, and cross-sectional imaging (CT and MRI). We were not aiming to teach students how to perform an ultrasound scan. Instead, we wanted to introduce them to this safe, non-invasive and widely available imaging technique with its unique strengths and weaknesses and enhance their learning of anatomy in the process.

Previous studies reporting the use of ultrasound to teach anatomy to medical students are shown in Table 3,1–9 which summarises the structure of each course, study subjects and anatomical regions studied. We chose a class demonstration with a hired model for a variety of reasons. Logistically, we had neither the resources nor manpower to offer hands-on training.
A high-quality ultrasound machine equipped with a range of transducers was used to provide images of optimum resolution, rather than relying on potentially inferior images displayed by smaller portable machines used in other studies.\textsuperscript{3,7,11,12} It is well known that the yield from ultrasound is highly operator dependent. Therefore, demonstration by a skilled expert should be more rewarding and using an actor/actress also removes any ethical dilemmas or anxiety surrounding the use of student volunteers (both the potential to discover pathology and that of providing false reassurance from a ‘normal scan’ done by a novice).

Although the students rated the session highly, sonographic visualisation of anatomy in this way does have limitations. The orientation of the image can be difficult to conceptualise when moving between structures and regions and students are denied hands-on experience.

We only evaluated learning by asking the students to what extent the session had improved their understanding of anatomy. Consequently, we addressed Kirkpatrick’s first level of effectiveness (reaction) but did not attempt to quantify the learning opportunity or its impact on the application of anatomy (behaviour and results).\textsuperscript{13} The positive wording of our questionnaire may have introduced a bias toward favourable responses. We would agree with Ivanusic et al. (2010)\textsuperscript{7} that ultrasound is best used to highlight specific anatomical features or concepts and used as an adjunct to other methods of teaching anatomy (including cross-sectional imaging), rather than as a substitute for these.

Interestingly, first year medical students in the UK randomised to learning gross cardiac anatomy by either cadaver prosections or a live echocardiography demonstration showed similar educational performance scores;\textsuperscript{9} unfortunately, the authors did not investigate the educational utility of combining these approaches. Finally, our demonstration was restricted to the abdomen, pelvis, and neck but we are interested in extending this to include echocardiography as others have done.\textsuperscript{3,7,9}

Ultrasound imaging has been reported in other educational contexts other than primarily as an adjunct to teaching anatomy to medical students. For example, Talarico (2010)\textsuperscript{14} from Indiana made reference to ultrasound examination of cadavers during the delivery of a non-medical anatomy course and Zumwalt et al (2010)\textsuperscript{15} at Boston University School of Medicine described how radiology residents spent about 20-30 minutes teaching senior medical students how to use an ultrasound machine during a radiology module. Other undergraduate medical programs have focused on ultrasound imaging in the emergency room,\textsuperscript{16} in assisting physical examination of the heart,\textsuperscript{17} liver,\textsuperscript{18} abdomen,\textsuperscript{11,19} or neck,\textsuperscript{8} or simply to provide a primer in basic ultrasound technical skills.\textsuperscript{20}
<table>
<thead>
<tr>
<th>Author</th>
<th>Institution</th>
<th>Medical Students and Mode of delivery</th>
<th>Study subjects</th>
<th>Study region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teichgräber et al (1996)</td>
<td>Hannover Medical School, Germany</td>
<td>First year Up to 10 students per US machine Introductory lecture + 2 or 6 hour seminar. Hands-on</td>
<td>Student peers</td>
<td>Abdomen and pelvis</td>
</tr>
<tr>
<td>Heilo et al (1997)</td>
<td>University of Oslo Medical School, Norway</td>
<td>Second year Groups of 15 students (up to 8 per machine); 1-2 hours. Hands-on</td>
<td>Student peers</td>
<td>Abdominal viscera, thyroid, and forearm</td>
</tr>
<tr>
<td>Wittich et al (2002)</td>
<td>Mayo Medical School, Minnesota, USA</td>
<td>First year Introduction (1.5 hour), small group training (1 hour), independent practice (mean 14 mins). Hands-on</td>
<td>Student peers</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>Wicke et al (2003)</td>
<td>University of Vienna, Austria</td>
<td>Groups of 6-7 undergraduate students of variable seniority 10 weekly 3 hour sessions. Hands-on</td>
<td>Student peers</td>
<td>Abdomen and pelvis</td>
</tr>
<tr>
<td>Tshibwabwa and Groves (2005)</td>
<td>McMaster University, Ontario, Canada</td>
<td>First year Groups of 6 students. 3 x 1.5 hour sessions. Hands-on</td>
<td>Not stated</td>
<td>Cardiovascular and renal</td>
</tr>
<tr>
<td>Ivanusic et al (2010)</td>
<td>University of Melbourne, Australia</td>
<td>Second year 1 hour demonstration by clinicians Images projected to class of 22 students</td>
<td>Student volunteers</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>Brown et al (2012)</td>
<td>Universities of Arizona &amp; Nebraska, USA</td>
<td>First year Class presentations (109 students) 3 x 20 min presentations</td>
<td>Not stated</td>
<td>Neck</td>
</tr>
<tr>
<td>Griksaitis et al (2012)</td>
<td>Southampton &amp; Durham Universities, UK</td>
<td>First year Class demonstration by clinician (53 students); 30 mins</td>
<td>Student volunteers</td>
<td>Cardiac</td>
</tr>
</tbody>
</table>

Rao et al (2008) evaluated first year medical students in Detroit who practiced assessing abdominal, cardiovascular, urinary, and musculoskeletal structures with a portable ultrasound machine during six 90-minute sessions; their goal was to provide a basic course in the application of clinical ultrasound which included normal sonographic anatomy. While most students reported that the experience was positive there was a 39% fall off in attendance between the first and sixth sessions.
In conclusion, ultrasound is a safe and versatile imaging modality that can be incorporated into undergraduate medical curricula in a variety of ways but is effective at demonstrating real-time clinical anatomy. The logistic difficulties of educating large classes, the limited availability of skilled personnel and equipment, and time constraints can be overcome by using an ultrasound demonstration session.

Although this does not give students hands-on experience, it provides them with an introduction to the clinical utility of ultrasound and reinforces their anatomy learning rather than attempting to teach them basic ultrasound imaging skills. If, in the future, medical students in New Zealand are encouraged to acquire basic hands-on ultrasound imaging skills then this preliminary ultrasound demonstration delivered in the context of learning clinical anatomy could serve as a useful introduction.

**Competing interests:** None known.

**Author information:** Mark D Stringer¹; Lynda J Duncan²; Latika Samalia¹

1. Department of Anatomy, Otago School of Medical Sciences, University of Otago, Dunedin
2. Department of Radiology, Dunedin Hospital, Dunedin

**Correspondence:** Professor M D Stringer, Department of Anatomy, Otago School of Medical Sciences, University of Otago, PO Box 913, Dunedin, New Zealand. Fax: +64 (0)3 4797254; email: mark.stringer@anatomy.otago.ac.nz

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**References:**


Time to “refine” clinical ward assessments? Or time to retrain?

Depak K Patel, Stephen Child

Abstract

**Aim** To investigate the reliability and intra-professional variation of senior and junior doctors in the assessment of a junior doctor’s clinical skills via video simulation.

**Methods** Simulation video was created showing 4 clinical scenarios. This video was shown to consultants, registrars and junior doctors in various forms at Auckland City Hospital. Participants evaluated each scenario against a modified version of the current assessment form used by the Medical Council of New Zealand.

**Results** 103 Respondents completed the survey: 22 Senior Medical Officers, 17 registrars (PGY3+), 43 junior doctors (PGY1-2) and 21 undergraduates (medical students). Statistical significance between groups was reached only for Question 6 in which Senior Medical Officers rated communication skills and respect for patients lower than postgraduate students (p=0.005). Large variability was noted in ratings for ‘presentation of history’ and ‘clinical knowledge’.

**Conclusion** There is marked variation between Senior Medical Officers in the assessment of a junior doctor’s clinical practice as demonstrated by the use of a simulation video. This variation is of potential major concern. Quality training methods of assessors may need to be implemented for standardisation of assessment if a summative component exists.

Ward clinical assessments are used worldwide for evaluations of both undergraduate and postgraduate students. In New Zealand, after completing a clinical attachment, junior doctors are rated from a scale of 1 (poor) to 5 (excellent) using an assessment form devised by the Medical Council of New Zealand (MCNZ) on 19 distinct domains of practice by a senior clinician with or without input from other team members. These evaluations are primarily formative however a low rating (receiving two scores of ‘2’ on an evaluation form, or any ‘1’) can have serious consequences such as discontinuation of employment or non-accreditation of training.

New Zealand currently has little coordinated training of assessors (Senior Medical Officers – SMOs) in actual assessment. Although some receive ad hoc training through university or college affiliation, literature regarding the reliability and inter-rater variability of SMOs in the assessment of junior doctors in New Zealand is scarce. This study aimed to assess the reliability and intra-professional variation of senior and junior doctors in the assessment of a junior doctor’s clinical skills via video simulation.

**Method**

A clinical simulation video was created showing a junior doctor interacting with other staff members in four different clinical scenarios. These included a junior doctor interacting with a nurse (scene 1).
presenting a patient work up to a consultant (scene 2), performing a physical examination (scene 3) and handover of care at the conclusion of a shift (scene 4). The video was then presented to groups of doctors in various teachings fora throughout Auckland City Hospital (ACH).

Participants included SMOs, registrars, junior doctors (postgraduate year one and two) and medical students. Participants were given a modified version of the MCNZ junior doctor evaluation form tailored towards the video presented (Table 1). Each of the 10 domains of clinical practice were scored on a scale from 1 – unsatisfactory (performs significantly below that generally observed for this level of experience), 2 – below expectation (requires further development), 3 – meets expectation (performs at a satisfactory level), 4 – above expectation (performs at a level better than that which would be expected for the level of experience), 5 – exceptional (performs at a level beyond that which would be expected for the level of experience).

The video was designed to simulate a range of a junior doctor’s clinical performance as well as a range in quality. The junior doctor – nurse interaction was performed towards a ‘3’, the patient work up presentation and physical examination performed towards a ‘5’ and the handover of care performed towards a ‘1’. In the authors’ experience, such variability is commonly seen by SMOs on a day to day basis within an individual trainee’s skills and abilities.

To test for differences in the rated items by medical position, analysis was done using the Kruskal-Wallis test in SAS version 9.2 software.

Results

103 respondents completed the evaluation form: 22 SMOs, 17 registrars, 43 junior doctors and 21 medical students. Respondent data was collated from a PGY1/2 teaching session (42 respondents), Medical Grand Round (48 respondents) and a General Surgery Grand Round (13 respondents). Background training of respondents included general medicine, gastroenterology, pathology, haematology, cardiology, endocrinology, pulmonology, infectious diseases and general surgery. A response rate was unable to be calculated as the video was shown to 3 group audiences at pre-arranged teaching sessions within ACH with surveys collected on exit from the session.

Variation in rating (regardless of participants’ medical position) was noted amongst all questions (Table 2). The range in responses for SMOs was greatest for question 1 (clinical knowledge) and question 2 (presentation of history).

Statistical significance was noted between assessor groups only for Question 6 (p=0.005) – the ability to communicate with patients and families (respect for patients). Question 6 also received the highest rating from junior doctors (median=3.0) and the lowest rating from SMOs (median=1.0). It should be noted also that this item had the fewest number of people responding to it (n=70).
Table 1.

<table>
<thead>
<tr>
<th>Clinical Knowledge and Skills</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Clinical knowledge (e.g. knowledge of common symptoms, drug doses and side effects, drug interactions, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Presentation of History skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Judgement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Diagnostic skills (Identifies and prioritises patient problems, appropriate physical examination)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Patient management (Synthesises data, makes appropriate management decisions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Time management (Plans and organises work, sets goals and meets them, prioritises calls, seeks advice on priorities if needed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient Communication</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Ability to communicate with patients and families (respect for patients)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication and Teamwork</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Ability to communicate with other healthcare professionals (ability to work in a multidisciplinary team and with all team members irrespective of gender, contributes effectively to teamwork)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Initiative and enthusiasm (able to identify needs of the job, follows up without being prompted, thinks and plans ahead)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Professional Attitudes and Behaviour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>N/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Reliability and dependability (punctual, carries out instructions, fulfils obligations, complies with hospital policies, keep up to date with work)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Personal manner (approachability, warmth, openness, rapport etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of respondents</th>
<th>SMO Median</th>
<th>REGISTRAR Median</th>
<th>JUNIOR DR Median</th>
<th>STUDENT Median</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 – Clinical knowledge</td>
<td>102</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>0.198</td>
</tr>
<tr>
<td>Q2 – History presentation</td>
<td>102</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>2.0</td>
<td>0.078</td>
</tr>
<tr>
<td>Q3 – Diagnostic skills</td>
<td>103</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>0.552</td>
</tr>
<tr>
<td>Q4 – Patient management</td>
<td>97</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>2.0</td>
<td>0.631</td>
</tr>
<tr>
<td>Q5 – Time management</td>
<td>95</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.163</td>
</tr>
<tr>
<td>Q6 – Patient communication</td>
<td>70</td>
<td>1.0</td>
<td>2.5</td>
<td>3.0</td>
<td>2.0</td>
<td>0.005</td>
</tr>
<tr>
<td>Q7 – Peer communication</td>
<td>103</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.807</td>
</tr>
<tr>
<td>Q8 – Initiative</td>
<td>94</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.187</td>
</tr>
<tr>
<td>Q9 – Reliability</td>
<td>99</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.938</td>
</tr>
<tr>
<td>Q10 – Personal manner</td>
<td>102</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.845</td>
</tr>
</tbody>
</table>

* The p-values are testing for significant differences (p<0.05) in item ratings by the respondents’ medical position. These were obtained using the Kruskal-Wallis test.
Table 3: Distribution of SMO responses per question

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of respondents</th>
<th>Median</th>
<th>Lowest Score</th>
<th>Highest Score</th>
<th>25th percentile</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 – Clinical knowledge</td>
<td>22</td>
<td>3.0</td>
<td>2.0</td>
<td>5.0</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Q2 – History presentation</td>
<td>22</td>
<td>3.0</td>
<td>1.0</td>
<td>5.0</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Q3 – Diagnostic skills</td>
<td>22</td>
<td>3.0</td>
<td>2.0</td>
<td>5.0</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Q4 – Patient management</td>
<td>21</td>
<td>3.0</td>
<td>2.0</td>
<td>5.0</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Q5 – Time management</td>
<td>20</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Q6 – Patient communication</td>
<td>16</td>
<td>1.0</td>
<td>1.0</td>
<td>4.0</td>
<td>1.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Q7 – Peer communication</td>
<td>22</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Q8 - Initiative</td>
<td>19</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Q9 - Reliability</td>
<td>20</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Q10 – Personal manner</td>
<td>21</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Discussion and Conclusion

Our study demonstrates rater variation between professional groups as well as significant variation in overall rating irrespective of professional group.

Inter-rater variability can be defined as a reflection of the differences in rigor and focus between raters assessing the same individuals' performance. Previous studies also showed large inter-rater variability in assessor ratings of registrars performing clinical tasks shown on a videotape. Elliot and Hickam from Portland, USA discovered limitations in the evaluation of medical students performing physical examinations.

Faculty observers did not reliably evaluate 32% of examination skills and agreement was lowest when observing facets of the head, neck, and abdominal examinations. Noel et al from New Hampshire demonstrated disagreement in faculty members’ assessment of a junior doctor’s patient work up on a videotape. Davies et al demonstrated how ratings of junior doctors (foundation programme year 1 and 2 and senior house officers) varied by staff group with consultants more likely to give ratings of concern compared to junior doctors assessing their colleagues.

Our study is limited by a) small sample size b) possible respondent bias from group sessions c) brevity of the video d) the inability to extrapolate “one off” observations on a video to those of extended multiple clinical interactions and e) lack of prior benchmarking to assessments.

Despite the limitations of our study it is reassuring that our results are similar to the previous studies. Although most median scores were similar in each professional group, regression to mean was noted in the results. Question 6 produced the only statically significant difference between medical positions suggesting SMOs were more critical than junior doctors in the assessment of communication and respect for patients.

The relevance of our study, however, lies in the variability of assessments by key personnel involved in potential summative outcomes. This is concerning as one score of ‘1’ or two scores of ‘2’ can lead to discontinuation of employment or non-accreditation of training. As other authors abroad have mentioned in their simulated
assessments methods, this study further reinforces the inter-rater variability existing in the assessment of junior doctors in one of New Zealand’s largest hospitals.

If our results were corroborated in larger studies, then possibly this invites a review of all in-training clinical summative assessments and the need for standardised assessor training.

**Competing interests:** None known.

**Author information:** Stephen Child, Director, Clinical Education Training Unit—and General Physician, General Medicine, Auckland City Hospital, Auckland; Depak K Patel, Trainee Intern, University of Auckland

**Correspondence:** Stephen Child, Clinical Education Training Unit, Level 15 Support Building, Auckland City Hospital, Auckland., New Zealand. Email: StephenC@adhb.govt.nz

**References:**

ACE inhibitor fetopathy: a case series and survey of opinion amongst New Zealand paediatricians, obstetricians, neonatologists, and nephrologists

Maneesh Deva, Tonya Kara

Abstract

The use of ACE (angiotensin converting enzyme) inhibitors is contraindicated throughout pregnancy due to potential adverse effects to the developing fetus (fetopathy). Despite this, women continue to receive ACE inhibitors both in New Zealand and overseas and large scale epidemiological studies have shown cases of associated harm to infants.

We present three New Zealand infants with potential renal complications following in utero ACE inhibitor exposure including hypertension, renal failure and death. We also present data from an email-based survey of experience and opinion from relevant New Zealand specialists on how to best counsel women of child-bearing age regarding ACE inhibitors (quantitative and qualitative data). To our knowledge this is the first data published on this subject in New Zealand.

ACE inhibitor exposure in pregnancy may result in potential renal, cardiac and limb complications for the developing fetus. How best to counsel women regarding ACE inhibitors and pregnancy remains an area for further discussion in New Zealand.

Cases

Angiotensin converting enzymes (ACE) inhibitors are useful and well tolerated drugs used in the treatment of hypertension. Their use in pregnancy in New Zealand is now contraindicated due to proven adverse fetal effects (fetopathy). These effects include malformations following oligohydramnios (lung hypoplasia, ossification and limb defects); direct renal complications (hypertension, renal failure) as well as cardiac and central nervous malformations due to impaired uteroplacental blood flow.

Ongoing use of ACE inhibitors during pregnancy has been observed overseas and remains difficult to prevent. Women are often not under specialist care early in their pregnancy and there is a potential lack of clinician awareness of this contraindication. Previously, it was thought that first trimester use of ACE inhibitors was safe, however the large scale cohort study in 2006 by Cooper et al has shown that first trimester exposure is associated with an increased rate of malformations and ACE inhibitors should be avoided throughout pregnancy. Therefore adequate advice and education should be considered prior to pregnancy to avoid this preventable outcome in New Zealand.

We present three New Zealand infants with potential renal complications from in-utero exposure to ACE inhibitors, including hypertension, renal failure and death.
Infant 1

Infant 1 was born to 38-year-old Indian mother, gravida 5 para 1 (2 miscarriages, 1 stillborn at 20 weeks gestation). The pregnancy was complicated by pre-existing hypertension and gestational diabetes (managed with diet control). The mother was taking the ACE inhibitor cilazapril until 17 weeks gestation when the pregnancy was diagnosed. At the 18-week ultrasound scan, bilateral echogenic kidneys were documented, pulmonary hypoplasia and possibility of an absent bladder.

The family was counselled prior to delivery that the expected outcome was poor and therefore dialysis would not be offered in New Zealand as discussed with the tertiary paediatric renal service. Infant 1 delivered via ventouse following spontaneous preterm delivery at 35 weeks gestation with shoulder dystocia.

Infant 1 required Neopuff resuscitation taking first gasp at 2 minutes with established respirations at 15 minutes (APGARS 3, 4, 6, 8). The infant was macrosomic with a birthweight of 4130g (far above 97th centile) without significant oedema. Infant 1 was admitted to Neonatal Intensive Care with continuous positive pressure (CPAP) respiratory support.

Initial blood gas was consistent with birth asphyxia (pH = 6.99, base excess = -14). Infant 1 remained hypoglycaemic for the first 12 hours despite escalating IV dextrose concentrations. Infant 1 remained anuric for the first 24 hours with initial urea of 5 mmol/L and creatinine of 126 mmol/L (normal maternal biochemistry). Day 2 renal ultrasound scan sited an empty bladder, oedematous kidneys with ‘no functional renal tissue’ (Figure 1).

Figure 1. Bilateral multicystic dysplastic kidneys with no renal parenchyma identified

Ventilation was weaned to oxygen on day 4, but Infant 1 remained anuric with escalating serum urea and creatinine levels (Figure 2). Calcium gluconate and per rectum resonium was used given associated hyperkalaemia.
On day 5 Infant 1 had bloody nasogastric aspirates and prolonged periods of desaturation. Comfort care plans were made, umbilical lines removed and Infant 1 passed away in the presence of family.

**Infant 2**

Infant 2 was born to a 43-year-old New Zealand Māori women, G5 P3 (1 previous termination). The women had hypertension noted previously in each of her previous pregnancies and was subsequently diagnosed with a benign pituitary tumour secreting ACTH (Cushing’s disease). This was removed and replaced with daily hydrocortisone. The hypertension persisted post resection which was well controlled with the angiotensin II blocker (2nd generation ACE inhibitor) candesartan.

The pregnancy was unplanned and unexpected and candesartan continued through the first trimester. The 20 weeks gestation ultrasound scan showed oligohydramnios and candesartan was discontinued. Subsequent ultrasound scans showed recovery in amniotic fluid and a cardiac effusion seen at 22 weeks also resolved. The maternal hypertension was controlled without further medications for the remainder of the pregnancy.

Infant 2 was born following spontaneous rupture of membranes and subsequent induction of labour at 36 weeks. Infant 2 was vigorous at birth, weighed 3275g and did not require resuscitation (APGARS 9, 9, 10). After initial breast feeds, Infant 2 and mother were transferred to a local birthing centre. Within 6 hours respiratory distress was noted and Infant 2 was admitted to Neonatal Intensive Care.

Infant 2 was found to have severe myocardial dysfunction with poorly contractile ventricles seen on echocardiogram. Infant 2 was treated with prostaglandins, dobutamine, nitric oxide, antibiotics and was intubated for 10 days in total. Initial
blood pressures were noted to be surprisingly ‘easy to maintain’ and as subsequent echocardiograms and overall condition improved, hypertension became evident (with mean arterial pressure recordings above 90 mmHg). This was managed with oral hydralazine at usual dosage.

During the admission, Infant 2 had normal renal ultrasound scans, urea and electrolytes and it was postulated that in-utero hypertension may have caused the initial severe cardiac dysfunction. Infant 2 was discharged from Neonatal Intensive Care on day 15, full suckling feeds on hydralazine with home monitoring of blood pressures.

Renin levels were later found to be elevated (9.3 ng/mL/hour) which is consistent with renovascular malformation in utero exposure to angiotension II inhibition. Hydralazine was later changed to Amlodipine with sound growth and developmental progress being made.

**Infant 3**

Infant 3 was born to an 18-year-old New Zealand European/Pakeha primip. The mother had a transposition of the great arteries repair at day 10 and pulmonary stenting procedure at age 10 years. From childhood she was treated with the ACE inhibitor quinapril. It is not known whether her parents were counselled regarding pregnancy when this was commenced, however she has no recollection of this being discussed with her directly or before transfer to adult services.

The pregnancy was unplanned and diagnosed at 5 weeks gestation and quinapril was appropriately discontinued. The mother had ongoing urinary tract infections and was on nitrofurantoin as prophylaxis. She was also Group B streptococcus positive at 35 weeks gestation. The pregnancy was noted to have oligohydramnios at the 28 week gestation scan which progressed to anhydramnios. Echogenic kidneys and intrauterine growth restriction was also noted subsequent ultrasound scans. The infant had normal amniocentesis karyotype and TORCH serology. The parents had normal renal ultrasound scans.

Infant 3 delivered following spontaneous labour via forceps assisted vaginal delivery at term. The infant was vigorous (APGARS 7, 9, 9) and symmetrically growth restricted (birthweight = 2005g) with normal male genitalia. The baby received CPAP resuscitation and was intubated for increasing respiratory distress.

Initial chest radiograph revealed a small pneumomediastinum and pneumothorax which resolved without intervention. A single dose of surfactant was given and the infant was extubated on day 2. A widely splayed sagittal suture was noted- a feature consistent with in utero ACE exposure. Urine output was seen within the first 24 hours however, serum urea and creatinine climbed (peak day 4 = 278 mmol/L).

Renal ultrasound scans showed small dysplastic kidneys with small cortical cysts. Infant 3 commenced suckling feeds within the first week and was discharged on day 9. There was no hypertension during the admission. Oral sodium supplements were required for persistent hyponatraemia and Kindergen (low protein) formula was used to supplement feeds breast feeds. Infant 3 was readmitted to Neonatal Intensive Care for three days for a calcium level of 3.6 which normalized with intravenous pamidronate and fluids.
Following discharge Infant 3 had a normal micturating cystourethrogram. Infant 3’s weight remained low (5th centile) and nasogastric feeds were commenced. At the age of 8 months a gastrostomy and Tenckhoff catheter was inserted to commence daily dialysis. Weight gains improved further and work up commenced for transplantation as urine output gradually declined.

At the age of 22 months Infant 3 received a deceased donor kidney and has been making satisfactory progress post transplantation.

**Discussion**

ACE inhibitor fetopathy is a recognised clinical syndrome consisting of several possible malformations following *in utero* exposure to ACE inhibitors and angiotensin II blockers. These features consist of renal tubular dysplasia, anuria oligohydramnios, growth retardation, hypocalvaria (including widely splayed suture lines) and hypertension.\(^7,8\) These features, as seen in animal models, are thought to be related to fetal hypotension during critical times of fetal development.\(^9\)

Isolating and attributing the outcomes of the infants presented to only ACE inhibitor exposure is not possible and certainly there has been wide phenotypic variation reported following *in utero* ACE inhibitor exposure.\(^12\) Infant 1 was macrosomic and clearly affected by maternal diabetes.

Infant 2’s mother was of advanced maternal age and Infant 3’s mother was also on Nitrofurantoin (Category B pregnancy drug: probably safe, but concerns\(^13\)) and had multiple infections. Three of the mothers also had hypertension which itself has been linked to complications during labour.\(^14\)

This is also reflective of debate on this subject as safety data regarding the use of ACE inhibitors stemmed from analyses of case reports which are clouded by confounding factors.\(^15,16\) Only recently, following large cohort studies the strength of this contradiction has increased.

The study by Cooper et al (2006) has been the most notable to date, quoting increased risk of malformation rates with risk ratios ranging from 7.2 (central nervous system and cardiovascular) to 9.32 (renal complications) with large confidence intervals given the overall low incidence of these events (less than 1 per thousand live births).\(^2\)

Locally, Medsafe New Zealand currently advises avoidance of ACE inhibitors throughout pregnancy\(^4–6\) and to our knowledge, this is the first report on this subject in New Zealand.

The three infants presented all had renal complications that are consistent with *in utero* ACE inhibitor exposure and therefore are potentially avoidable. Reducing this occurrence in New Zealand infants remains difficult for several reasons which these cases highlight.

Many women may not be aware of pregnancy (and some may not be anticipating this possibility) who are taking ACE inhibitors. Infant 2 and 3’s mothers were of advanced in maternal age (38, 43) and pregnancy was not expected. Infant 2 followed from an unplanned pregnancy which is not uncommon in the New Zealand population and has been previously reported at 31%\(^18\) and worldwide at 38% of all live births.\(^19\)
As the indications for ACE inhibitors grow, heightened awareness will be required to avoid inadvertent exposures.

Inadequacy of pregnancy counselling to potential mothers on ACE inhibitors has been observed overseas and will be prevalent to some extent in New Zealand. Lack of clinician awareness, lack of patient awareness and optimal timing of pregnancy counselling are important considerations.

To explore the experience and current opinion of pregnancies potentially affected by ACE inhibitors amongst New Zealand specialists we conducted a brief anonymous, email based survey sent to paediatricians, neonatologists, maternal- fetal medicine obstetricians and nephrologists.

**Survey**

**Aims**

To gather the opinion both quantitatively and qualitatively on the use of ACE inhibitors during pregnancy by relevant hospital-based specialists in New Zealand (paediatricians, neonatologists, maternal- fetal medicine obstetricians and nephrologists).

**Methods**

We constructed a brief (<1 minute completion time) email-based survey with a short introductory statement on the subject. The email was sent via the paediatric society web server, perinatal society webserver and to maternal fetal medicine and nephrology colleagues in New Zealand.

**Results**

**Q1 identifying survey participants**

The majority of the responses were from paediatricians (52/79 responses, 65%) with the remainder of the responses made up from neonatologists (11), obstetricians (8) and other physicians including nephrologists (8) (Figure 3).
Q 2,3—Do you have experience with a pregnancy which has had ACE inhibitor exposure? What was the outcome/s?
Twenty-seven responses stated they had experience with a pregnancy which had antenatal ACE inhibitor exposure. Of this, 14 out of 27 (52%) responses stated that the neonate was affected as a result of ACE exposure, with 3 out 27 (11%) resulting in fetal/neonatal demise.

Q4. When is the best time to counsel women on ACE inhibitors?—
Nearly half of all responses indicated that at the time an ACE inhibitor is first commenced is the best time to counsel regarding pregnancy. In addition two responses commented that all of these times are appropriate (Figure 4).

Q5. Who is best placed to counsel women on ACE inhibitors?
Most responses either suggested the prescribing practitioner (26/72, 36%) or the general practitioner (25/72, 35%) (Figure 5). A small number of responses suggested that the LMC/midwife would be best placed to do this (2 responses).
Figure 4. When is the best time to counsel women on ACE inhibitors?

![Bar chart showing the percentage of women who were counseled on ACE inhibitors at different times.](attachment:image)

- When first commenced on an ACE inhibitor: 48%
- When of child bearing age: 30%
- When planning to become pregnant: 26%
- When pregnancy is confirmed: 7%
- During 1st antenatal visit: 5%

Figure 5. Who is best placed to counsel women on ACE inhibitors

![Bar chart showing the percentage of women who were counselled by different health professionals.](attachment:image)

- The prescriber: 26/61
- General practitioner: 25/61
- Obstetrician: 5/61
- Physician: 3/61
- LMC/midwife: 2/61
In addition, three responses were thankful in alerting this to their attention as they were not aware of this potential problem in pregnancy. Similar comments also stated that the use of ACE inhibitors in pregnancy is underappreciated.

**Discussion**

The survey was limited by its nature and is by no means a useful estimation of the true frequency of fetuses affected by ACE inhibitors in New Zealand. The denominator was unknown and due to its anonymous nature, there is also the possibility to have duplication of cases experienced by respondents. In New Zealand PHARMAC reports well over a million ACE inhibitor prescriptions are filled per year with an unknown, but potentially large number, to women of child bearing ages.\(^{21}\)

The opinions of how best to deal with this potential problem in pregnancy highlights several issues such as prescriber responsibility, timely pregnancy counselling and clinician practice scope.

The general practitioner or prescriber was thought to be the most appropriate person placed to counsel women by the majority of our survey responses. The difficulty in keeping up to date of current best practice is an ongoing challenge for clinicians, not helped by previous safety claims in the first trimester.\(^{11}\)

A smaller group responded that the obstetrician or midwife (8/72, 11%) are better placed to do so. The potential pitfalls of this approach are highlighted by the cases presented in that the pregnancy may not be diagnosed for several weeks to months. Another wider issue also exists of assigning (or assuming) responsibility by other healthcare colleagues. This is most particularly pertinent in the care of pregnant women where the sharing of care may take place between LMC, GPs and hospital specialists.

The best time to counsel women remains another difficult area. Women may have been commenced on ACE inhibitors years prior (such as infant 3’s mother) and pregnancy counselling may not be appropriate, ideal or long lasting. Although 35% (26/74) of responses suggested the best time would be at the time of planning a pregnancy, in many situations the pregnancy may be unplanned\(^ {18}\).

Furthermore, 12/74 stated the best time would be once pregnancy was confirmed or at the first antenatal visit. This may reflect a slightly differing knowledge base of pregnancy that our responders, primarily paediatricians, have towards pregnancy. This was reinforced by the three comments received thanking our study for raising awareness of this issue as they were previously unaware.

Our results suggest there is a range of opinion amongst our survey participants reflecting differing experience and awareness. Heightened awareness by all health care professionals involved in the use of ACE inhibitors is a good basis to reduce this avoidable occurrence.

As the indications for ACE inhibitors grow, the challenges discussed will continue to evolve. Although we only surveyed consultant specialists in our survey, similar questions and opinions will be equally valuable and valid from LMCs, GPs, pharmacists and legislators.
Conclusion

In New Zealand we present three infants with potential renal complications from in utero exposure to angiotensin converting enzyme (ACE) inhibitors, including hypertension, renal failure and death. ACE inhibitors remain contraindicated throughout pregnancy and to our knowledge this is the first data published on this subject in New Zealand.

How best to counsel women regarding ACE inhibitors and pregnancy remains an area for further discussion in New Zealand. From a paediatric point of view we need to take into account that a drug may be started at an early age and remember to counsel appropriately once the patient reaches an appropriate age.

Competing interests: None known.

Author information: Maneesh Deva, Advanced Paediatric Trainee (General Paediatric); Tonya Kara, Project Supervisor and Paediatric Nephrologist; Starship Children’s Hospital, Auckland

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Correspondence: Dr Maneesh Deva, Starship Children's Health, Private Bag 92024, Auckland 1142, New Zealand. Email: ManeeshD@adhb.govt.nz

References:
20. www.surveymonkey.com/s/7POZQJ
Sexual health, risks, and experiences of New Zealand university students: findings from a national cross-sectional study

Rebecca Psutka, Jennie Connor, Kimberly Cousins, Kypros Kypri

Abstract

Aim To describe the sexual health and behaviour of university students as a sentinel population of young New Zealanders.

Methods A random sample of 5770 students aged 17–24 from universities across New Zealand were invited to participate in an online survey in 2009. Questions on current sexual behaviours, lifetime unintended pregnancies and terminations, and sexual orientation were included.

Results 2922 students responded (51% of the sample), including 1857 women (61% of respondents), reflecting the high proportion of women in the university population (57%) and higher response from women. Sixty-nine percent of both men and women had ever had sex. Of these, 47% reported ≥3 partners ever, and 20% had ≥3 partners in the last 12 months, with no significant gender differences.

Describing the last time they had sex, 58% of men and 51% of women reported using a condom and 38% of men and 29% of women had consumed alcohol. Approximately 6% of women and 5% of men reported ever having sex that resulted in an unintentional pregnancy. Of these pregnancies, 74% of women and 72% of men reported a termination while another 19% of men did not know the outcome.

Conclusion Multiple sexual partnerships were common. Condom use was uncommon and inversely associated with number of recent sexual partners. One in 20 students had or contributed to at least one unintentional pregnancy. The prevalence of risky sexual behaviours in this population raises concern about the number of students at risk of sexually transmitted infections and unintentional pregnancies.

There is little information on the sexual health and behaviour of young people in New Zealand (NZ). Indications from national statistics on prevalence of sexually transmitted infections and incidence of terminations are that further attention is required. In 2009, NZ had an estimated national chlamydia prevalence of 803 per 100,000 people, higher than in previous years and 3–4 times higher than in Australia and the UK.¹

NZ has high termination of pregnancy (TOP) rates compared with most OECD countries. In 2008, there were 19.7 terminations per 1000 women aged 15–44 per year compared to 19.6 in the USA, 21.3 in Sweden, and 8.7 in the Netherlands and 7.3 in Germany.² High levels of TOP may reflect good provision of abortion services, poor availability of contraceptive services, or greater sexual activity at younger ages.³

The only national survey of sexual behaviour in the general NZ population was the NZ Partner Relations Survey in 1991.⁴ Birth cohort studies from Dunedin and
Christchurch collected some sexual health and behaviour data as the cohorts reached early adulthood 15 and 20 years ago, respectively.\textsuperscript{5,6}

The Dunedin cohort study of individuals born in 1972/3 found that the median age of first intercourse was 17 in women and 16 in men in the late 1980s.\textsuperscript{5} The Christchurch 1977 birth cohort reported on risk behaviours. About 32% of those aged 20–21 reported unprotected sex in the past year, and that those aged 18–21 had an average of 5.5 sexual partners during that timeframe.\textsuperscript{7}

University students are a large, relatively easy to reach subgroup who may serve as a sentinel population for young people more generally, notwithstanding some obvious differences. There is no contemporary information regarding the sexual health outcomes and experiences of tertiary students in NZ, but some recent information is available on sexual and other risk behaviour in younger adolescents.

The Youth Health Survey of a nationally representative sample of secondary students in NZ, completed in 2001,\textsuperscript{8} showed that by age 17, 50% of students had ever had sex, 15% of sexually active students didn’t use or only sometimes used condoms and/or contraception, and 63% used a condom last time they had sex. In the 2007 iteration, the authors reported no substantial change in behaviour since 2001.\textsuperscript{9}

Motivation for a study of sexual health, risks, and experiences amongst tertiary students comes from both this lack of information on sexual health and increasing concern about the potential impact of high levels of risky drinking. A 2005 survey found that NZ university students frequently attributed unsafe, unhappy, and unwanted sexual experiences to drinking.

With reference to the preceding four weeks, 5% of women and 8% of men reported unsafe sex, 3% of women and 4% of men had sex they were not happy about at the time, and 8% of women and 9% of men had a sexual experience they later regretted that they attributed to their drinking.

Unwanted sexual advances due to another person’s drinking negatively affected 21% of women and 12% of men, and 0.5% of both genders reported sexual assault in those four weeks.\textsuperscript{10} This suggests adverse sexual experiences associated with drinking are fairly common on university campuses, and that the sexual health of university students is worthy of attention.

The aims of this study are to better understand the sexual health, risk behaviour, and experiences of the NZ university student population by investigating age of sexual debut, number of partners, choice of partners, condom use, and occurrence of unintended pregnancies and terminations.

**Methods**

**Design**—Cross-sectional data were collected as part of the 2009 Tertiary Student Health Survey, using a confidential online computerised questionnaire. A detailed description of the methods for the previous iterations of this survey has been published\textsuperscript{11} and is summarised here.

**Participants**—All 8 NZ universities were invited to participate and students from 8 campuses of 6 universities were eventually included. Enrolment lists provided by institutions were used as a sampling frame, from which random samples of full-time, intramural Māori and non-Māori students aged 17–24 years were invited by both letter and email, timed to arrive the same day, to visit a secure website and complete a questionnaire. Overall, 5770 randomly selected students were invited to participate in the 2009 survey.
Measures—Information was sought from study participants on their sexual behaviour and experiences through written questions with categorical responses in drop-down menus. The first question in the sexual health section of the questionnaire was: “Have you ever had sexual intercourse?” Those answering “yes” were presented with the rest of the questions.

- **Age at first sex:** “How old were you when you first had sexual intercourse?” [<14, 14, 15, 16, 17, 18, 19+]  
- **Number of partners ever:** “How many people have you had sexual intercourse with in your life?” [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10–20, >20]  
- **Number of partners in the last 12 months:** “How many people have you had sexual intercourse with in the last 12 months?” [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 10–20, >20]  
- **Last sexual intercourse:** “Did you use a condom last time you had sex?” [yes, no]  
- **“Had you been drinking alcohol the last time you had sex?”** [no, yes, a little, yes a lot]  
- **“Thinking about the last time you had sex, which best describes you and your partner…”** [we had just met for the first time; we had met recently; we had known each other for a while but didn’t have a steady relationship; we had a steady relationship at the time; we were living together or engaged or married]  
- **Unintended pregnancies:** “Have you ever become pregnant unintentionally?” (women only) “Have you ever got someone pregnant unintentionally?” (men only) [no, once, twice, more than twice]  
- **Terminations:** “Did this result in a termination of pregnancy (abortion)?” (Those reporting unintended pregnancies only) [no, once, twice, more than twice, don’t know]  
- **Sexual attraction:** “What best describes who you feel attracted to?” [opposite sex only, opposite sex mainly, both sexes equally, same sex mainly, same sex only, no attraction]  

Analysis—Analyses were conducted using survey procedures in Stata version 11 software and weighting was used to account for the oversampling of Māori students. Bivariate analyses used chi² tests, comparisons between groups used two-sided Student’s t-tests, and p values < 0.05 were considered statistically significant.  

Ethical approval—The study was approved by the New Zealand Multi-region Ethics Committee (MEC/05/01/013).  

Results  

Demographics—Of the 5770 students invited to participate, 2922 (50.6%) completed the survey while a further 226 (3.9%) began but did not complete the survey. Participants had a median age of 20 and women were over-represented (61% respondents female vs. 39% male), while the university students invited were 57% female and 43% male. Most students lived in close proximity to other students with 71% living in a residential college or sharing a flat/house. Sixty-nine percent of both women and men reported having had sexual intercourse. The characteristics of the study population are described in Table 1.
Table 1. Characteristics of the study population, weighted for sampling design

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total (n=2922)</th>
<th>Men (n=1140)</th>
<th>Women (n=1782)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17–19 years</td>
<td>46</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>20–21 years</td>
<td>37</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>22–24 years</td>
<td>17</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>25–26 years</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Ethnicity ¹</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>NZ European</td>
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<td>69</td>
<td>80</td>
</tr>
<tr>
<td>NZ Māori</td>
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<td>25</td>
<td>32</td>
</tr>
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<td>Chinese</td>
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<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Pacific Islands</td>
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<td>3</td>
</tr>
<tr>
<td>Other</td>
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<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Residence type</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Share a flat/house</td>
<td>51</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Hall of Residence</td>
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<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Live with parent/guardian</td>
<td>23</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Live in own home/renting</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Board</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ever had sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>5</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

¹Categories of ethnicity are not mutually exclusive

Sexual behaviours—Of students who reported having had sex, the median age at sexual debut was 17 overall (16 for women, 17 for men) and 21% of respondents reported that they had sex before they were 16 years old (24% of women, 16% of men). The distribution of lifetime number of sexual partners was right-skewed, and the median for both women and men was three partners. For the number of sexual partners in the last 12 months the median was just one partner although the distribution shows that about 25% of university students had three or more partners during this time.

The majority of students (66%) reported that the person they last had sex with was someone with whom they were in a “steady relationship” or were “living together, engaged, or married”. However, 3% of women and 11% of men reported that they had “just met” the person they last had sex with.

Only about half of the respondents (54%) reported using a condom the last time they had sex (men 58%, women 51%). There was a trend of decreasing condom use with increasing age (Chi-squared p<0.0001), and women were less likely to use condoms than men (Student’s t-test p<0.001). Overall, 32% of respondents reported that they had been drinking the last time they had sex (men 38%, women 29%).

Prevalence rates of reported sexual behaviour and risks are presented in Table 2.
Table 2. Prevalence of sexual behaviours in participants who had ever had sex, weighted for sampling design

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total (n=2017) %</th>
<th>Men (n=783) %</th>
<th>Women (n=1234) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first sexual intercourse (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;14</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>16</td>
<td>23</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>17</td>
<td>24</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>18</td>
<td>21</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>≥19</td>
<td>11</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Median</td>
<td>17 years</td>
<td>17 years</td>
<td>16 years</td>
</tr>
<tr>
<td>Number of sex partners ever</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>6–9</td>
<td>13</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>10–20</td>
<td>10</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>&gt;20</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Median</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Number of sexual partners in last 12 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>57</td>
<td>54</td>
<td>59</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>20</td>
<td>17</td>
</tr>
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<td>3</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<td>4</td>
<td>5</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6–9</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10–20</td>
<td>3</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td>&gt;20</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Median</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Last sexual partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Just met for the first time</td>
<td>5</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Met recently</td>
<td>8</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Known, no steady relationship</td>
<td>20</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>In a steady relationship</td>
<td>52</td>
<td>47</td>
<td>55</td>
</tr>
<tr>
<td>Living together/engaged/married</td>
<td>14</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Condom use at last sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>54</td>
<td>58</td>
<td>51</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
<td>39</td>
<td>46</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Drinking alcohol at last sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>68</td>
<td>62</td>
<td>71</td>
</tr>
<tr>
<td>A little</td>
<td>18</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Quite a lot</td>
<td>14</td>
<td>16</td>
<td>13</td>
</tr>
</tbody>
</table>

There was an association between use of a condom at last sex, and both partner choice and number of sexual partners, shown in Table 3. Use of a condom at last sex declined both as number of sexual partners increased (p=0.042) and as partner choice became more stable (p<0.0001).
Table 3. Reported condom use at last sex, by reported number of sexual partners in the last 12 months and by last sexual partner, weighted for sampling design

<table>
<thead>
<tr>
<th>Variables</th>
<th>Condom used at last sex?</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>Number of sexual partners in last 12 months (n=1927)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>52</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>61</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–5</td>
<td>50</td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6–8</td>
<td>48</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥9</td>
<td>42</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe last sexual partner (n=2068)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Just met for the first time</td>
<td>74</td>
<td>26</td>
<td>p&lt;0.0001²</td>
<td></td>
</tr>
<tr>
<td>Had met recently</td>
<td>68</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Known, no steady relationship</td>
<td>64</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In a steady relationship</td>
<td>51</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living together, engaged, or married</td>
<td>40</td>
<td>59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Two-sided, unpaired Student’s t-test of the association between increasing number of sexual partners in last 12 months and decreasing use of a condom at last sex.

²Two-sided, unpaired Student’s t-test of the association increasing stability of relationship and decreasing reported condom use at last sex.

Unintended pregnancies—Of the women in the study, 112 (5.8% of those who had ever had sex) reported having had an unintentional pregnancy. Younger women reported lower rates of terminations: 3.3%, 4.4%, and 3.3% of 17, 18, and 19 year old women who had ever had sex, respectively. Additionally, 43 men (5.0% of the men who had ever had sex) reported having had sex that resulted in an unintentional pregnancy.

Women reported that 74% of unintentional pregnancies resulted in a termination. Men reported that 72% of unintentional pregnancies resulted in a termination and an additional 19% of men did not know the outcome. Table 4 summarises the unintentional pregnancy data and Figure 1 demonstrates the distribution of outcomes by age and gender of respondent.
Table 4. Prevalence of unintended pregnancies and terminations of pregnancy (TOP) in those who have ever had sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>Women (n=1356)</th>
<th>Men (n=737)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Ever had sex that resulted in an unintentional pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>94</td>
<td>1245</td>
</tr>
<tr>
<td>Once</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Twice</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>&gt;Twice</td>
<td>0.02</td>
<td>1</td>
</tr>
<tr>
<td>Did this result in a TOP?</td>
<td>(n=112)</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>Once</td>
<td>67</td>
<td>73</td>
</tr>
<tr>
<td>Twice</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Don’t know</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Percentages weighted for sampling design.

Figure 1. Frequencies of outcomes of unintended pregnancies reported by female and male study participants by age at survey

**Sexual attraction**—About 95% of both men and women reported sexual attraction to the opposite sex only or mainly, with men being more likely to report exclusively opposite sex attraction (90.8% vs 83.2%), shown in Table 5. About 2% of both the
men and women reported attraction to both sexes equally and about 1% of women and 3% of men reported same sex attraction only or mainly.

Table 5. Self-reported current sexual attraction of NZ university students, weighted for sampling design

<table>
<thead>
<tr>
<th>Best description of sexual attraction</th>
<th>Total (n=2872)</th>
<th>Men (n=1045)</th>
<th>Women (n=1827)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposite sex only</td>
<td>87</td>
<td>91</td>
<td>83</td>
</tr>
<tr>
<td>Opposite sex mainly</td>
<td>10</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Both sexes equally</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Same sex mainly</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Same sex only</td>
<td>1</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>No attraction</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Numbers in columns may not add to 100% because of rounding.

Students who reported being attracted to both sexes equally were significantly more likely to report first sex before 16, and those reporting being attracted to the same sex only or mainly were significantly less likely to report first sex before 16 (Chi-squared p<0.001) (Table 6).

Table 6. Age of first sex, by self-reported current sexual attraction of NZ university students (n=2049), weighted for sampling design.

<table>
<thead>
<tr>
<th>Age at first sex</th>
<th>Opposite sex only</th>
<th>Opposite sex mainly</th>
<th>Both sexes equally</th>
<th>Same sex mainly</th>
<th>Same sex only</th>
<th>No attraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;14</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>17</td>
<td>24</td>
<td>–</td>
<td>22</td>
<td>–</td>
</tr>
<tr>
<td>16</td>
<td>23</td>
<td>21</td>
<td>22</td>
<td>27</td>
<td>44</td>
<td>90</td>
</tr>
<tr>
<td>17</td>
<td>25</td>
<td>22</td>
<td>20</td>
<td>16</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>18</td>
<td>21</td>
<td>18</td>
<td>23</td>
<td>43</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>≥19</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>–</td>
</tr>
</tbody>
</table>

Chi-squared p<0.001 that there are associations between current sexual attraction and age at first sex.

Discussion

This paper describes indicators of sexual health in a representative sample of university students, a large subset of the 17–24 year old NZ population. The results highlight issues that may be of public health concern amenable to prevention, such as unintentional pregnancies and STIs.

Although most respondents report having two or fewer sexual partners in the last year, those with higher numbers of sexual partners reported less condom use. Importantly, 26% of the population that reported that they had met their last sex partner for the first
time said that no condom was used, indicating there is a significant proportion of the population at substantially increased risk of adverse sexual health outcomes.

A strength of this study was the use of an Internet-based format that can obtain better quality data and higher response rates at a lower cost than traditional methods. This may be especially important to ensure validity of responses for sensitive topics such as sexual health and experience.

An increasing proportion of young people are attending university in NZ, but this study is not generalisable to the total population of 17–24 year olds as there may be important differences in behaviour. For example, there is evidence from previous NZ university research that students drink more heavily than their non-student peers.

The modest response rate is a limitation of the study and we can expect some effect of self-selection on the results. As women were more likely to complete the survey than men, any selection bias is likely to be less for women. Previous research comparing the characteristics of those who do and do not respond in the Tertiary Student Health Surveys demonstrates that those who do not respond are more likely to be hazardous drinkers and have a higher prevalence of other health risk behaviours. The extent of underestimation of hazardous drinking prevalence was estimated to be small (<1%) when the response rate is over 66% and progressively larger as the response rate falls. As we have an overall response rate of 51% in this study it is likely that to an extent we have underestimated hazardous drinking and other risk behaviours.

This study did not gather information on alternative choices in contraception, such as oral contraceptive pill uptake and use, limiting interpretation of condom use data, at least for pregnancies and terminations.

Frequency of sexually transmitted infections (STIs) was not included due to the unreliability of self-reported data. In any case, STI diagnosis may reflect healthcare seeking behaviour as well as disease prevalence, given the high asymptomatic rates of STIs like Chlamydia. However, the prevalence of STIs in this university student population could be substantial given the majority of students (69%) have had sex, at least 20% of those have had three or more sexual partners in the last year, and only 54% used a condom the last time they had sex.

The median age of first sex found in the present survey of students (16 for women; 17 for men) is similar to that found in the Dunedin general population cohort in the late 1980s (17 for women; 16 for men), and the overall median age of 17, for both women and men in the Youth 2000 survey of high school students. This was also consistent with data from Australia in 2002 and the UK in 2001. The Australian Study on Health and Relationships (ASHR) found that people who self-identified as bisexual were significantly more likely to report first intercourse before 16 years of age, also consistent with our findings.

Overall in our study 58% men and 51% of women (54% overall) used a condom at last sex but this varied by age and gender, with a trend of decreasing condom use with increasing age. In comparison, the Youth 2000 findings of 63% condom use at last sex are considerably higher in this younger age group.

In this contemporary university population there were high termination rates. About 3–4% of 17–19 year old women and 6% of women overall had ever had an
unintentional pregnancy with about 74% of the pregnancies resulting in terminations. Comparatively, ASHR found 1.7% of women aged 16–19 had ever been pregnant, and 18.9% of these pregnancies resulted in a termination.\textsuperscript{25}

**Implications**

We are interested in sexual experiences and behaviours in this population group because of the associated risks with negative health outcomes including sexually transmitted infections and unintended pregnancies and terminations.

NZ has a high prevalence of Chlamydia,\textsuperscript{1,26} and so failure to use condoms in NZ could be associated with a higher STI risk than in other countries. Teenage pregnancy rates are also high compared with other OECD countries,\textsuperscript{2} indicating suboptimal use of effective contraception in NZ.

There are few barriers to students accessing condoms or other contraceptives in NZ, as many are highly subsidised and available from a wide variety of sources.\textsuperscript{27} This study suggests that ease of access is not sufficient to ensure appropriate use. Efforts clearly need to continue in promotion of condom use amongst young people in NZ and further exploration of the reasons for not using condoms could help inform new approaches.

There is some previous research on the role of heavy drinking in sexual behaviour amongst university students\textsuperscript{10,28} and recently amongst genitourinary medicine clinic attendees in the UK\textsuperscript{31} that suggests that alcohol is frequently involved when young people make risky sexual choices.

**Conclusion**

The prevalence of risky sexual behaviours in this population raises concern about the number of students at risk of sexually transmitted infections and unintended pregnancies. We found that one in five students had three or more sexual partners in the last year. Given the relatively chaotic atmosphere of early university experience and the addition of frequent heavy drinking to the mix, a better understanding of how drinking behaviour affects sexual behaviour and barriers to using condoms would inform public health intervention strategies.

**Competing interests:** None.

**Author information:** Rebecca Psutka, Research Fellow in Epidemiology, Department of Preventive and Social Medicine, University of Otago, Dunedin; Jennie Connor, Professor, Department of Preventive and Social Medicine, University of Otago, Dunedin; Kimberly Cousins, PhD Student, Department of Preventive and Social Medicine, University of Otago, Dunedin; Kypros Kypri, A/Professor, School of Medicine and Public Health, University of Newcastle, Newcastle, Australia

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Correspondence: Rebecca Psutka, Research Fellow in Epidemiology, Department of Preventive and Social Medicine, University of Otago, Dunedin, New Zealand Email: rebecca.psutka@otago.ac.nz

References:


New Zealand Registration Examination (NZREX Clinical): 6 years of experience as an Objective Structured Clinical Examination (OSCE)

Steven Lillis, Malcolm Stuart, Sidonie, Nikita Takai

Abstract

The NZREX Clinical pathway is one of several methods by which international medical graduates (IMGs) may enter the New Zealand medical workforce. The NZREX Clinical is the clinical component of the pathway and consists of a 16-station OSCE. The examination has previously been held twice a year, however due to applicant numbers NZREX Clinical is now held 4 to 5 times a year and 28 candidates are examined in each cohort. A comprehensive range of methods are used to promote validity and reliability of the examination. The mean pass rate over the last 5 years is 60%.

Several pathways exist for the registration of IMGs into the New Zealand medical workforce; the competent authority pathway (based on the applicant holding a primary qualification from a competent authority—the United Kingdom and the Republic of Ireland—and having completed an internship in a competent authority), the comparable health system pathway (based on comparable experience in a comparable health system), and the temporary special purpose pathways.

The NZREX Clinical is the pathway for IMGs who do not meet the other registration pathways. Only those with an acceptable primary medical qualification listed on the Avicenna website are eligible to sit the NZREX Clinical. Prior to sitting the NZREX Clinical, IMGs must have successfully met Council's criteria for English language requirements and must have passed either the United States Medical Licensing Examination Steps 1 and 2 (Clinical Knowledge) or have passed the Australian Medical Council MCQ examination or have passed the Professional and Linguistics Assessment Board Part 1 (United Kingdom) within the last 5 years.

Successful NZREX Clinical candidates enter a period of provisional registration in New Zealand, during which time they will be further assessed. To be eligible for registration in a general scope, candidates who pass NZREX Clinical must successfully complete four 3-month runs in a New Zealand public hospital and be signed off by their supervisor. All runs for interns are categorised by the Medical Council of New Zealand according to their educational role.1

The compulsory runs are one category A medical run, one category A surgical run and two other runs which may be A, B or C runs. Category D runs are not acceptable. While it is possible to work in primary care during this year, stringent conditions apply to those wishing to do so.

Previous research has explored the experiences of IMGs entering the New Zealand workforce through the NZREX Clinical pathway.2 The research demonstrates that these IMGs experience difficulties adjusting to the culture in New Zealand hospitals.
and society alongside financial and bureaucratic barriers to integration with the New Zealand workforce. The importance of robust orientation processes and adequate support from Resident Medical Officer Units cannot be overemphasised for doctors that have been successful in NZREX Clinical.

Prior to September 2005, the NZREX Clinical format was based on the various medical disciplines with little coordination across disciplines regarding content or method of assessment. Some disciplines utilised the traditional 'long case and two short cases structure, others a series of short cases. Both real patients and simulated patients were used.

Standard setting was by expert opinion with no psychometric data to inform the process. The examination rotated through a number of centres sequentially, giving little opportunity for examiners to gain experience in assessment. A decision was made in 2005 to redesign the process with respect to best practice in the delivery of assessment in a high stakes medical examination. This paper describes the current structure of the NZREX Clinical.

Assessment design

After a comprehensive literature review to inform both the design process and eventual structure, a working group was formed to create the blueprint from which the examination would be drawn. Those involved in the initial blueprint design were recruited for expertise in education, assessment, content knowledge relevant to the examination and cultural issues relevant to the process.

The blueprint specifies the clinical domains (cardiovascular, respiratory, neurological, gastroenterology, genitourinary, musculoskeletal, pregnancy, endocrine/metabolic, haematological, oncological, behavioural and senses) as well as the competencies that are examinable in each domain (history taking, clinical examination, investigating, management, clinical reasoning, communication and professionalism).

The domain of clinical reasoning was included to test the capability of a candidate to integrate different aspects of clinical information such as correctly interpreting the combination of history, physical examination and investigations. The ability of a candidate to 'counsel' a patient (such as breaking bad news) is examined under management. The examination stations are drawn exclusively from a blueprint.

An 'item writing group' composed of hospital consultants, general practitioners, registrars, interns and trainee interns is used to develop stations. Currently, there are over 100 stations available for selection at any one examination.

The current NZREX Clinical is an OSCE format of 16 stations. Each station lasts for 12 minutes. There are 2 minutes allocated for reading the station instructions, followed by 10 minutes in each station. Each domain is tested in at least one station. The competencies that are tested are history (three cases), clinical examination (four cases), investigating (two cases), management (three cases) and clinical reasoning (four cases). There is a specified minimum of one case on child health, one case on mental health and one case on women’s health. Stations are termed 'dynamic' where there is a simulated or real patient and 'static' where the station is paper based.
On average, three to four of the stations are paper based per examination. Static stations are necessary because some parts of the blueprint do not lend themselves well to the use of simulated or real patients (interpretation of investigations such as ECGs, x rays and blood tests, for example). All dynamic stations assess a candidate’s competence in communication and professionalism. Professionalism is defined on the marking sheet as: "Candidates should display a good sense of professionalism this would encompass areas such as: integrity, respect, cultural competence, ethical practice, non-discrimination and honesty".

The examination is held in a single centre, North Shore Hospital. When recruiting examiners, a strong preference is given to those with prior NZREX Clinical experience. New examiners are provided with one-on-one coaching from either the Examinations Director or the Assistant Examinations Director.

Professional actors are used for the vast majority of cases to play the role of a simulated patient. Many of the actors have significant NZREX Clinical experience. Similarly, the management staff remain consistent from examination to examination. It is considered important to maintain a high degree of consistency in the personnel used to run the examination.

All actors and examiners attend a training session (mock examination) 1 week prior to the examination to learn the case that they will be involved with. Final year students (trainee interns) are used to assist the examiner and actor to 'learn' the case by taking the role of the candidate. In general, between three and four separate run-throughs with different trainee interns is necessary to adequately prepare a station.

The trainee interns also assist as an independent assessment of the 'pitch' of the examination by giving feedback regarding how easy or difficult the stations are in comparison to recent assessments that they have experienced in their New Zealand-based training. During the session, a calibration exercise is also undertaken using a videoed case and standard marking sheets. The objective of the exercise is to develop consensus over how marks should be awarded for various aspects of a case. After separate marking, there is discussion amongst the group concerning the allocation of marks. This process has been valuable in improving consistency in the performance of examiners.

Although simulated patients are utilised for the majority of stations, 'real' patients with stable signs are sometimes utilised. While excellent for testing the detection of abnormal clinical signs, the inclusion of 'real' patients presents significant management issues as well as concerns over how both validity and reliability may be influenced.

In March 2010, an expert external examiner provided an independent assessment of the NZREX Clinical process. The report was favourable and provided guidance on several areas where further improvements could be made. Recommendations included reviewing the blueprint with increased emphasis on content validity, providing retired stations to candidates, making available information on validity and reliability of the examination as well as methods of standard setting and pass rate variations, running calibration exercises for examiners and using couplet stations where the same clinical scenario was examined in different ways.
The report was sent to the Ministry of Health and District Health Board Chief Executives and Chief Medical Officers. All of the recommendations have been actioned or are in the process of being actioned. It is envisaged that the external review will be repeated at 5 year intervals.

**Standard setting**

A variety of methods of standard setting have been described with defensibility as a key factor in the choice of method.\(^3\) For the NZREX Clinical, the purpose of the examination (to ensure that candidates are competent to enter a period of highly supervised provisional registration in New Zealand, during which time they will be further assessed) influences the process of standard setting.

Calculation of the 'cut score' (the score above which a candidate will be deemed to be successful) for the examination utilises a combination of a 'Borderline groups' method\(^4-7\) for the dynamic stations and a modified Angoff\(^8-10\) method for the static stations. The cut score is adjusted for the Standard Error of Measurement (SEM) to allow for uncertainty of scores.

The SEM is dependent on both the standard deviation of scores and the reliability of the examination and therefore varies between cohorts of candidates. In general, the SEM adjustment is between 3% and 5% of the total score. Thus the cut score will vary from examination to examination to adjust for the differences in difficulty of a particular series of stations and the reliability of the examination.

All stations have equal weight and there are no 'killer stations', where failure to gain a pass mark in that station results in failing the entire examination. However, a 'critical incident' policy was introduced for instances where there has been a clear breach of expected professional standards.

If a candidate has a potential critical incident as judged by an examiner, the case is immediately discussed with the Examinations Director or Assistant Examinations Director and a Senior Examiner. The implications of a critical incident are described in Council’s ‘Policy on Critical Incidents’.\(^11\)

**Psychometrics of the examination**

Cronbach's alpha is the most commonly used measurement of reliability in OSCE examinations.\(^12\) However, the coefficient is limited in its use by the size of the sample being analysed. In general, a sample of 200 would be considered necessary for a robust analysis with smaller sample sizes resulting in lower alphas.\(^13\)

As the maximum sample size for NZREX Clinical is 28, the alpha coefficients generated as part of the analysis need to be considered from this perspective. The range of alpha over the last 5 years has been 0.75 to 0.85, indicating satisfactory internal consistency.\(^14-16\) A range of statistical analyses are undertaken on the results of the examination for quality control; discrimination analysis for each station, Spearman's Rho for each station against all stations combined and 'alpha with item deleted' for each station.

Poorly performing stations can thus be identified and rewritten or reviewed. At the end of each examination, anonymous feedback forms are completed by both examiners and candidates.
**Reporting of results**

Reporting of the results is to the senior officers of Council: the Chair, the CEO, the registrar and medical advisers. The report details the method by which the cut score was calculated, the candidates deemed to have passed, significant events that may have occurred and the statistical data detailed above. Relevant information from the candidate and examiner feedback is included.

**Results**

Since the OSCE format was introduced in 2005 until the end of 2011, approximately 520 candidates have sat the NZREX Clinical as a part of their registration process. The mean of the 'cut scores' was 62.2% and was quite consistent from cohort to cohort with a standard deviation of 1.8%. The pass rate was more variable, ranging from a high of 85% to a low of 45%. The mean pass rate is 60.2% with a standard deviation of 9.1. Comparisons of cut score and passing percent are given in Figure 1.

![Figure 1. Comparison of ‘cut score’ and passing percentage across exams](image)

There have been approximately 320 successful candidates in NZREX Clinical since September 2005. Future developments in the examination process will focus on predictive validity by comparing successful performance in the NZREX with sequential supervisor reports in subsequent years. A comparison between the NZREX and the Australian Medical Council clinical examination for IMGs is underway with the objective of contrasting and improving methods and processes.
Conclusion

The NZREX Clinical is part of a wider process whereby IMGs who are eligible for the NZREX Clinical pathway can be adequately assessed. The examination is founded on robust educational principles, has comprehensive methods of quality control and utilises internationally accepted methods of standard setting. Because of the small numbers of candidates that take the examination, care must be taken in the interpretation of statistical data for both candidates and the examination process. The pathway provides a small but important source for meeting New Zealand's medical workforce requirements.

Competing interests: None known.

Author information: Steven Lillis, Examinations Director; Malcolm Stuart, Assistant Examinations Director; Sidonie, Senior Professional Standards Coordinator (performance and examinations); Nikita Takai, Professional Standards Coordinator (performance and examinations), Medical Council of New Zealand, Wellington

Correspondence: Dr Steven Lillis, Medical Council of New Zealand, PO Box 11649, Wellington 6142, New Zealand. Email: lilliss@waikatodhb.govt.nz

References:
Shedding light on the decision to retain an interview for medical student selection

Phillippa Poole, Boaz Shulruf, Ben Harley, John Monigatti, Mark Barrow, Papaarangi Reid, Caitlin Prendergast, Warwick Bagg

Abstract

Medical schools need to justify their range of selection tools and processes. This paper describes the selection tools used at one university in New Zealand (Auckland), which combine a measure of academic achievement, score on a test of general cognitive ability, and score in a structured interview. Further, it describes considerations in justifying the decision to continue with an interview as part of the selection process. This information may be of use to stakeholders in the Auckland medical programme, and to other schools evaluating their admission tools.

Medical schools develop selection processes to serve multiple aims. Among these are to determine those with the potential to become good doctors, as well as to screen out those with unfavourable traits or unlikely to complete the programme. Furthermore, any process needs to rank fairly the eligible applicants in order to offer the limited number of places. The student body resulting from any selection process must be competent to practice effectively as junior doctors, with the base for further training in any branch of medicine. Finally, the future specialist workforce must be sufficiently diverse to meet future community health needs.

To assist with meeting the final aim, both NZ schools have two affirmative entry pathways—one for Māori or Pacific students, and one for students from a rural background. Regardless of pathway, the choice of tools for the process of medical student selection remains complex and controversial.

At the University of Auckland, the standard process is that medical school applicants are ranked for offer of a place by combining scores from their Grade Point Average (GPA, weighting 60%), the Undergraduate Medical Admissions Test (UMAT, weighting 15%), and a structured interview. The interview is weighted at 25% for the majority of applicants, other than a few deemed ‘must have’ or ‘must not have.’

To be eligible for consideration, an applicant must have achieved an average of at least a B+ grade (GPA of 6) across their eight courses in Overlapping Year 1 (OLY1) at The University of Auckland, or over the last 2 years of an acceptable prior degree. After a ranking based on GPA, interviews are offered to about twice as many applicants as there are places. In 2011 for 2012 entry, for example, there were 420 interviews conducted. The presence of an interview is the most significant difference in process from that used by the University of Otago.

In early 2011, driven in part by increasing medical student numbers, a review of the place of the interview in Auckland medical student selection was requested by the then Dean, Professor Iain Martin. An Interview Working Party (see Appendix 1) was established.
This paper describes the main deliberations and recommendations of this Working Party, with the dual aims of disseminating this information to stakeholders and assisting schools debating the place of interview in medical student selection.

**Evaluation of the current Auckland interview**

The interview has been an intrinsic part of Auckland medical student selection since the first cohort was selected in 1967. The first Dean of the medical school introduced an interview at the outset reportedly to identify ‘bad buggers’. Based upon decisions of those responsible for admissions, the format of the interview has varied over time. Among these are a single longer interview with one and two interviewers; two short interviews, and an observed group task. Since 2000, there has been a single semi-structured interview with two interviewers.

In general, interviews are acknowledged to have low reliability. Among the reasons for this are low agreement between raters, rater variability, rater-student effects, and potential for candidates to adopt socially desirable stances in response to questions. More structured interviews show higher reliability, and seeking examples of past behaviour may produce more honest responses than asking candidates what they would do if faced with a particular scenario.

To this end, the current 25-minute interview is qualitative and semi-structured, with applicants assessed on five domains: maturity; communication; awareness and knowledge; career choice, and well-roundedness. Scoring is based on 7 categorical descriptions in each domain as this is associated with less discrepancy between interviewers. In addition, the interviewers make a global judgement about the suitability of the applicant using five categories: ‘exceptional’ (= "must have"); ‘highly desirable’; ‘acceptable’; ‘uncertain unacceptability’ and ‘unacceptable’ (= "must not have").

Other measures used at Auckland to enhance reliability include: calibration sessions for interviewers; new interviewers being paired with more experienced interviewers; each interviewer scoring independently in the first instance, before the final score is agreed. Interviewer performance is reviewed each year, with poor interviewers not invited back. Discrepant scores (>1 category) result in an interviewee being offered a second interview (2–3 each year). In the uncommon event of a formal appeal, this is very rarely upheld. Despite these measures, scores still vary considerably from year to year.

In terms of validity, the interview domains have not changed substantially since the school started in 1968, which may suggest a degree of face and construct validity. Yet, we have found recently that the interview has no predictive validity in terms of predicting achievement later in the medical programme, withdrawal, or failure to complete Year 4 on time. Further, the effect of interview on ethnicity and gender is neutral, with most change in ethnicity occurring by the admixture of students from affirmative pathways. Interview scores correlate negatively with UMAT and GPA, suggesting it measures something different, but we currently have no idea what this is.

The number of applicants deemed to be ‘must have’ by each interviewer is as high as 25 per year. Of these, about half would have been selected anyway, leaving around
10–12 who move up the rankings and receive an offer. The Working Party found little evidence that the performance of these students was distinguishable from others in their class during medical school.

By contrast, the ‘must not have’ group comprises 2–4 students per year, mostly due to inability to adjust to the interview situation, rather than to frank mental health or dysfunctional personality issues. It is acknowledged that the interview can never check for these fully. To date, the outcomes of these students have not been tracked. In addition to reliability and validity considerations above, the Working Party identified other potential benefits or disadvantages of the current interview, or foreseeable harms in dropping it. These are summarised in Table 1.

Table 1 Considerations whether or not to include an interview as part of medical student selection

<table>
<thead>
<tr>
<th>Construct</th>
<th>Potential benefit of current interview</th>
<th>Potential disadvantages of current interview</th>
<th>Potential harm if no interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaping of applicant pool</td>
<td>Sends an important signal to applicants of commitment to excellence in communication and interpersonal skills.</td>
<td>Otherwise acceptable students may avoid applying, fearing that interview may disadvantage them.</td>
<td>No differentiating feature from schools without interview.</td>
</tr>
<tr>
<td>Richness and diversity of cohort</td>
<td>Allows selection of some with acceptable GPA plus exceptional qualities or life experience. May favour women, hence correcting for historical male predominance.</td>
<td>Interviewers may be biased towards selecting ‘people like me’ thus discounting more diverse candidates.</td>
<td>Several applicants with exceptional qualities or life experiences will be missed.</td>
</tr>
<tr>
<td>Commitment to local priorities</td>
<td>May explore commitment e.g. to rural practice.</td>
<td>Students may rehearse desirable answers.</td>
<td>No opportunity to explore commitment.</td>
</tr>
<tr>
<td>Screening</td>
<td>May deter or exclude people with very poor interpersonal skills. Interview may have already done its job before scores are used for ranking.</td>
<td>Interviewers may be ‘charmed’ by highly unsuitable candidates and scored highly.</td>
<td>Would need another measure of personal qualities, or else risk admitting those with poor interpersonal skills who are currently excluded.</td>
</tr>
<tr>
<td>Community engagement</td>
<td>Wider community feels engaged in selecting future doctors, e.g. rural doctor or student may sit in on rural applicant interviews.</td>
<td>A narrow pool of interviewers could undermine notions of true community engagement.</td>
<td>Loss of engagement and transparency.</td>
</tr>
<tr>
<td>Student engagement</td>
<td>Strong medical student support of, and pride in, the medical interview.</td>
<td>Cost, stress and inconvenience of interview.</td>
<td>Loss of early engagement with faculty and programme.</td>
</tr>
<tr>
<td>Staff engagement</td>
<td>Faculty feels engaged in selecting future doctors and the medical programme.</td>
<td>Takes staff away from other academic endeavours.</td>
<td>Loss of opportunity for engagement between student and staff.</td>
</tr>
<tr>
<td>Professional induction</td>
<td>Applicants must present professionally. Allows professional judgement to be exerted by faculty members.</td>
<td>Interview is situation-specific and may miss those who would be professional in clinical setting.</td>
<td>Missed opportunity; may not happen until much later in the programme.</td>
</tr>
<tr>
<td>Student withdrawal</td>
<td>The occasional applicant may fail the interview on purpose, avoiding loss of face to their community.</td>
<td>Interview may be difficult for very shy students.</td>
<td>Applicant may feel obligated to take a place that is offered, with resultant opportunity costs.</td>
</tr>
<tr>
<td>Weighting of interview</td>
<td>Allows a lower weighting of UMAT (or any other new tools) until shown to be valid.</td>
<td>Continuous quality improvement approach needed to justify methods and weighting.</td>
<td>If increased UMAT weighting, there may be cost implications for applicants (resits, prep. courses).</td>
</tr>
<tr>
<td>Cost</td>
<td>Cost is relatively low compared with cost of admitting a student who does not complete, or is highly unsuitable for medicine.</td>
<td>Cost per successful applicant is about $75 (mainly casual staff, parking, catering) PLUS opportunity costs of interviewers’ time.</td>
<td>Savings in the order of $12,500, and staff time. Other options such as Multi Mini Interview likely to be more expensive.</td>
</tr>
</tbody>
</table>
What options exist to improve the selection process?

The current selection process bears some resemblance to current best practice;\(^{17}\) with this being a battery of tools involving informed self-selection (in Auckland’s case, undertaking a university health sciences first year; website information; interview question as to what has been done to find out about a medical career); academic achievement (GPA); general cognitive ability (UMAT), and aspects of personality and interpersonal skills (interview).

How tools are combined to rank students will be the subject of ongoing debate, as internationally, there is no agreement as to the best method.\(^{18}\) Notwithstanding this, the selection system in use currently at Auckland is associated with a low attrition rate (fewer than 3% of mainstream admissions), which is much lower than in the early 90’s when the rate was about 10%.\(^{19}\) Then, half of students left for academic failure and the other half withdrew for other reasons.

The Working Party believes that one of the reasons for the low attrition rate is that, to be selected, applicants must undertake and achieve sufficiently at a number of sequential steps over at least a year (viz. enter and complete first year or degree programme; sit UMAT during that time; attend interview). This observation is consistent with data from a controlled experiment in The Netherlands which found attrition was far lower in medical students selected with dedicated medical school admission tests (admission GPA as a threshold; thence grading on interview + written motivational statement + CV + general knowledge test), than in students selected on their GPA alone (OR 0.56, 95%CI 0.39–0.80).\(^{20}\)

On the other hand, whether or not dropping the interview would make any difference to the attrition rate is uncertain. The attrition rate at Otago, which does not have an interview, is also relatively low.

Multiple Mini Interviews (MMIs) are increasingly used by medical schools to select students, as they have been shown to have a higher reliability derived from increasing the number of stations, not increasing the number of raters in any one station.\(^{15}\) MMIs have some predictive power for students’ later clinical exam results in medical school\(^{21}\) and licensing examinations.\(^{22}\)

Briefly, applicants are required to attend several stations where they respond to a specific scenario placed in front of them or to specific questions posed by an interviewer, for 8–10 minutes at each station. While referred to as ‘interviews,’ the activities at each station may be wide-ranging, and candidates rated on their performance using a standard rating scale. Thus, MMIs allow a broad sampling of a candidate’s abilities, dilute effects of chance and interviewer bias, and allow a candidate to recover from a poor station with an independent interviewer.\(^{15}\)

Other advantages may include fewer problems with security violations,\(^{23}\) and being less subject to influence by coaching.\(^{24}\) Disadvantages include the time and expense to develop and deliver the MMI process. MMIs already form part of the Māori and Pacific pathway selection process to Auckland’s health programmes. However, the information gained during these MMIs is used to determine at which level a student...
should be advised to enter tertiary education to maximise their chances of success, rather than to whom places in medicine should be offered.

GPA is by far the most reliable and most predictive tool for future performance, with UMAT far behind in this regard. Furthermore, there is a scarcity of tools with which to test interpersonal skills and personality reliably. In the past, a principal’s report was used to inform decision-making for school-leaver applicants, but this was dropped when selection became based on university, not school, performance.

This decision is in accordance with the literature that shows personal references and statements to be unreliable and of no predictive value. A potentially more robust tool is the personal qualities assessment (PQA), which is a portfolio of psychometric tests designed to predict performance in medical school and professional progress. This was developed in Newcastle by the same group that developed UMAT, but has yet to be validated.

A lottery, once a certain GPA has been achieved, is appealing as it might be fairer. Against this is that students selected using a lottery system are more likely to drop out of their medical programme than those selected using a combination of academic and non-cognitive tools. Although reasons are not entirely clear, this may relate to student commitment to the programme. In the NZ setting this would be unacceptable for funding and workforce reasons, as universities cannot backfill places of students who leave.

Conclusions and future directions

Members of the Working Party acknowledged how their own conflicts of interest might lead to bias; in particular that students and graduates of the Auckland medical programme had benefitted from having an interview in the selection process and were not likely to advocate dropping it. They agreed with the previous Dean’s comment (I. Martin, personal communication 2011) that any selection policy would be based on a ‘fusion of culture, beliefs and evidence.’ This review did not consider moving to a wider stakeholder perspective, including surveys; first for reasons of expediency; second as it seemed unlikely this would add much to the debate in terms of considerations or ways forward.

Accepting the limitations above, the main findings of the Working Party were that the Auckland interview in its current format is not particularly valid or reliable in terms of its ability to predict future success at medical school, but at least it is not as resource-intensive as initially thought. The group identified additional considerations when deciding the possible benefits and harms of retaining or dropping the interview, as outlined in Table 1. While testing of the constructs in Table 1 would require future research, it may act as a checklist for others evaluating admission policies.

The Working Party suggested alternative ways that might improve interview validity, reliability, feasibility and acceptability, but highlighted that any format would inevitably result in ‘trade-offs’ among these.
Among the scenarios thought to be viable in the Auckland setting were:

- Status quo, but reduce the number of students offered an interview to, say, 1.5 times the number of places, rather than 2. This would preserve current feasibility, reliability, validity, local culture and beliefs, but reduce further the very small chance of being able to move to the top of the rankings.

- Have two shorter interviews, each with one interviewer, assessing overall attributes but with different specific foci. This may increase reliability as there is more sampling, but could decrease construct validity, and introduce other quality control problems. Furthermore, having shorter stations will discriminate against nervous students who take some time to ‘warm up’.

- Use an MMI format with 6–8 stations. This could be expensive and hard to staff if used for all students; some types of stations may ameliorate this (e.g. a personal statement or videoed interaction with a standardised patient who might score the performance).

- Use the interview dichotomously, in that applicants are either ‘acceptable’ or ‘not acceptable’. Using a ranking based on GPA and UMAT, the highest ranking candidates are offered a relatively short interview with one experienced faculty member who decides if they are ‘acceptable’ or ‘uncertain’.

A major effort, in the form of an MMI, is then dedicated to further assessment of those about whom there is uncertainty from this first interview, or with ranking scores nearer the cut-off point for an offer of a place. This would retain many of the qualitative benefits of the interview, remove the ability to move to the top of the rankings, and potentially allow resources to be used more effectively; that is, not wasted on obtaining information of no benefit. Admission would be then offered in order to applicants ranked on GPA and UMAT, and ‘acceptable’ after interview process.

At the Board of Studies (Medical Programme) meeting in February 2012, it was decided that as the pros of continuing with an interview outweighed the cons, an interview would remain as part of Auckland medical student selection. In particular, the Board favoured further exploration of the last scenario. Interestingly, this is not that far from the initial use of the interview to screen out unsuitable candidates, proposed by Dr Cecil Lewis.

We wish to notify potential applicants and other stakeholders that the present interview format will continue until such time as a ‘better’ format and process is determined.

**Competing interests:** None known.

**Author information:** Phillippa Poole, Assoc Prof of Medicine, Department of Medicine, The University of Auckland; Boaz Shulruf, Assoc Prof of Medical Education, The University of New South Wales (previously at The University of Auckland); Ben Harley, Medical Student, The University of Auckland; John Monigatti, Director of Medical Admissions, The University of Auckland; Mark Barrow, Assoc Dean (Education), Faculty of Medical and Health Sciences (FMHS), The University of Auckland; Papaarangi Reid, Tumuaki, FMHS, The University of Auckland; Caitlin Prendergast, Medical Student, The University of Auckland; Warwick Bagg, Head of Medical Programme, The University of Auckland
Acknowledgement: We thank staff in the Admissions Office (FMHS, The University of Auckland) for data.

Correspondence: Assoc Prof Phillippa Poole, Department of Medicine, Room 12-079, Support Building, Auckland Hospital, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand. Email p.poole@auckland.ac.nz

References:


Appendix 1. Members of the Interview Working Party (all from FMHS, The University of Auckland):

- Assoc Prof Phillippa Poole, past Associate Dean (Medical Programme), Chair
- Assoc Prof Papaarangi Reid, Tumuaki
- Assoc Prof Mark Barrow, Associate Dean (Education)
- Assoc Prof Warwick Bagg, Head of Medical Programme
- Dr John Monigatti, Director of Medical Admissions
- Dr Boaz Shulruf, Centre for Medical and Health Sciences Education
- Mr Ben Harley, past President AUMSA
- Ms Caitlin Prendergast, Grassroots rural student representative
Pancreatic stone and treatment using ERCP and ESWL procedures: a case study and review

James M Hayes, Steven L Ding

Abstract

Introduction Pancreatic duct stones are found in 22 to 60% of patients with chronic pancreatitis (CP). The stones can lead to obstruction of the outflow of pancreatic secretions causing increased intraductal pressure. The pancreas is relatively noncompliant. Therefore the rise in intraductal pressure can induce tissue hypertension and ischemia. This can be a major factor causing pain in patients with CP. This hypothesis is supported by the observation that symptoms may improve following pancreatic duct drainage.

Case presentation A 62-year-old woman presented with persistent epigastric pain. Investigations revealed calcifications within the main pancreatic duct and head of the gland. Treatment with endoscopic retrograde cholangiopancreatography (ERCP) and extracorporeal shock wave lithotripsy (ESWL) achieved a good outcome.

Conclusion Standard endoscopic removal of the stones proved impossible so treatment with ESWL was undertaken. Following fragmentation, the calculi and fragments passed spontaneously or were removed endoscopically. If pancreatic stones cannot be removed endoscopically, ESWL should be considered prior to surgery.

Background

Pancreatic duct stones are found in 22 to 60% of patients with chronic pancreatitis (CP). The stones can lead to obstruction of the outflow of pancreatic secretions causing increased intraductal pressure. The pancreas is relatively noncompliant. Therefore the rise in intraductal pressure can induce tissue hypertension and ischemia. This can be a major factor causing pain in patients with CP. This hypothesis is supported by the observation that symptoms may improve following pancreatic duct drainage.

A 62-year-old Caucasian woman presented with 4 months of persistent epigastric, central abdominal and left iliac fossa pain. The pain radiated to the back and could be severe. There was associated nausea, retching and anorexia with an unspecified amount of weight loss. She had intermittent diarrhoea with previous constipation and pain in response to stress.

Past history included hysterectomy complicated by adhesions and bowel obstruction, rectal bleeding and a right knee replacement. She had no personal or family history of pancreatitis, dyslipidaemia or malignancy. She took one standard unit of alcohol daily and paracetamol and a paracetamol-codeine phosphate compound for severe pain but no other regular medications. Physical examination revealed moderate epigastric tenderness. There was no guarding and no masses or organs were palpable.
Investigations showed CRP 93 mg/L (NR <5), total white cell count 11.3×10⁹/L (neutrophils 8.7, monocytes 1.1) and amylase 74u/L (NR 8–53). Liver function tests, amylase, carbohydrate antigen (CA 19–9), carcinoembryonic antigen (CEA) and IgG4 were all within normal reference range. She underwent upper and lower gastrointestinal (GI) endoscopy revealing mild reflux oesophagitis LA grade A and *Helicobacter pylori*-associated gastritis and mild sigmoid diverticular disease.

Abdominal ultrasound showed calcified stone/s within the head of the pancreas associated with main duct dilatation to 7mm. There was no fluid collection or mass lesion. The liver, biliary tree and gallbladder were normal. CT confirmed a 7mm stone within the main pancreatic duct in region of the neck with dilation of the duct downstream from this (Figure 1). There was a cluster of calcification superiorly within the pancreatic head.

**Figure 1. CT scan—pancreas (arrow points to the stone)**

![CT Scan](image)

**Case**

ERCP was performed 2 months after initial presentation (Figures 2, 3, 4). The pancreatic duct was selectively cannulated with a sphincterotome followed by guide wire and found to be mildly dilated to 7–8mm. The guidewire was obstructed at the neck, presumed to be secondary to the stone (although the stone was not visualised).

A pancreatic sphincterotomy was performed and a 5fr 5cm length plastic removable stent was placed. MRCP therefore performed (Figure 5) to further evaluate pancreatic duct anatomy. This showed partial pancreas divisum and confirmed the stones. The pancreatic duct appeared to be decompressed with calibre reduced to 5mm.
Figure 2. ERCP—pancreatogram

Figure 3. ERCP—normal major ampulla
Figure 4. ERCP—plastic pancreatic stent

Figure 5. MRCP
A surgical opinion was obtained and it was decided that pancreatic duct bypass and resection were not to be pursued. Six weeks later, she underwent ESWL. This was performed with a modern Dornier S II on Mobile Medical Technology’s lithotripsy bus. The system is equipped with dual imaging modalities which permits fluoroscopy or ultrasound localisation of stones. Fluoroscopy was used in this instance (Figure 7).

The shock rate was set to 1 Hz and the power increased from a minimum of 12 kV to a maximum of 15.1 kV. A rate of 1 Hz provides superior fragmentation. During the procedure, the patient lay on the lithotripter table in a prone right anterior oblique position. Treatment was performed under conscious sedation, administered by a specialist anaesthetist. Total duration of treatment was 1 hour and was well tolerated. The patient stayed in hospital for 1 night to receive supportive care and was discharged well the following morning. There were no complications.
A second ERCP was performed 5 days after ESWL (Figure 8). By this stage she had already had reduction in pain. The pancreatic stent was removed with a snare and pancreatic duct cannulated with a sphincterotome. A pancreatogram was obtained showing dilatation of the main duct to 8mm, but complete filling to the tail.

There was no stone, stricture or obstruction evident. The duct was trawled with a 9mm extraction balloon confirming a clear duct. A single pigtail stent 7fr 7cm length was then placed to ensure drainage and reduce the risk of pancreatitis (Figure 9) associated with pancreatic instrumentation. The pancreatic stent was removed 2 weeks later at upper GI endoscopy.

**Figure 8. ERCP—pancreatogram**

![Pancreatogram](image1)

**Figure 9. ERCP—pancreatic stent**

![Pancreatic Stent](image2)
At follow-up about 5 weeks after ESWL, abdominal pain and anorexia had resolved and she was feeling stronger on a daily basis.

**Discussion**

It was initially thought that this patient’s symptoms represented a combination of gastro-oesophageal reflux, Helicobacter gastritis and irritable bowel syndrome. Although she did have these problems, her ongoing epigastric pain and abnormal pancreas drew attention to the pancreas. Despite evidence for chronic pancreatitis, there was no history of preceding acute pancreatitis.

It was assumed her pain and systemic symptoms arose from stone obstruction of the main pancreatic duct. It was anticipated that there may be residual fragments and a stricture following ESWL. However at the second ERCP the pancreatic duct was mildly dilated with no other pathology present. The stone was very effectively treated by ESWL. The patient is doing very well without need for further intervention. She is however at increased risk of pancreatic cancer and ongoing surveillance with tumour markers and imaging is planned.

ERCP can be technically challenging and pancreatic endotherapy is usually performed by advanced endoscopists only. Endoscopic stone removal alone can have limited success, due to stone location, burden, and presence of strictures in the pancreatic duct. In chronic calcific pancreatitis, the main goals of therapy are to relieve pain by decompression of the main pancreatic duct, primarily by removing stones or treating strictures.

Endoscopic decompression has been shown to be effective in some nonrandomised studies. Endoscopic stone extraction and duct decompression is limited by the size of the pancreatic calculi and presence of strictures. ESWL overcomes the problem of the stone size by fragmenting the stones and reducing the stone burden, therefore allowing endoscopic clearance of the duct facilitates or spontaneous stone passage.

Focused shock waves administered during ESWL cause stone fragmentation. Repetition of this process eventually leads to pulverisation of the calculi.

Treatment of calculi by ESWL was first used for the treatment of kidney stones in 1980. The technique has since been applied to gallstones and pancreatic stones. Current data suggest that ESWL is effective in complete duct clearance in up to 50% of patients and in duct decompression and symptomatic improvement in up to 70% of patients. Therefore ESWL should be considered a useful adjunct in the treatment of pancreatic duct calculi.

Choi and Kim review ESWL for pancreatic duct stones in patients with chronic pancreatitis and find that ESWL is an effective and safe procedure for endoscopically irremovable main pancreatic duct stones, and, in selected patients, ESWL alone may be effective.

Furthermore in the first meta-analysis evaluating ESWL with or without endoscopic therapy in pancreatic duct clearance and symptom relief, seventeen studies published between 1989 and 2002 were reviewed. Results show that ESWL is useful in reducing the stone burden in the main pancreatic duct and also for improvement of pain.
The effect of ESWL on pain relief is significant. The potential mechanism for this improvement in pain is possibly due to main pancreatic duct decompression and relief of obstruction by stone fragmentation. Failure to relieve pain can be due to incomplete stone clearance, persistent strictures, or parenchymal pancreatic pain due to a diseased organ and not related to ductal hypertension.

All studies showed homogeneity suggesting similar effect size irrespective of the combinations of therapy. All studies were case series with a total of 588 subjects. Outcomes of therapy are best studied in randomised, placebo-controlled trials.

ESWL is an excellent therapeutic modality for large pancreatic calculi. The high efficacy, non-invasive nature of the procedure, along with the low complication rate make it a procedure of choice and can be offered as first-line therapy for selected patients with large pancreatic and CBD calculi.

Competing interests: None declared.

Author information: James M Hayes, Medical Imaging Lecturer, Faculty of Health and Science, CPIT, Christchurch; Steven L Ding, Consultant Gastroenterologist and Clinical Senior Lecturer, Christchurch Gastroenterology, Christchurch

Acknowledgements: We thank Dr Stu Gowland and Dr John Tuckey for their helpful comments on this paper.

Correspondence: James M Hayes, Medical Imaging Lecturer, Faculty of Health and Science, CPIT, PO Box 540, Christchurch, New Zealand. Email: james.hayes@cpit.ac.nz

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An unusual cause of massive splenomegaly in an adult

Mandeep Singla, Kulandaivelu Arivarasan, Varun Dhir, Prashant Sharma, Aman Sharma, Shefali Sharma, Surjit Singh

A 20-year-old male was admitted to our hospital with progressively increasing swelling of the abdomen since 12 years earlier; he tired easily. On examination, he had massive splenomegaly and moderate hepatomegaly (Figure 1), with kyphoscoliosis.

Figure 1. Massive splenomegaly and hepatomegaly

There was no lymphadenopathy. His blood investigations revealed bicytopenia (Hb 8.1, platelet count 18,000 and TLC 6100); the liver function tests were normal.
CT abdomen showed massive splenomegaly with multiple cystic and calcified lesions—probably old infarcts and hepatomegaly (see Figure 2 upper panel), with the spleen extending into the pelvis displacing bowel loops (see Figure 2 lower panel).

Figure 2. CT of the abdomen showing massive splenomegaly shifting other contents of the abdomen laterally

An X-ray of the thoracic spine showed vertebral collapse (not shown). Bone marrow examination revealed foamy histiocytes (Figure 3). The leucocyte β glucosidase level was low: 0.96 nmol/hour/mg (normal 6–9) thus confirming the diagnosis of Gaucher’s disease (lower than 15% normal mean). He was referred for possible inclusion in a clinical trial to another centre.
Discussion

Gaucher’s is an orphan pan-ethnic autosomal recessive disease (incidence 1:40,000) caused by mutations leading to deficiency of the enzyme β-glucosidase (also called glucocerebrosidase or glucosylceramidase). This leads to lysosomal accumulation of glucosylceramide most commonly in histiocytes, which leads to various organ manifestations. It is divided into three types: type 1 or the chronic non-neuronopathic form (95%) and the neuronopathic forms; type 2 (infantile) and type 3 (juvenile). The type 1 form is the most common, usually presents in childhood, and is characterised by hepato-splenomegaly, cytopenias and skeletal disease. In the skeleton these patients may have abnormal bone remodelling, bone infarctions (bone crises), lytic lesions and pathological fractures. However, the presentation can occur in the adults and there can be only some features present. This was the type present in our patient.

The type 2 and 3 forms have in addition neurologic features like bulbar signs and occulomotor involvement. The treatment of choice is enzyme replacement therapy (recombinant imiglucerase), which is expensive and not easily available, or substrate reducing drugs. This is an unusual cause of massive splenomegaly in adults, and should be considered especially in those with long standing organomegaly without fever or lymphadenopathy.
Author information: Mandeep Singla, Senior Resident¹; Kulandaivelu Rivarasan, Junior Resident¹; Varun Dhir, Asst Professor¹; Prashant Sharma, Asst Professor²; Aman Sharma, Asst Professor¹; Shefali Sharma, Asst Professor¹; Surjit Singh, Professor¹

1. Department of Internal Medicine
2. Department of Hematology

Post Graduate Institute of Medical Education and Research, Chandigarh, India

Correspondence: Dr Varun Dhir, Assistant Professor, Department of Internal Medicine, PGIMER, Chandigarh 160012, India. Email: varundhir@gmail.com

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Papules of unknown aetiology

Swati Andhavarapu, Winston W Tan

Case—A 27-year-old female with hypocellular myelodysplastic syndrome underwent matched unrelated donor allogeneic stem cell transplantation in July 2011. She presented with diarrhoea 3 weeks after transplant and was diagnosed as acute graft versus host disease of the gut. She did not respond to steroids and was treated with infliximab (antiTNFα monoclonal antibody), pentostatin and abatacept (CTLA4-IgG fusion protein) with minimal response.

She developed dark-coloured necrotic-appearing papules on her skin (Figure 1) which were biopsied. Culture plate showed grayish-black colonies (Figure 2). Septated hyphae with sporulation were noted on microscopy (Figure 3).

Figure 1. Patient with papules on her face
Figure 2. Sabouraud agar plate with grayish black colonies

Figure 3. Lactophenol Cotton Blue Wet mount preparation showing septate hyphae with sporulation (magnification 40×)

What is the diagnosis?
Answer—Disseminated Curvularia.

Discussion—Curvularia is a hyphomycete fungus which is a facultative pathogen of many plant species and of the soil. Curvularia infections in humans are uncommon and may affect respiratory tract, cornea and skin. Several uncommon presentations have been reported such as onychomycosis, mycetomas, allergic bronchopulmonary disease, keratitis and endocarditis following cardiac surgery.\(^1\)

The optimal therapy is unclear. Aggressive surgery can be performed in localised disease. Responses have been reported with amphotericin B, miconazole, ketoconazole, terbinafine and itraconazole in patients with systemic involvement.\(^2\)

Long-term observation is recommended to monitor for recurrences, especially in immunocompromised individuals.

Our patient was treated with combination of amphotericin B and caspofungin with improvement in the skin lesions.

Author information: Swati Andhavarapu, Division of Hematology and Oncology; Winston W Tan, Division of Hematology and Oncology; Mayo Clinic, Jacksonville, Florida, USA

Correspondence: Dr Swati Andhavarapu, Division of Hematology and Oncology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, Florida, USA 32224. Fax: +1 904 9536611; email: andhavarapu.swati@mayo.edu

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Comment on Carran and Shaw’s “New Zealand Malayan war veterans’ exposure to dibutylphthalate” article

We read the paper by Carran and Shaw (27 July 2012)1 with some disquiet. We have a high degree of respect for veterans and consider that the flaws in the study are so serious that one must question why the paper has been published in its current form or indeed why the research went ahead at all.

This research was not hypothesis generating. It should therefore have been done properly using established epidemiological techniques. This is in fact neither a cohort nor a case-control study; it is a cross-sectional convenience sample and a cluster investigation without determination of the size of the cluster. If a power calculation had been carried out it would have shown that the study aims were not achievable. With an expected incidence of cryptorchidism of 1.09%, a follow up of approximately 4600 individuals would have been required to detect a relative risk of 2 at the 5% confidence level with a power of 80%. For hypospadias, at 0.33%, the numbers required are in excess of 15,000.

The epidemiological and statistical techniques were also inadequate. A well powered nested case-control study,2 with 78 cryptorchidism case and 56 hypospadias cases nested within a cohort of 8698 male births, did show an association between pesticide exposure and cryptorchidism. On the other hand hypospadias was not associated with pesticides but with paternal, and not maternal, smoking. Both abnormalities were associated with poorer maternal health, socioeconomic factors and pre-term delivery. A previous study also showed associations with maternal parity, low foetal growth and duration of gestation.3 The relationships are therefore complex, and require, at the very least, consideration that these factors should be included in a model that can adjust for them. This requires an appropriate regression model and calculation of either Standardised Incidence Ratios or Odds Ratios.

In addition there is a critical flaw in the response rate of the study at 33%. Response bias is quite likely to have occurred, with responders more likely to have been concerned about exposure and report one of the adverse events.

Additionally, the assumptions that the estimated doses of dermally administered doses of dibutyl phthalate increased the risk of multigenerational developmental effects are flawed. The doses absorbed by the soldiers were compared to a Lowest Adverse Effect Level of 50 mg/kg.4 The cited study investigated orally administered dibutyl phthalate to pregnant female rats which resulted in altered gene expression and testosterone synthesis in the fetal testes of the in utero males.

There can be no comparison between soldiers who were dermally exposed to dibutyl phthalate at least several years before they reproduced, and in utero male rats being exposed to dibutyl phthalate following maternal oral ingestion. Furthermore, estimated doses dermally absorbed by these soldiers were based on an investigation assessing percutaneous absorption of dibutyl phthalate in rats.5
The authors rejected the absorption rates across cadaver skin from the same study without giving evidential reasons why this approach was flawed; using human tissue is a well-established procedure and \textit{in vitro} results are predictive of \textit{in vivo} absorption. Rates of steady state absorption of dibutyl phthalate across rat skin can be up to 130 times greater than across human tissue.\textsuperscript{3} Any calculation estimating absorption across human skin based on animal models will therefore be substantially inflated.

Lastly there are the ethical issues of explaining the study results to what is, in effect, a vulnerable group. It includes the veterans, but also their offspring. There are already questions being raised about compensation. It is clear that New Zealand Veterans of Malaya, Vietnam and the Christmas Island Nuclear Tests were exposed to a toxic environment during their service. Decisions on compensation will however have to be made by the Government. Studies like this do not help in that process.

David McBride  
Associate Professor in Occupational Health

Leo Schep  
Toxicologist, National Poisons Centre

Department of Preventive and Social Medicine, University of Otago  
Dunedin School of Medicine

References:


Smoking around hospitals

As New Zealand officially moves towards its appointment with smokefreedom in 2025¹ a wide variety of new policies together with improved smoking cessation treatments will be required to keep to the target.

Initiatives already underway include removing the visibility of smoking in public areas, plain packaging all tobacco materials and ensuring that all tobacco products and associated advertising are out of sight in shops—this denormalisation will reduce children’s and adolescents’ interest in smoking.

A peculiar perversity of the Smokefree Environments Act, which has very successfully prevented indoor smoking in public places is to very visibly concentrate smokers, both patients and staff, at the front entrance or close by the entrance to many New Zealand hospitals. As legislation prohibits smoking on hospital grounds this often involves moving smokers to the street. At Wellington hospital, for example, smokers have been gradually encouraged to move further and further away from the hospital’s front entrance and down onto the street. Similarly, at the Hutt hospital, smokers have been moved further away from the hospital entrance.

One potential risk associated with this is that should they [patients] collapse they will need to re-enter hospital by ambulance. Those on telemetry who collapse in the street will not be able to rapidly access the hospital resuscitation team thus decreasing the chances of successful resuscitation.

Of course, for most hospitalised smokers in hospital, nicotine replacement which is now widely offered as part of the ABC programme² is an important therapy which prevents much of the physical and psychological symptoms associated with nicotine withdrawal. It is likely to be only the very nicotine addicted smoker who needs to brave the elements and stand in the street to smoke.

The smokefree environments legislation was not designed to stigmatise smokers or have them in hospital gowns on the street, but it is an unintended consequence. If we consider tobacco smoking, to be a nicotine addiction that is tough for many to break, and that nicotine replacement is insufficient for some smokers, then we should assume a more compassionate stance and consider the provision of at least some shelter and privacy for patients. The upside will be to reduce the visibility of smoking and have patients where they can maintain close contact with the hospital and where cessation advice and help could be offered directly. The downside is that this may be seen as condoning smoking, a retrograde step in the smokefree vision, and it may require a law change.

So far smokers have generally been supportive of the measures to reduce smoking and the concept of a Smokefree New Zealand; it would be unfortunate to alienate that support by herding hospitalised smokers further and further away, both literally and metaphorically.
Julian Crane*, Stephen Vega, Brent Caldwell, Marie Ditchburn, David Robiony-Rogers, Angela Thie, Alison Huxford

*Department of Medicine, University of Otago, Wellington

References:


Vagal nerve stimulation in New Zealand: improvement of seizure control following the implantation of a vagal nerve stimulator

Vagal nerve stimulator (VNS) is a form of neuro-stimulation therapy that was approved for use in medication refractive epilepsy in patients not eligible for resective epilepsy surgery in Europe and the United States in the mid 1990s. A number of well-designed international trials support the efficacy of this treatment. Despite these positive trial results access to VNS in New Zealand is limited and currently not readily funded by the government. We would like to report the outcome of, what we believe to be the first government funded adult VNS implantation in New Zealand.

The patient is a 31-year-old man with symptomatic localisation related epilepsy due to a dysembryonic neuro-epithelial tumour diagnosed during childhood. Seizures started prior to tumour diagnosis and continued despite initial tumour resection, a second resection in an attempt to quell the epileptogenic focus, and trials with virtually all anti-epileptic medications available in New Zealand. The patient suffers from a variety of seizure types including auras, simple partial seizures (SPSs) affecting right upper limb motor function without alteration of consciousness, complex partial seizures (CPSs) affecting right upper limb motor function with alteration in consciousness, and generalised tonic clonic seizures (GTCs). Due to his epilepsy he has been unable to pursue a career or hold a steady job in the past despite normal intellectual ability.

In 2008 seizure frequency escalated resulting in multiple emergency department visits and admissions. At that stage the option of further resective surgery was rejected due to the low likelihood of further benefit and high risk of resultant hemiparesis given the close proximity of his epileptogenic focus to the motor strip. VNS was subsequently considered and funding was eventually approved by the patient’s home district health board (Whanganui DHB). The VNS was implanted at Wellington Hospital in July of 2009 under the guidance of the MidCentral Health neurology team.

To assess the effect of the VNS in the patient both hospital records and detailed patient seizure diaries from 18 months before to 24 months after VNS implantation were reviewed.

Variables considered include: monthly frequency CPSs, GTCs, days with any seizure, days with ≥10 seizures, doses of rectal diazepam and emergency department visits.

After implantation of the VNS the average monthly frequency of CPSs reduced by 94% with only two CPSs in the most recent seven months. The patient did not experience a single GTC over the final 13 months of the reviewed period with an overall 85% reduction in monthly GTC seizure frequency after VNS implantation. SPS and aura frequency are harder to quantify in this patient as he often experiences them for hours in a row introducing inaccuracies when attempting to count them individually.
In an attempt to quantify SPSs he was instructed to group days by either ≥10 or <10 SPS/auras per day as an indicator of severity. In contrast to the first two variables there was a 32% increase in this variable following VNS implantation. However, overall the total number of days with any type of seizure per month remained reduced by 26% following the implantation of the VNS.

Surrogate markers for seizure severity include rectal diazepam use and emergency department visits. The patient routinely uses rectal diazepam (10mg) when he experiences a frequency of seizures that causes significant physical discomfort; however, he tries to limit diazepam use as best as possible due to its side effects of drowsiness rendering him unable to participate in routine tasks for the remainder of the day after using it.

Therefore diazepam use serves as a good indirect indicator of seizure frequency/severity and functional outcome. As with seizure frequency subsequent to VNS implantation there was a 32% reduction in average monthly diazepam use.

Unsurprisingly, correlating with the marked reduction in GTCs there was a dramatic reduction in emergency department after VNS implantation of 77%.

Table 1. Summary of percentage improvement in variables studied.

<table>
<thead>
<tr>
<th></th>
<th>Complex Partial Seizures</th>
<th>Generalised Seizures</th>
<th>Doses Of 10mg Diazepam</th>
<th>Total Seizure Days</th>
<th>ED Visits</th>
<th>Seizure &gt;10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Monthly - pre VNS</td>
<td>50.3</td>
<td>2.2</td>
<td>23.9</td>
<td>18.4</td>
<td>0.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Avg Monthly - post VNS</td>
<td>3.0</td>
<td>0.3</td>
<td>16.1</td>
<td>13.4</td>
<td>0.2</td>
<td>5.8</td>
</tr>
<tr>
<td>% improvement</td>
<td>94</td>
<td>85</td>
<td>32</td>
<td>26</td>
<td>77</td>
<td>-32</td>
</tr>
</tbody>
</table>

This case highlights the significant benefit that patients can experience in response to VNS implantation. It also reiterates the typical outcome seen with VNS: seizures are not cured, but significantly reduced to the point of dramatic changes in quality of life and potential reduction in burden on society.

While this patient demonstrated a mild increase in SPS his significantly more disabling GTCs and CPSs and concomitant reduction in diazepam use allowed him to subsequently start pursue an informatics degree and safely help to take care of his infant son. The reduction in emergency department presentations not only underscore the improved quality of life for the patient and his family, but also demonstrate a substantial reduction in treatment cost to the public health sector.

We hope that these results replicating international evidence in a New Zealand patient will highlight the need to improve access to this effective therapy for carefully selected New Zealanders suffering from intractable epilepsy.
Michael Funnell
Trainee Intern
University of Otago, Wellington at Palmerston North Hospital

Annemarei Ranta
Consultant Neurologist
MidCentral Health, Palmerston North; and
Associate Dean of Undergraduate Medical Education
University of Otago, Wellington at Palmerston North

References:
Learning about public health via novels: Low interest by medical students, especially relative to movies

We previously identified and assembled a collection of novels in ebook format that had public health themes,¹ which could potentially be used in medical education. Subsequently, we made 10 of those novels available at our medical school library on a hand-held device (Kobo eReader). In addition, another 10 novels in paperback format were also made available. Five novels shared both formats and all novels are described in an online report.² The availability of these novels was regularly promoted by the library service to the fourth and fifth year medical students during the 2011 academic year (there were 87 and 90 of these students respectively).

Despite this promotion, in a 12-month period (ending February 2012), there were only a total of 17 (42.5%) withdrawals of the reading device with the ebooks and 23 withdrawals of print novels (57.5%). Furthermore, medical students only withdrew the reading device five times and withdrew other novels 10 times (with the remainder being other users: medical school staff and other health sciences students).

This apparent lack of interest in novels (regardless of format), contrasts with much more positive medical student attitudes to public health related movies³ and in terms of taking them out of this same library.⁴ Further to this, we recently (March/May 2012) surveyed the first two groups of medical students to undertake the public health run in 2012, using an anonymous written questionnaire. They reaffirmed high agreement with the provision of public health related movies (20/25 saying “agree” or “strongly agree”). When compared to reading a novel with public health themes, most “much preferred” (12/25) or “somewhat preferred” (7/25) a movie. Only one of these new students had taken out novels (ebook or hard copy) from the library even though (9/23) reported that they were aware that these particular resources were available.

In summary, there appears to be fairly limited value in making novels available to medical students, at least in this particular university setting. In contrast, there is evidence for higher student interest in movies with public health themes. Therefore using the latter may be preferable for encouraging student engagement with public health and social issues.

Nick Wilson¹, Anne Tucker², Maxine Schutte¹, Peter Gallagher¹, Philippa Howden-Chapman¹

¹ University of Otago Wellington, PO Box 7343 Wellington South, New Zealand (NZ)
² Whitireia Community Polytechnic, Wellington, NZ
References:


“The Noblest of all Professions”

Published in NZMJ 1912 March;11(41):95.

(From St. George's Hospital “Gazette”)

When you're snugly in your bed and just asleep.
And suddenly your night-bell gives a jar,
And you struggle up, though feeling, oh! so cheap,
Remember what a splendid chap you are.

When you're waiting for the cervix to dilate,
Or wondering if the head can struggle through,
And hardening your heart to perforate;
Remember what the public thinks of you.

When the pride of all the flock has got the dip,
And you stand by, debating, with a knife,
Have you seized the happy time, or let it slip?
Remember, please, the splendour of your life.

When you're asked to break some ghastly piece of news,
Or tell some wretched man he'll live a week;
While you sketch two kinds of death and let him choose,
Remember your profession is unique.

Just remember how your patients' bosoms burn
With gratitude and thankfulness immense:
Yes, remember all the praises that you earn,
And mind you join the "Medical Defence."
Obesity and hypertension related to sleep disorders?

There is growing evidence of a relationship between sleep and health—in particular, obesity and hypertension. 22,389 healthy volunteers (blood donors) were enrolled in this study which correlated the incidence of sleep disorders with obesity and hypertension. Sleep disorders were identified by a questionnaire seeking information about snoring, sleep apnoea, and insomnia. Obesity was assessed as a body mass index (BMI) of >30 and hypertension as a blood pressure >140/90. Lack of sleep (36%), snoring (33%), elevated blood pressure (20%), and obesity (19%) were recorded in this healthy cohort. The conclusions were that obesity and hypertension are significantly associated with a variety of sleep disorders.


Alcohol drinking and risk of rheumatoid arthritis in women

Apparently there are studies that suggest that those who drink alcohol have a lowered incidence of rheumatoid arthritis. This report concerns a prospective study of 34,141 Swedish women born between 1914 and 1948 who were enrolled in their national mammography cohort. Repeated assessments of their alcohol consumption between 1987 and 1992 were correlated with the incidence of development of rheumatoid arthritis.

The researcher’s analysis showed that women with a consistent consumption of more than three alcoholic drinks a week for at least 10 years had about half the risk of developing rheumatoid arthritis as never drinkers. They note, however, that the effect of higher doses of alcohol on the risk of rheumatoid arthritis remains unknown. And we wonder whether the same effects apply to men as well?

BMJ 2012;345:e4230.

Prevention of type 2 diabetes by bariatric surgery

Weight loss protects against type 2 diabetes but is hard to maintain with behavioural modification alone. This nonrandomised, prospective, controlled study examined the effects of bariatric surgery on the prevention of type 2 diabetes. 1659 obese patients who underwent bariatric surgery were matched with 1771 obese controls who were managed by usual care. None had diabetes at baseline. Patients in the bariatric surgery cohort underwent banding (19%), vertical banded gastroplasty (69%), or gastric bypass (12%). At 15 yrs type 2 diabetes had developed in 392 of the control group and in 110 of the surgical cohort. These results reflect incidence rates of 28.4 and 6.8 cases per 1000 person-years respectively. Clearly better results for surgery. A downside was an 0.2% post-operative mortality rate and 2.8% of the surgical patients required reoperation within 90 days for complications.

Assessment of the 2010 global measles mortality reduction goal

Measles remains a major cause of childhood death even though an efficient vaccine was introduced in 1963. Consequently in 2008 all WHO member states endorsed a target of 90% reduction in measles mortality by 2010 over 2000 levels.

The authors of this study have developed a model to estimate the progress made towards this goal. Their estimate is that the global measles mortality decreased 74% from >500,000 deaths in 2000 to >100,000 in 2010. Measles mortality was reduced by more than three-quarters in all WHO regions except the WHO southeast Asia region. India accounted for 47% of estimated measles mortality in 2010, and the WHO African region accounted for 36%. Good, but not good enough


Does the patient’s perspective of hypertension affect their compliance with treatment?

To elucidate the researchers systematically reviewed 59 papers from 16 countries. They excluded studies which involved patients with other cardiovascular disease or diabetes or who were pregnant. They report that a large proportion of participants thought that hypertension was principally caused by stress and produced symptoms, particularly headache, dizziness, and sweating.

Participants widely intentionally reduced or stopped taking drugs without consulting their doctors. Other causes of non-adherence noted were drug adverse reactions, fear of addiction and in some countries cost of treatment. Contrary to the conclusion of individual studies, this review found no evidence of differences in understanding between ethnic, cultural, or geographical groups.

BMJ 2012;344:e3953.
Montagu Edward (Bill) Williams

8 September 1921 – 6 August 2012 (MB ChB Otago 1952, RNZAF AF4213957, The New Zealand 1990 Commemoration Medal for Services to New Zealand)

“Dr Bill” Williams was born the son of a nurseryman in Te Awamutu in 1921. He attended New Plymouth Boys High School and then worked on the family nursery until WW2, when he enlisted in the RNZAF. He was posted to Canada for training and then to Wales, where he flew as a navigator on Lancaster bombers, completing his training just as the war ended.

After the war he returned to New Zealand and entered Otago University Medical School, graduating in 1952. He completed his House Surgeon years at Waikato Hospital. He married Helen in 1951, and their three surviving children all went on to become GPs.

Bill moved to Whakatane in 1953 to take up General Practice, and then in 1956 moved to live in Pakuranga, Auckland. He bought Ian Broadfoot’s practice which had been formed in 1948 in nearby Panmure, only the second group practice in New Zealand, to join partners George Hitchcock, Irvine Cowie, and Des Hall.

Subsequent partners there were Peter Gibson, John Taylor and Ralph Reeves. He practised there until semi-retirement in 1983. In 1956 he was the first doctor at the newly-established Pakuranga Children’s Health Camp, treating more than 25,000 children over the next 45 years. Although he received several awards from the community for his services, his greatest satisfaction and enjoyment came from the children. During their short time under his care he made huge efforts to ensure any medical or surgical needs of the children were subsequently met, to better their future lives.

He set up several Industrial Medical clinics at some of Auckland’s larger industrial sites, where he attended on-site weekly for many years, becoming a foundation member of ANZOM. He also had a busy obstetric practice for 25 years, delivering over two thousand children.

He was an astute diagnostician, using his profound knowledge of anatomy and the disease process combined with his deep intuition for the human being in need. He had a gift for relating to all people, showing those in distress the positives in their situation, but not giving them false hope.
After retirement from Panmure he continued to enjoy seeing patients for another 20 years in the surgery he and Helen set up at their home, before they moved into the Pakuranga Park Village.

For recreation over his life he always enjoyed the sea, as well as travel to Fiji and the United Kingdom. He was an accomplished snow skier, helping to build a ski lodge on the slopes of Mt Ruapehu, which his children and grandchildren still use today.

In his retirement he continued his prolific tomato-growing, grew Frangipani, restored a classic MG car and remained a keen fisherman and sailor. His last outing on his boat was this year, at the age of 90. He was a caring and generous family man who gained the respect and admiration of a large number of patients and friends. Many of the former became the latter, many for decades.

He is survived and sadly missed by his wife Helen and his children Scott, Christine and Alex, as well as his nine Grandchildren and four Great Grandsons.

Scott Williams, Alex Williams (GPs, Panmure, Auckland) and Christine Williams (GP, Te Puke) wrote this obituary.
David Cranleigh Thomson Bush

1926 – 2011; MBChB, DA(Eng), FANZCA

Dr David Bush died in Christchurch on July 5, 2011 aged 84 years.

David was born in Wellington and grew up on a farm in the Awatere Valley—an isolated area in the upper South Island (now known for being part of the Marlborough wine region), and as a boy always wanted to be a farmer. However, his father had other ambitions for him and sent him to secondary school at Christ’s College in Christchurch where he was a prefect and gained his school colours for shooting. He also did well enough academically to obtain a place at the University of Otago in Dunedin and then on to its medical school, graduating with his MBChB in 1952.

Following graduation, David completed his house surgeon years at Christchurch Hospital and then took the six-week boat trip to England as the ship’s doctor. In the UK, he continued anaesthesia training, obtaining the DA while working in Whittington Hospital.

Dr Bush returned to Christchurch to finish his anaesthesia training and, having obtained his FFARACS, he took up a post as a consultant anaesthetist. At this time he also met, and after a three-week courtship proposed to, his wonderful wife Nan.

David’s initial interests included paediatric anaesthesia and he anaesthetised a lot of children with great skill in his early career.

He eventually dropped some sessions at Christchurch Hospital and developed a very busy private practice. His surgeons recall him as being very meticulous in his work—a great attribute for an anaesthetist—and very caring to his patients. He was also very willing to come in at all hours for emergencies.

David was also very highly regarded by the nursing staff at all the hospitals in which he worked. He was forever the polite gentleman, always calling the nurses “Sister”, never by their Christian names, and was known for his impeccable manners. He was also much liked for his habit of calling into the wards at the end of a busy day in theatre to check that all was well and offer to reinsert any IVs.

Although quite conservative by nature, David Bush did have quite an innovative side. When the Inland Revenue Department decreed that only vans could be claimed as work vehicles, he took the back seats out of his racy yellow Mitsubishi and turned it into a van! Early on in his private career he recognised that the backless theatre stools, which were the only seating provided in theatre at that time, were not good for the anaesthetist’s posture during long cases. To solve this problem, he installed the “Bush Chair of Anaesthesia” in the theatre he used most. This was a padded swivel chair with arms, which made extended plastic surgery cases a lot more comfortable. On the clinical side, the PACU nurses recall that he was one of the first Christchurch anaesthetists to prescribe IV rather than IM analgesia for his patients in the recovery unit. This was unusual at the time.
Another of David’s contributions to anaesthesia in Christchurch was the encouragement of younger anaesthetists starting out in private practice. He was a great mentor and even arranged with his surgeons to hand over some of his lists to help them get started. He would also very generously put on a luncheon at his local restaurant for our annual meeting.

Away from the operating theatre, David had a wide range of interests. Encouraged by his school friend, radiologist Shailor Weston, he joined the Royal Naval Reserve where he served as a medical officer for over 15 years, reaching the rank of Surgeon Lieutenant Commander and receiving the Volunteer Reserve Decoration for his work. His interest in things nautical extended to his owning various boats that were used for family holidays on the Southern Lakes where he also headed for winter skiing. He was a keen golfer and bridge player as well as a model train enthusiast—using leftover orthopaedic plaster-of-Paris for his scenery.

Along with his all his hobbies and very busy work schedule, David, in conjunction with his colleague, the late Dr Bill Pryor (the author’s father), somehow managed to co-author the third and fourth editions of Bill’s book, *A Manual of Anaesthetic Techniques*. These were published in the late 1960s and early 1970s and, being a very practical tome, proved popular with the junior anaesthetic staff at that time. The fourth edition even managed a Spanish translation! David also contributed the chapter “Anaesthesia for Major Oral Surgery” in Bill’s other book on anaesthesia for dentistry.

Having worked incredibly hard over the years, David retired in his early sixties, determined to leave anaesthesia practice while still “on top of his game”. This he certainly achieved. He had several years of very happy retirement with Nan who had not only looked after the family during David’s very busy career but had also been his secretary —making herself constantly available to answer the phone to surgeons and patients. There were no practice rooms or cell phones in those times. He was absolutely devastated when Nan was diagnosed with Motor Neurone Disease and his health unfortunately deteriorated rather rapidly after she predeceased him.

However, even in the rest home, afflicted with the cruel symptoms of Alzheimer’s, David’s hallmark impeccable manners never deserted him. He continued to greet family and friends, whom he no longer recognised, with a wonderful smile and ever-polite greeting. Unfortunately, his good manners did cause occasional problems. When David was moving around the home, Zimmer frame pile-ups were a common problem with David always insisting that the ladies went through the doorways first!

David will always be remembered as a very principled man, a true gentleman, a skilled anaesthetist who gave great care to a huge number of patients and great service to his surgeons, a very generous colleague and a very devoted husband, father and grandfather who is greatly missed.

Dr Peter Pryor (FANZCA, Christchurch) wrote this obituary.