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CREDITS

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Thinking outside the medical school box

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As a Trainee Intern, I am on the cusp of ending my time as a student and starting work as a doctor. This transition period has offered me and my colleagues a chance to think about and reflect on our six years of medical school. Being at medical school is an amazing opportunity and can be described as a roller-coaster ride of emotions – from the excitement of being accepted into medical school in second year, to the stress of exams in fifth year, to the elation of graduating and becoming a doctor.

Medicine is an intensely academic course. However, for all of us, I hope that the time we spend at medical school consists of more than just textbooks, assessments and learning scientific facts. Medicine is an art and it cannot be memorised solely from a book. Our time at medical school also presents us with an opportunity to explore and learn more about the world around us. For second and third year medical students, I urge you to participate in some of the various extracurricular activities offered at medical school, and at the wider university. It may seem like you are too busy studying to have spare time for such activities, but, in hindsight, I can say that you do indeed have the spare time. Play some social sport, join an interest group or learn a language. Or perhaps consider the opportunities offered through medical school, such as joining one of the various rural and global health groups, or even becoming part of the Editorial Board of this Journal!

As you continue further into medical school, continue with those activities, as they will help keep you sane through the stressors of the clinical years. Not only will extracurricular activities be good for your mental and social wellbeing, they will provide you with invaluable real-life experiences that will ultimately help you become a better doctor.

The theme of this issue of the New Zealand Medical Student Journal (NZMSJ) is Medical Humanities. This is an interdisciplinary area where medicine intersects with aspects of the humanities, such as politics, literature, ethics, history, film, sociology, philosophy and the visual arts. The field provides insight into humans as social creatures, and gives medical practitioners a chance to develop and critique our skills in observation, empathy and analysis. The University of Auckland's website on Medical Humanities adds that:

> "Humanities can present an additional and important context, not only for the practice of medicine, but also for thinking about the nature of medical problems." [1]

Medicine is not just about treating the patient in front of us, but thinking about the wider issues that led the patient to present in front of us in the first place. Further developing our critical and analytical skills, through reading and learning beyond the science, can help us become more holistic and better doctors.

In third year, students have the opportunity to do a short course in Medical Humanities; and in this issue of the Journal, we have three articles that students wrote as part of that course. The articles explore various themes; from the legality of assisted suicide, to the methodology of obtaining knowledge, to how medicine is depicted in art. The Editorial Board hopes that the diversity of articles and views contained within them encourages the readers to think critically and creatively themselves.

The Journal continues in its ethos to publish quality academic articles, which are of educational interest to New Zealand medical students. In this issue Kaihan Yao and Tasneen Haque present a case report on peri-prosthetic fractures. We also have an elective report on David Short's time in Nepal and two book reviews that we hope students will find helpful.

The New Zealand Medical Student Journal was started in 2003, to give students the opportunity to gain experience in submitting articles to an academic journal; and to also be an educational tool for those students involved in Editorial Board of the Journal. We publish articles from New Zealand medical students, and also from others around the world, provided they are relevant to our readers. We encourage you to think outside the medical school box and do something different in 2013. For instance, write an article for us, join our Editorial Board, or contribute in some other meaningful way to the medical student community.

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The Australian Internship Crisis: the impending 'tsunami' of Australian medical graduates

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nzmsa

Michael Chen-Xu is a Trainee Intern at the University of Otago, Wellington. He has just finished his BMedSc(Hons) looking at platelet responses to stimulation by Toll-like receptor agonists in acute coronary syndrome patients. He has also just finished his term as the 2012 NZMSA President. As the President, Michael represented medical students to the government and various stakeholder bodies interested in the health system.

Australia is currently facing an internship placement (PGY1) crisis for 2013, with 3326 Australian-trained medical graduates (2,828 domestic and 498 international) applying for the 3,091 available internship places – however, the shortfall of internships is 180 places based on updated data.[1] Internships are crucial for graduates both in New Zealand and Australia. Graduates must satisfactorily complete an internship year to obtain registration with their respective States' statutory registration body. The respective State Governments fund these intern places.

The discrepancy between medical graduate numbers and internship places is set to increase, with the Federal Government and the State Governments at an impasse regarding the funding for internship places for 2012, and Australia projected to graduate 3,800 students in 2015. Many observers in New Zealand are concerned that the current internship crisis in Australia this year marks the beginning of an impending "tsunami" of Australian medical graduates flooding into New Zealand, competing with New Zealand-trained medical graduates for PGY1 jobs.

Admissions to medical school in Australia have been static since the 1980s, before significant increases in medical school admissions were undertaken in 2000, following reports that the Australian medical workforce was in undersupply.[1] Since then, medical school admissions have more than doubled from 1,600 in 2000, through to 3,469 in 2010[2] – admissions are set to plateau at about this level for the near future. At the same time, numbers of students graduating from Australian medical schools have increased from 1,587 in 2005, through to 3,326 in 2012.[2] Meanwhile, internships places have steadily increased, although not at the same pace at which graduate places have – from 1,531 in 2004, through to 3,091 in 2012.[2]

In Australia, all Commonwealth Supported domestic medical students are guaranteed to receive internships, but not full-fee paying domestic or international students. Following a high-profile campaign by the Australian Medical Students' Association (AMSA), the shortage of 235 internships has become a topical issue, given the medical workforce shortage in Australia and the large growth in graduate numbers without corresponding increases in internships. In response to the AMSA campaign, the Federal Government Department of Health and Ageing promised $10 million of funding for 100 extra internship places on the proviso that the State Governments provide the funding for the rest of the shortfall. At this stage, the State Governments have refused to do so.[1]

So, how will this affect New Zealand medical students?

Currently, the Advanced Choice in Employment (ACE) scheme is structured (following changes proposed by NZMSA) to make it difficult for Australian medical graduates to be eligible for ACE, as candidates are expected to start work in New Zealand befaore the academic year ends for many Australian medical schools. This, theoretically, allows New Zealand domestic students to be preferred to Australian citizens/permanent residents, even though under the immigration law, citizens/permanent resident Australian and New Zealand medical students are equivalent in ACE. The legislation does not allow New Zealand international-student graduates to be preferred over Australian citizen/permanent resident graduates under ACE, however.

NZMSA is currently engaging with Health Workforce New Zealand to ensure that the DHBs provide sufficient internship places for all New Zealand trained medical students.

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NZMA
New Zealand Medical Association

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

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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.

INTRODUCTION

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.[1–3]

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.[4–7,8p249,9] 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 Maori health and Maori 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 Maori 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 in the following eight health professional programmes in 2010 were included in the study (Table 1).

Professional programme	School-leaver entry pathway	Tertiary entry pathways
Bachelor of Dental Surgery (BDS)		√
Bachelor of Dental Technology (BDentTech)	√	√
Bachelor of Medical Laboratory Science (BMLSc)		√
Bachelor of Medicine and Bachelor of Surgery (MBChB)		√
Bachelor of Oral Health (BOH)	√	√
Bachelor of Pharmacy (BPharm)		√
Bachelor of Physiotherapy (BPhty)		√
Bachelor of Radiation Therapy (BRT)	√	√

Table 1: Eight professional programmes included in the study.

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.[11–13]

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.

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

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

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.

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

Table 3: Sex (2010 year; domestic and international students).

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.

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

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

Ethnicity In 2010, Maori, Pacific and New Zealand European students were underrepresented, 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 MBChB.

When assessing Maori participation it is more accurate to compare with the domestic student population as there were very few international students who identified as Maori.

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 MBChB. 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.

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

Table 5: Ethnicity (2010 year; domestic and international students).

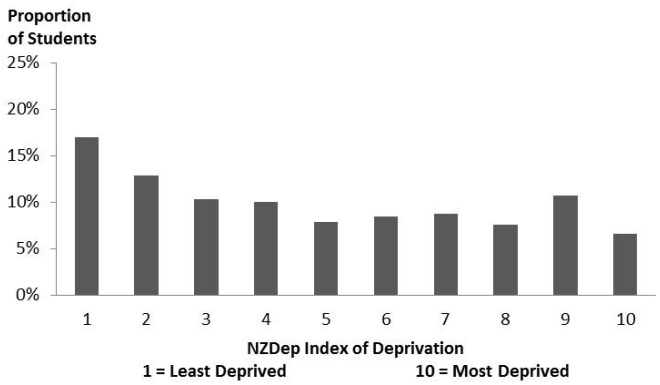

Figure 1: Bachelor of Pharmacy students by NZDep.

* NZDep (index of socioeconomic deprivation).

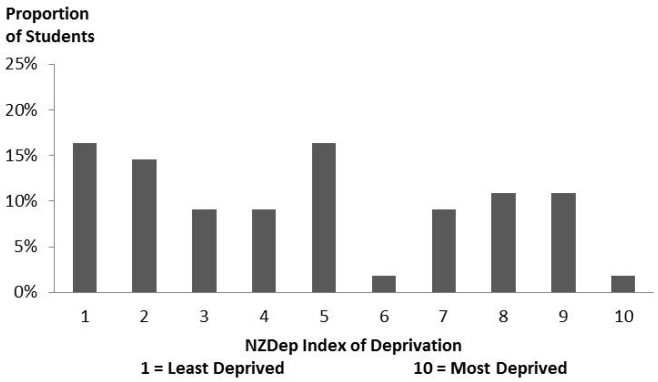

Figure 2: Bachelor of Medical Laboratory Science students by NZDep.

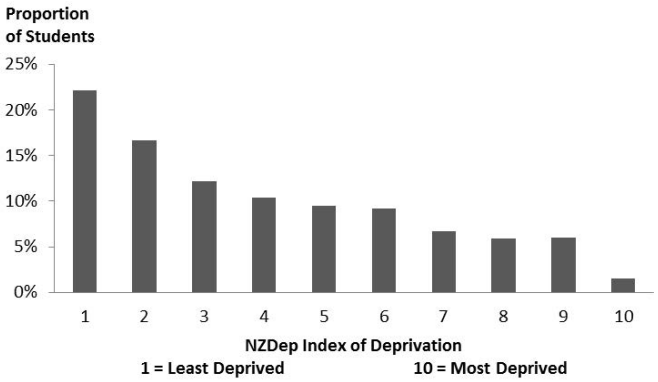

Figure 3: Bachelor of Medicine and Bachelor of Surgery students by NZDep.

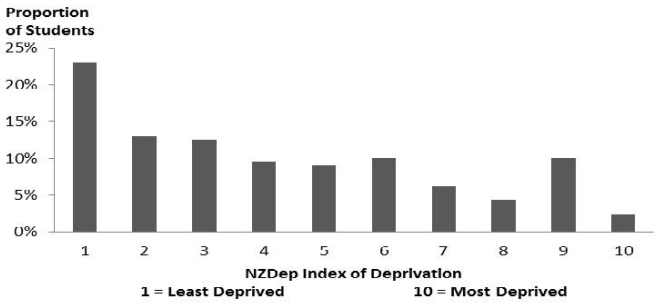

Figure 4: Bachelor of Dental Surgery students by NZDep.

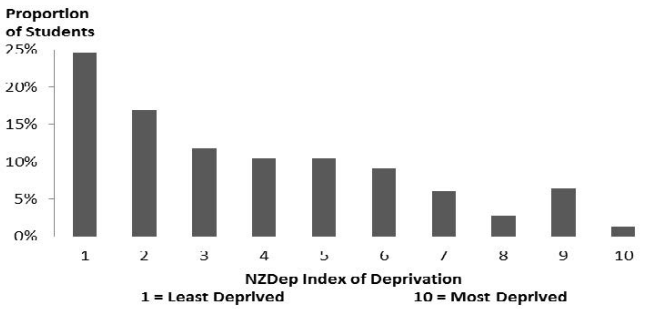

Figure 5: Bachelor of Physiotherapy students by NZDep.

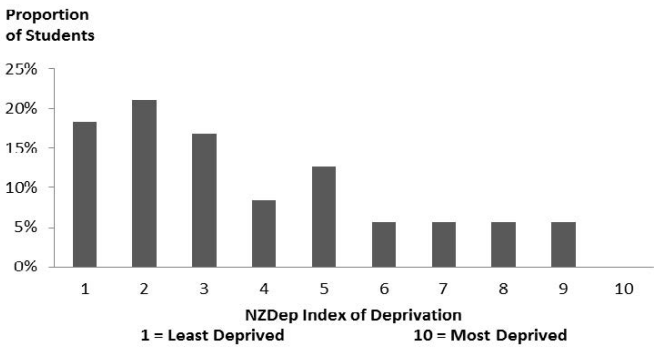

Figure 6: Bachelor of Radiation Therapy students by NZDep.

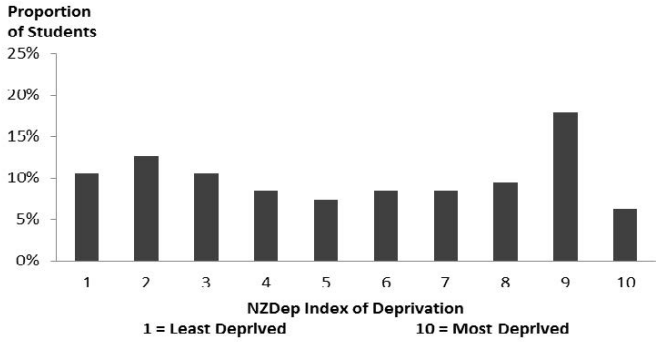

Figure 7: Bachelor of Oral Health students by NZDep.

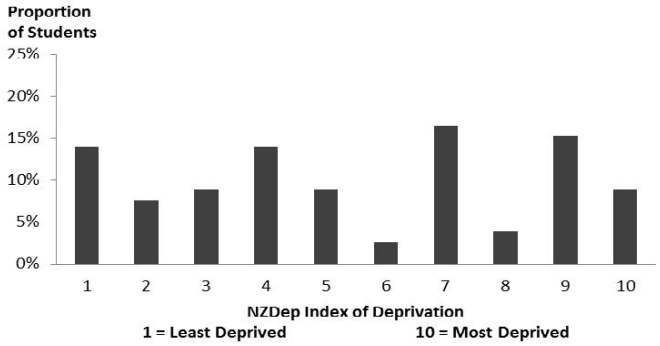

Figure 8: Bachelor of Dental Technology Health students by NZDep.

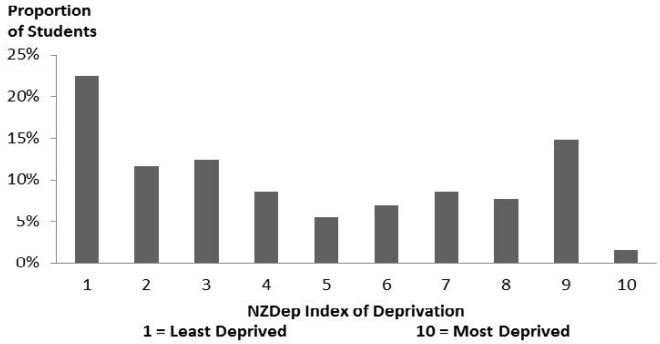

Figure 9: Maori Health Science professional programme students by NZDep.

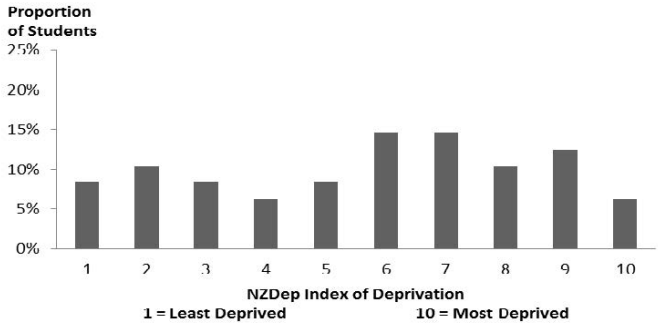

Figure 10: Pacific Health Science professional programme students by NZDep.

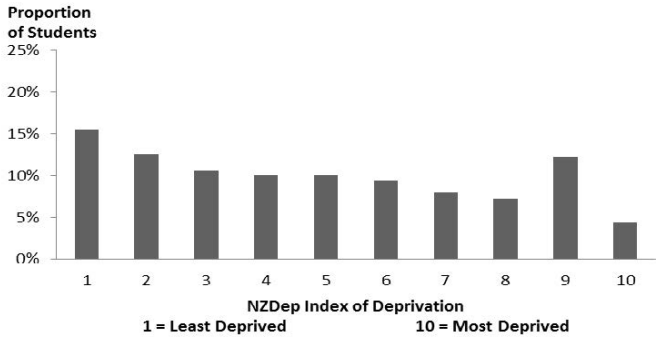

Figure 11: Asian Health Science professional programme students by NZDep.

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).

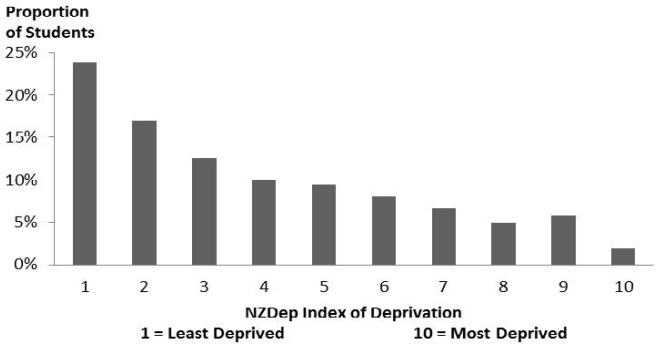

Figure 12: New Zealand European and Other Ethnicity Health Science professional programme students by NZDep.

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

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

*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 Maori (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.[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.[25]

The University also runs several science outreach programmes focussed towards keeping secondary school students active in, and inspired by, the field of science. For example, a series of 'Science Wānanga' 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 Wānanga 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.[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.[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[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.[29] Recent evidence, however, from the UK suggests that graduate entry pathways have had little effect on the socioeconomic profile of UK medical students.[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 Maori 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.

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Peri-prosthetic fractures around hip and knee prostheses

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ABSTRACT

Peri-prosthetic fractures (PPFs) are a serious complication of total hip and knee arthroplasties, with rising incidences in recent years. Falls and low trauma events remain the leading causes for PPFs as well as increasing age.

PPFs present complex management challenges with a high incidence of complications, failures and compromised long-term clinical outcome. Due to the inherent variability in PPFs, management should be tailored individually. Conservative approaches have generally produced poorer results in comparison to surgical intervention, and are usually reserved for patients with a high anaesthetic risk and for stable fractures around a well-fixed implant. Operative treatment is recommended for unstable and loose prostheses and choice of surgical intervention determined by whether the stem is well fixed (surgery involving open reduction and internal fixation) or loose (revision arthroplasty).

CASE INTRODUCTION

Mr RA is a 66-year-old Caucasian male who presented to the Emergency Department with pain in his right knee and an inability to weight-bear four hours after a mechanical fall that took place in his home.

Mr RA had slipped on some wet tiles on his way from the kitchen to the porch. He landed on the right side of his body; however the precise impact point was unknown. He experienced severe pain immediately in his right knee, and was unable to get up due to being unable to weight-bear on his right lower limb. He called for help and was eventually brought to the Emergency Department within four hours by a friend who happened to be visiting.

Mr RA denied experiencing any shortness of breath, chest pain, dizziness, limb weakness or any other neurological deficits both prior to and after the fall. He also stated that there was no head strike associated with the fall and at no time did he experience any loss of consciousness or incontinence.

Medical Background

Mr RA had total hip replacements to both left and right hips, two years and eight years ago respectively, secondary to osteoarthritis. He also had an appendicectomy as well as a history of several injuries including a clavicle fracture, ruptured Achilles tendon and a rib fracture, all of which were treated conservatively.

His medical history included hypertension and hypercholesterolaemia.

Physical Examination

On examination, Mr RA was alert, responsive and appeared to be relatively comfortable despite the pain he reported in his right knee. His vital signs were within normal limits, with a blood pressure of 130/92 and a pulse rate of 65. His heart sounds were dual, with no added sounds; and both his lung fields were clear on auscultation and percussion. His abdomen was soft and non-tender with active bowel sounds. Neurological examination yielded no significant findings.

Mr RA's right lower limb appeared to be shortened compared to his left and was externally rotated at the knee. Slight bruising was also noted on the medial surface of his right knee. The distal right thigh and the right knee were warm and tender on palpation. The range of movement at the right knee was severely restricted due to pain. Mr RA's right lower limb was not neurovascularly compromised with normal neurology, and his dorsalis pedis pulse was clearly palpable.

Temperature	36.6°C
Blood pressure	130/92
Pulse rate	65
Oxygen saturation	100% on Room Air

***Table 1**: Mr RA's vital signs at presentation.*

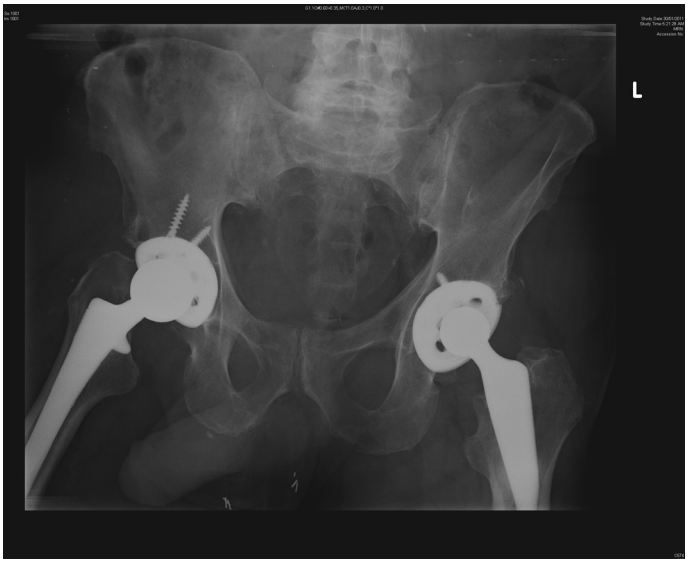

Figure 1: AP X-ray of Mr RA's pelvis.

Investigations

There were no significant abnormalities found on Mr RA's blood investigations or on his chest X-ray.

Mr RA's pelvic X-ray (Figure 1) showed that he had bilateral hip replacements and that the hip implants were in good position, with no signs of loosening of the implants.

X-rays of Mr RA's right femur and knee (Figure 2, 3) showed a spiral fracture of the distal femur that was significantly displaced and externally rotated. However, the fracture line did not appear to be extending down to the knee joint.

Figure 2: AP X-ray of Mr RA's right femur and knee.

Figure 3: Lateral X-ray of Mr RA's femur and knee.

Impression

Information gathered from the clinical history, examination and investigations indicated that Mr RA had a spiral fracture of his right distal femur that was complicated by the fracture's peri-prosthetic location.

Management

The orthopaedic team reviewed Mr RA and came to the conclusion that surgical intervention was necessary. Prior to surgery, Mr RA had optimal analgesia and his right leg was placed in a Thompson splint. As Mr RA's right hip prosthesis was well fixed despite the fracture, the orthopaedic team decided that an open reduction and internal fixation (ORIF) procedure with plates, screws and wire cerclage would be appropriate.

The surgery was carried out successfully with satisfactory, but not anatomical, reduction (Figure 4, 5). Post-operatively, Mr RA was admitted to the surgical ward for pain management and rehabilitation facilitated by the occupational therapists and physiotherapists. Three days after the surgery, Mr RA was discharge from the hospital stable and well on a non-weight bearing status for three months, ambulating with crutches; as well as with a follow-up appointment at the fracture clinic scheduled for two weeks later.

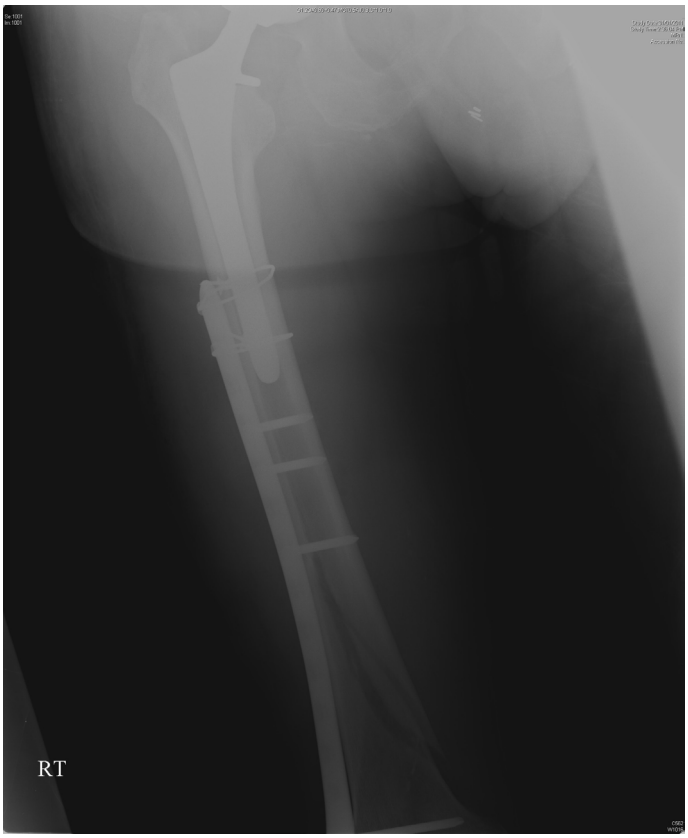

Figure 4: AP X-ray of Mr RA's femur and knee post-operation with plates, screws and wire cerclage in place.

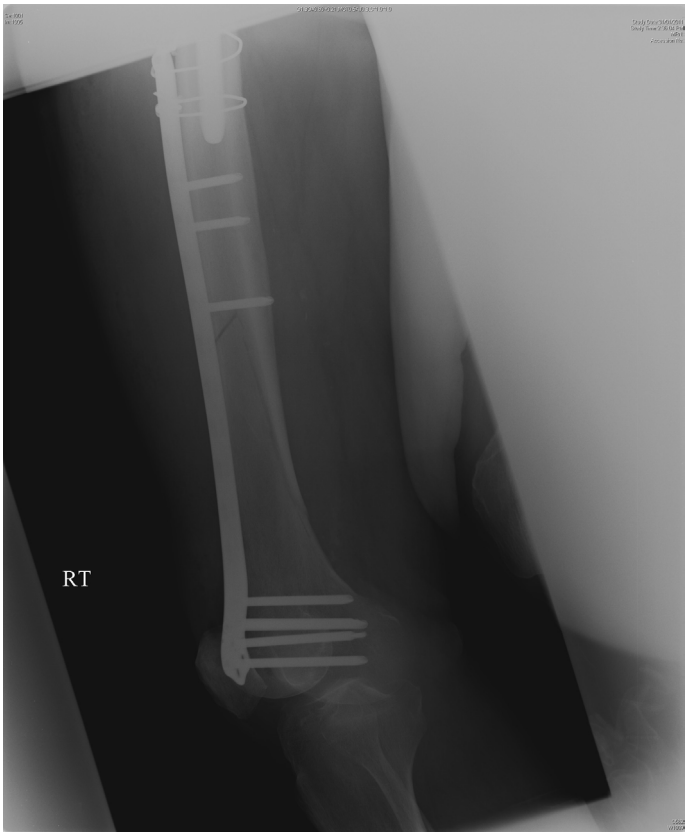

Figure 5: Lateral X-ray of Mr. RA's femur and knee post-operation with plates, screws and wire cerclage in place.

This case highlights periprosthetic fractures as an issue that has been rising in incidence over the past years as our population ages and total hip and knee replacement procedures have become more common. A detailed discussion of peri-prosthetic fractures around hip and knee prostheses follows.

DISCUSSION

Introduction

Peri-prosthetic fractures (PPFs) are defined as fractures that occur around joint replacement prostheses. They are among the most serious complications of total hip and knee arthroplasties, with rising incidences in recent years largely due to both the growing popularity of joint replacements as well as the ageing population.[1-5]

Currently, the incidence of peri-hip-prostheses fractures is reported to be approximately 1-5% and that of peri-knee-prostheses to be approximately 0.3-2.5%.[4-6] Elderly women with osteopenia appear to be at the highest risk of sustaining PPFs, with a study suggesting that 4 out of 5 PPFs occur within this demographic group.[7,8]

PPFs have also been found to be a leading cause for revision total hip arthroplasties, second only to aseptic loosening of the prosthesis.[9]

Risk factors

Falls, such as the one Mr RA sustained, appear to be the leading cause of PPFs.[1,3,10,11] Various studies have also commented that low energy trauma events and spontaneous occurrences during activities of daily living are also common mechanisms leading to PPFs.[1,3,10]

Risk factors for PPFs include severe osteopenia and osteoporosis, lower body mass index, loosening of hip or knee prostheses as well as increasing age.[6,10,11,12] Cook et al. found that patients who were over 70 years old had almost a 3-fold increase in their risk of sustaining a PPF while patients who were over 80 years were 4.4 times more likely to suffer from a PPF.[12] Interestingly, Mr RA demonstrated few risk factors for a PPF, given his relatively young age, him being a male and his x-rays not appearing to demonstrate significant signs of osteoporosis.

Management

The principle goal in management of PPF is to return the patient to their pre-morbid level of function.[8]

The choice of treatment is dependent on many factors. Important considerations when determining the management strategy include condition, type and size of the prosthesis, its fixation status (loose or well-fixed), quality of surrounding bone and pattern of fracture.[6,10] The Vancouver Classification (Table 2) provides an excellent way of stratifying PPFs and the appropriate management for each type of PPF.[9] By the Vancouver Classification, Mr. RA could be stated to have a Type C PPF.

Type A	At trochanter
Type B	Around tip of prosthesis stem
Type B1	Well-fixed stem
Type B2	Loose stem
Type B3	Associated with poor bone quality or bone loss
Type C	Distal to tip of prosthesis stem

Table 2: Vancouver Classification of Peri-prosthetic Fractures For Total Hip Replacements.

Conservative management

Conservative management of PPFs has been found to be difficult, generally producing poorer results in comparison to surgical management due to a higher risk of developing a non-union.[3] As such, it is reserved primarily for patients who are not suited for surgery, namely those with high anaesthetic risks[6] or those who have stable, non-displaced PPFs with a well-fixed prosthesis.[10]

Conservative management of PPFs involves the application of a cast brace with or without a period of skeletal traction and restricted weight bearing. Close follow-up with routine radiograph is then required to ensure that satisfactory alignment is achieved and maintained.[10]

Some of the risks associated with conservative management include a high risk of infections, development of pseudoarthrosis as well as a high demand for supports post-trauma due to the resultant delay in weight-bearing.[4]

Surgical management

There has been a shift in the management of PPF towards surgical intervention due to the poor outcomes associated with conservative management.[9,13]

Surgical management has become the standard treatment for the majority of PPFs[9] and has typically consisted of open reduction and internal fixation (ORIF), a revision arthroplasty or a combination of both.[13] These approaches allow for faster functional recovery with less limitation in joint movement, thereby allowing immediate weight bearing and mobilisation.[6]

The decision as to which form of surgical intervention should be employed is largely dependent on the fixation status of the prosthesis as well as the quality of surrounding bone stock. The general consensus has been as below:[7,10,13:]

1. Well fixed prosthesis – ORIF alone.
2. Loose prosthesis – revision arthroplasty, with or without ORIF.
3. PPFs associated with poor bone quality or bone loss – revision arthroplasty augmented with structural allografts.
4. Uncertain about status of prosthesis – treat as per loose prosthesis.

In our case, given Mr RA's well-fixed hip prosthesis, ORIF was performed without the need for revision arthroplasty.

Complications

In practice, PPFs present complex management challenges that come with a high incidence of complications, failures and compromised long-term clinical outcome.[9] Several studies have reported non-union rates post-PPFs to be between 10% and 20%, with overall complication rates of up to 50%.[6] In fact, Zuurmond et al. found that almost a third of all PPFs eventually require reoperations.[14] The high rate of complications and treatment failure can be attributed to the extensive soft tissue damage and disrupted blood supply associated with the nature of PPFs.[14] Similarly poor bone quality due to osteoporosis and major blood-loss associated with invasive surgery can further complicate the management.[8]

Often patients with PPFs have significant co-morbidities, which make the management of these injuries even more complex[4]; therefore suitability for surgery is carefully considered.[1] By identifying high-risk groups (recurrent dislocations, loosening, osteolysis) and ensuring close follow-up, many of these complications can be avoided.[1]

Prevention

Steps should be taken to prevent PPFs by managing those with known risk factors. Patients with osteoporosis should be treated prior to undergoing surgical management.[14] Adjuvant fall prevention and post-operative rehabilitation further reduce the risk of PPFs and faster return to the pre-injury level of mobility.[12]

Conclusion

The trend over the past years has demonstrated that PPFs are becoming increasingly common as the prevalence of total hip and knee replacement procedures rises and as our population continues to age. Given this, it is important to be aware of the risk factors that predispose an individual to PPFs, understand the basic principles of PPF management and appreciate the challenges of managing PPF with high rate of complications and their severity.

Consent

Informed consent was obtained from the patient for the publication of this case report and accompanying figures.

Conflicts of interest: None declared.

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Figure 1: *Rembrandt van Rijn,* The Anatomy Lesson of Dr Nicolaes Tulp, *1632. Oil on canvas, 169.5 x 216.5 cm. Mauritshuis, The Hague.*

Medicine in art

The depiction of the evolution of medicine in art and the effects of commissioning and the media as shown by Rembrandt van Rijn's *The Anatomy Lesson of Dr Nicolaes Tulp* and Thomas Eakins' *The Gross Clinic*

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Since the dawn of time, mankind has developed the field of medicine to advance health and cure diseases. Throughout history, there has been much advancement in the field such as penicillin and anaesthetics, with artists choosing to portray these leaps in their artworks. Rembrandt van Rijn and Thomas Eakins, in *The Anatomy Lesson of Dr Nicolaes Tulp* and *The Gross Clinic* respectively, each painted a doctor while using numerous visual techniques and symbolisms to depict the great advancements these doctors had achieved. Despite the similar artistic methods and general direction, the two paintings greatly differ in what the artist wanted to portray and how each utilised his skills to implement this in his work.

This article will analyse how the advancements in medicine were portrayed by the two artists from different angles and how commissioning and the media affected their artistic directions.

The Anatomy Lesson of Dr Nicolaes Tulp (Figure 1) shows a surgeon dissecting the forearm of a cadaver in front of seven other surgeons. The surgeon on the right is Dr Nicolaes Tulp: the official City Anatomist of the Amsterdam Guild of Surgeons in 1623. He is dissecting the muscles on the forearm of a criminal named Aris Kindt while explaining the anatomy to his audience.[1] His right hand holds the forceps that manipulate the tendons while his left hand is raised and flexed. Other details include a book in the bottom-right corner and Rembrandt's signature in the background.

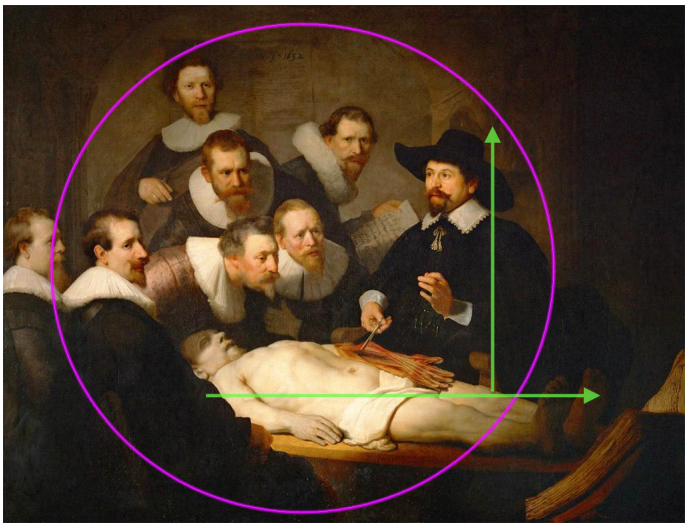

Figure 2: *Circular area of focus and brightness (purple circle) and straight line figures (green arrows) in Rembrandt van Rijn,* The Anatomy Lesson of Dr Nicolaes Tulp, *1632. Oil on canvas, 169.5 x 216.5 cm. Mauritshuis, The Hague.*

Rembrandt was famous for using colours and lighting to effectively emphasise the subject.[2] This is clearly visible in this work. The first holistic feature is the shadows curving around Dr Tulp, the surgeons and the cadaver, binding them in a circle of focus and setting the basic composition of the painting. The figures outside of this circle were added later and do not reflect the original intent of the artist.[3]

Another defining feature is the straight lines that Tulp and the cadaver form, as opposed to the random, chaotic arrangement of the other surgeons.[3] This naturally divides the painting into three parts. Tulp and the cadaver have their backs to dark areas, essentially framing the brighter upper-left quadrant. This sharpens the aforementioned circle, diverting the viewer's attention to what is happening within that area.

If composition and lighting set the framework for Rembrandt's visual message, then colours fill in the details. The general hue, or colour tone, is warm yellow-brown with the background being a dull gradient. Much variation in colour is seen within the circle of focus, especially in the skin tone of the subjects. Not only does this establish a strong contrast to further highlight the central subject, but the colours themselves play a significant role in delivering the key emotions that Rembrandt expressed in this work.

Vincent van Gogh commented on the cadaver, saying: "Yes, I was absolutely staggered by that too. Do you remember those flesh colours: it is de la terre (from the earth), especially the feet." [4]

This pale, ashen-grey skin described by van Gogh, or *umbra mortis*, of the cadaver starkly contrasts with the healthy, olive skin of the living.[1] Rembrandt further developed this contrast by adding flushed cheeks to the observers, not only depicting their health, but also to symbolise the emotions that will be discussed soon.[3]

The contrast in lighting and vibrancy of the colours sets a clear focus zone projecting out of the background creating an illusion of depth. However, what is interesting is that even within this zone one part is much brighter than the rest. It is clear that the brightest subject is the cadaver, who is also placed directly in the centre of the painting. As it is well known that Rembrandt used contrast deliberately, it raises the question as to whether the true protagonist of this scene is Tulp or the cadaver.[3]

The final portion of the visual analysis is the details, namely the facial expressions and gaze of each subject. These expressions are all unique and show the character of the portrayed person; Tulp's authoritative look, the cadaver's morbid look, and the surgeons' inquisitive and excited looks are all painted with intent. This gives the viewer the impression that the subjects are more than flat, emotionless figures simply drawn on a canvas. Their expressions are dynamic and natural, adding a lively touch to the painting that juxtaposes with the dead body in the centre.[3]

The *gaze* is a crucial feature that separates *The Anatomy Lesson* from other commissioned portraits. Here, Tulp does not have the full attention of the surgeons, who appear to each look in a different direction. Some carefully study the dissection, some look up to Dr Tulp with admiration and respect, but more interestingly, some stare directly at the viewer.[1] This projects the viewer into the dissecting room and produces an uncanny feeling. The surgeons' stern and authoritative facial expressions make the viewer feel humble and less important in the presence of Dr Tulp. The aforementioned respectful gaze of the surgeons towards Dr Tulp amplifies this effect.

To better understand what the visual elements signify, we must study the context in which the painting was made.

An interesting fact to note is that there is no preparator who would dissect the cadaver first so that the surgeon could explain without having to cut. Instead, there is an open textbook on the bottom-right. *The Anatomy Lesson* was commissioned by Dr Tulp and the Guild. Therefore, rather than depicting the dissection purely realistically, Rembrandt stylised the scene to match the surgeons' requests. For example, William Heckscher stated that Tulp wished to be portrayed as Andreas Vesalius, a famous 16th century anatomist of his time.[5] Evidence of this is seen in the anatomy textbook, presumably *De Humani Corporis Fabrica* by Andreas Vesalius,

Figure 3: *Direction of gaze of the seven Guild members (blue arrows) in Rembrandt van Rijn,* The Anatomy Lesson of Dr Nicolaes Tulp, *1632. Oil on canvas, 169.5 x 216.5 cm. Mauritshuis, The Hague.*

Figure 4: *After Johann Stephan von Kalkar,* Portrait of Andreas Vesalius, *1555. Woodcut. University Library Amsterdam.*

where Tulp's pose resembles Vesalius' portrait. This may also explain why the dissection is started at the arm rather than the abdomen, as was customary. Not only is it "neater" to dissect muscles than organs, but Tulp may be imitating Vesalius' portrait where the forearm is dissected.[5] This suggests that the emphasis is on Tulp's academic status. The fact that he is the only one wearing a hat, which indicates his respectful position, supports this.[1] Aloïs and Binstock also suggested that the broad space occupied by Tulp relative to the other surgeons easily allows the viewer to identify him as the leading figure.[6] Lastly, it was noted by medical professionals that the forearm anatomy is not entirely correct.[7] The flexor muscles of the forearm originate from the medial epicondyle of the humerus, yet Rembrandt's painting shows the muscles originating from the lateral epicondyle. Other than this error, the general muscle anatomy appears to be correct. This may have been intentional, where Rembrandt was forced to draw Vesalius' right arm dissection in Tulp's left arm dissection.

The setting contrasts starkly to the other anatomy painting by Rembrandt: *The Anatomy Lesson of Dr Joan Deyman*. Here, it can be seen how organs have been removed, while a preparator dissects the brain for the doctor. This is a more standard depiction of a dissection,[8] thus supporting the theory that Tulp may have influenced Rembrandt's depiction of the dissection.

That said, *The Anatomy Lesson* brought a major change to the art of commissioned group-portraits.[6] Unlike previous portraits of doctors, such as de Keyser's *The Osteology Lesson of Dr Sebastiaen Egbertsz*[9] Rembrandt painted the members in a more dynamic fashion.[6] This set his paintings apart from the other portraits that were no different to depictions of other guilds, such as militias, thus creating a new genre of "anatomy lessons".[10] In *The Osteology Lesson*, the doctors are *posing* in front of a skeleton whose sole purpose is to be a prop. They appear more interested in being portrayed beautifully, rather than the anatomy. Contrary to this, the surgeons in Rembrandt's painting appear genuinely fascinated by the dissection, with Tulp focussed on his task as he calmly explains everything.

The reason why this is significant is that instead of recording the advancements in medicine (dissections and understanding anatomy) photographically, Rembrandt chose to animate and dramatise it.[3] This not only had the effect of Rembrandt gaining fame and wealth through future commissions, but it also allowed him to add deeper meanings via symbolism. [10]

Despite the public interest in anatomy, dissections and surgical operations were quite controversial and rare. The portrayal of dissections only became prominent in the late 15th century whereas depictions of surgeries were uncommon until much later. This was because surgery was still an undeveloped field and also due to the influence of the church.[11] The legalisation of dissection in the Netherlands in 1555 revolutionised the study of anatomy, thus providing a milestone in the history of medicine. The two *Anatomy Lesson* paintings by Rembrandt served as a commemoration of public dissections.[10]

However, the true purpose of these paintings may be more complex. It is possible that Rembrandt deliberately chose dissection over surgery to explore some deeper themes through the use of a cadaver. For example, one surgeon reminds the audience of their own mortality by directing them to the cadaver with his hand.[13] However, the cadaver is not only a symbol of mortality, but also rebirth.

After dying, the cadaver is being used as a tool for educating the surgeons, who will then go on to treat patients with this *knowledge*. Ergo, it can be suggested that the cadaver will live vicariously as knowledge, helping surgeons save lives. Dolores Mitchell also suggested that there may have been a connection between the cadaver's death and the surgeons' education.[3]

William Heckscher suggested Tulp believed that an understanding of anatomy led to an understanding of God through the reverse engineering of a "divine creation".[5] William Schupbach agreed with Heckscher, suggesting that the message of the painting is that "*knowing God is to know oneself,*" and vice versa.[12] Furthermore, the cadaver resembles an image of Christ due to the position, clothing, illumination, and the crowd around him; possibly a reference to the mocking crowd at the crucifixion of Christ.[3] It was noted before that the cadaver receives an unusual amount of light and focus, considering that the painting was commissioned by the *living* members. This indicates that the cadaver is an allegory of rebirth and knowledge. As Tulp is dissecting the image of Christ, he is metaphorically dissecting both the way of God and His creation in an attempt to better understand himself. This reveals the concept of "know thyself".[3]

Figure 5: *Rembrandt van Rijn,* The Anatomy Lesson of Dr Joan Deyman, *1656. Oil on canvas, 100 x 134 cm. Rijksmuseum, Amsterdam.*

The symbol of discovering knowledge and the fact that Rembrandt chose dissection over surgery shows that *education* and the human nature of seeking knowledge are the key themes in this painting. The idea is reinforced by the facial expressions of the surgeons described above. The expression of wild, child-like curiosity and passion is portrayed vividly, invoking the viewer to also feel the exhilaration of learning about the human body.[1] Overall, it is apparent that Rembrandt placed emphasis on the educational aspect of medicine rather than the practical applications.

Therefore, *The Anatomy Lesson* is more than just a commissioned group portrait; it is a recording of an important milestone in medicine. The painting augments this through its central themes of man's quest for knowledge and the mortality of man, while portraying Dr Tulp as a respectable pioneer, just like Vesalius, in the field of anatomy.

Two hundred and fifty years later, another artist named Thomas Eakins decided to paint Dr Samuel Gross in commemoration of his career in surgery. In *q*, Eakins decided to record the scene of Dr Gross operating on a patient with osteomyelitis.[13]

We see Gross standing solemnly having just saved a patient's life. His expression is that of an experienced professional: confident and determined. Eakins' heroic portrayal of Gross was because he wished to commemorate Gross' surgical achievements such as pioneering the conservative surgical intervention for osteomyelitis.[14] This treatment allowed surgeons to save patients from amputation thus transforming the profession of surgery from a "butchering" to a healing profession. As noted previously, in Rembrandt's time surgery was considered to be a less desirable profession compared to internal medicine due to its crude and unhygienic methodology. By the 19th century, surgery was becoming increasingly safer allowing it to become a more respectable field. An example of the evolution of surgery can be seen in Eakins' *The Agnew Clinic*, painted 14 years later, where surgeons are wearing scrub gear, compared to Gross' normal attire. Ergo, *The Gross Clinic* serves the purpose of recording a milestone in medicine, just as Rembrandt depicted dissection as a milestone.

Figure 6: *Thomas Eakins,* The Gross Clinic, *1875. Oil on canvas, 240 x 200cm. Jefferson Medical College Dept. of Surgery, Philadelphia.*

In fact, Eakins was inspired by Rembrandt in both the visual and contextual elements.

Eakins also employed light as a framing tool, or *chiaroscuro,* giving Gross a radiant glow to highlight him from the dark background. As the light source is from above (surgeries were often performed in amphitheatres during noon, so that sunlight through a hole in the roof would illuminate the operating table), a shadow is cast on Gross' face that gives further depth to his stern expression. It is quite different from Tulp's calm, lecturing expression; Gross is depicted as a man completely focussed on saving the patient.[13] This shows the difference between the settings of Rembrandt's dissection and Eakins' surgery. Furthermore, the illumination of the hand and head is a metaphor of how the combination of dexterity and intelligence is what makes Gross such a great surgeon.[14]

It is important to note that the patient's thigh is illuminated too, suggesting that he or she is another key element of the scene.[13]

The effect of lighting is augmented by the vividly red blood on Gross' hand and the patient's leg. As the painting is dark and grey, these few spots of red stand out substantially, directing the audience's gaze to the scene of the surgery and Gross' scalpel; a tool that symbolises his surgical skills.

However, the blood plays a role much greater than highlighting. Although *The Gross Clinic* was submitted for the Centennial exhibition, it was rejected for being too provocative.[13] Some critics found the blood to be too realistic, causing them to feel uneasy. This was also true for the portrayal of the agonised woman on the left, presumably the patient's mother. The media and critics argued that Eakins had "gone too far",[15] criticising the "unnecessary" realism and going as far as to say that the exposure of the patient's naked thigh was indecent. It was rumoured that some members felt physically ill from the intense emotions caused by the painting, affecting their decision.[14]

Up until the early 20th century, most artists only portrayed surgeons in dissections. *The Gross Clinic* challenged this trend by showing the public the true face of medicine.[14] Eakins felt that dissection would not convey the raw emotions and powerful imagery of surgery, as depicted by the uncompromising realism, blood, and human response.[14] An obvious example is the mother. Among the figures present in Rembrandt's painting, there is not a mourner for the cadaver 3; only those who study the body with a *medical gaze*. This is a type of gaze with which the doctor views the patient as a sum of the constituent flesh and organs rather than a human being. The patient is broken down and dehumanised into his or her anatomy and physiology. In *The Gross Clinic*, the medical gaze is also present if one carefully studies the students' faces; however, the expressions on the

surgeons' faces appear to be concentrating on keeping the patient alive and fighting to preserve his quality of life. The mother adds a new layer of emotions, reminding the audience that this patient has a family who loves and cares for them. This intense, dramatic atmosphere was praised by reviewers (who were more accepting of Eakins' revolutionary painting), claiming that it was "intensely dramatic, and is such a vivid representation of [a surgery] scene...we know of nothing greater that has ever been executed in America". [16] This is a key difference between Eakins and Rembrandt in their portrayal of doctors.

Rembrandt was influenced by Tulp to paint him in the glory of Vesalius, thus deciding to use symbols such as hats and facial expressions to signify his academic achievements and stature. He did not require the use of blood or the expression of agony to convey his message of man's quest for knowledge through dissection. On the other hand, Eakins made Gross and his surgery a symbol of modern medicine and how much the field had evolved by showing the general public an unadulterated image of the operation.[14] The surgery depicted was revolutionary as it drastically improved patient outcomes. Also, the painting shows advancements in surgery such as anaesthesia.[13] This celebrated how medicine was changing to be more respectful of human dignity and the health of the patient,[14] rather than only treating the biomedical disease.

The lighting emphasis on the thigh supports this, as Eakins points out that the patient is a player in the surgery as well, just as Rembrandt used bright light to highlight the cadaver. Gross is a beacon of this change in medicine; his professionalism, represented by his calm composure, contrasts with the mother's response. It is noteworthy that Eakins' other artworks focus on pure realism such as manipulation-free photography.[13] But here we can see a degree of dramatisation via contrast and colours. The dramatisation can thus be considered intentional, carrying the artist's message. Despite this dramatisation, his almost photographic painting also shows how realistically he wanted to portray the scene rather than suiting to others' tastes and aesthetics.[17]

Another distinction between the two paintings is how Eakins puts more importance on Gross than the patient. Despite having a similar circular zone of brightness, Gross has a more prominent position standing in front of the patient. This contrasts to Tulp standing to the side and behind the cadaver.

Also, Gross' patient is hidden from view to the degree that the viewer cannot identify the age or gender of this patient. This also applies to the students in the background who are shrouded by darkness.[13] In fact, even the other surgeons are so immersed in their job that their faces are hidden. Gross is the only one not looking at the patient (other than the physician recording the details of the surgery and the mother who is too horrified to watch); instead he looks into the crowd as he catches a breath and explains what he had performed. Thus, he is still incorporating education into the practical aspect of medicine; however, it is evident from the above points that greater emphasis is placed on the surgery itself.

Both Rembrandt and Eakins used doctors in their paintings to portray the evolution of medicine and its ramifications on the general public.

In *The Anatomy Lesson of Dr Tulp,* the focus was on how dissections opened up the world of anatomy, allowing medical professionals to gain an insight into God's mortal creation and how we function. Thus, by extension: an insight into oneself. The atmosphere is calm and serene, with the colour contrast accenting the underlying tone of life versus death, especially through the differing skin tones. Being a commissioned painting, Rembrandt was somewhat limited and had to include features to suit the doctors' requests. Despite this, he managed to convey his intentions and messages while gaining a positive reception from the public.

In *The Gross Clinic*, the raw emotions and atmosphere of the operating theatre is projected to the audience, while celebrating the progress in medicine and improvement of patient care over the times. The atmosphere is grim and dark, with brightly lit surgeons acting as beacons of hope for the patient's survival, while also symbolising the professionalism and drama in the room. As it was not commissioned, Eakins was free to explore the use of realism and an array of features to dramatise his painting. This came at the cost of negative reviews and failing to be displayed at the Centennial exhibition. Nonetheless, he was able to convey his messages to those who viewed it, empowering them with the emotional atmosphere.

Although both incorporate similar visual features such as lighting and composition, there are stark contrasts between *The Anatomy Lesson* and *The Gross Clinic* in how they are used to symbolise different things. This shows how art can be used to view the world of medicine from different angles depending on the artist's intentions. Despite the influence of commissioning and negative media response, both Rembrandt and Eakins successfully created a legacy for their respective doctors, forever embedding them in events depicting some of the greatest medical achievements of their time.

LIST OF IMAGES USED

After Johann Stephan von Kalkar.
Portrait of Andreas Vesalius, 1555.
Woodcut. University Library Amsterdam.

Rembrandt van Rijn.
The Anatomy Lesson of Dr Joan Deyman, 1656.
Oil on canvas, 100 x 134 cm. Rijksmuseum, Amsterdam.

Rembrandt van Rijn.
The Anatomy Lesson of Dr Nicolaes Tulp, 1632.
Oil on canvas, 169.5 x 216.5 cm. Mauritshuis, The Hague.

Thomas Eakins.
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FEATURE: ARTICLE

There is a right to life; is there a right to die?

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Sam Holford is a 4th year medical student at the University of Auckland. He completed a BSc (Hons) majoring in pharmacology and spent a year tutoring and lecturing 300 level pharmacology before starting his MB ChB degree. If he wasn't doing medicine, he probably would have given law a go.

Euthanasia (Greek meaning 'good death') is the act of ending a life to relieve pain and suffering. Passive euthanasia is legal in New Zealand in the form of the right to refuse medical treatment, while active euthanasia is illegal and punishable by imprisonment. Legal (distinct from moral and spiritual) arguments for and against legislation allowing active euthanasia fall onto the human rights affirmed by the International Covenant on Civil and Political Rights (ICCPR), the European Convention on Human Rights, and in New Zealand, the Bill of Rights Act.[1-3] These documents confer an express right to life, but not to die, and legal arguments for a right to die seek an interpretation that would make it unjust for the State to interfere with a citizen's choice to die.

Voluntary euthanasia occurs when a conscious and rational patient gives express and informed consent to an action, or withdrawal of treatment, that will result in the ending of life. This is distinct from its speculative and involuntary forms, which lack the same degree of consent. Passive voluntary euthanasia is the refusal of treatment that may otherwise prolong life and is legal in New Zealand and protected by section 11 of the Bill of Rights Act: the right to refuse to undergo medical treatment.[3] Active voluntary euthanasia, or assisted suicide, is an action undertaken by a person other than the patient with the intent of ending life. It is an unlawful act that, independent of motivation, constitutes murder under section 167 of the Crimes Act.[4] Section 179 states that assisting suicide is illegal, while the act of taking one's own life is not.[4] This means that the law separates the State from an individual's choice to end their own life, actively or passively, so long as no other party takes part. This can be argued as discrimination against those that are physically unable to commit suicide as it limits their ability to exercise their rights. Human rights fundamentally confer to all people the freedom to make choices about how they live their life. It is therefore unjustified to have a blanket ban preventing a conscious and rational terminally ill patient and a consenting party from acting on the

patient's desire to end their life, particularly when society has the necessary tools to consider the merits of arguments for and against, on a case by case basis where necessary.

RIGHT TO LIFE

Article 3 of the Universal Declaration of Human Rights proclaims that "Everyone has the right to life, liberty and security of person".[5] The right to life is phrased by article 6 of the ICCPR as "Every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life".[1] Section 8 of the Bill of Rights Act states that "No one shall be deprived of life except on such grounds as are established by law and are consistent with the principles of fundamental justice".[3]

The right to life given in these articles is not a guarantee or protection against death, which is both inevitable and often unpreventable; however it certainly prohibits unjust deprivation of life against the will of the right holder. An element of choice can be inferred from the right to life as it is clearly not interpreted as a requirement to live due to the right to refuse treatment and the legality of suicide. It can therefore be implied that it protects the right to choose whether or not to continue living. The word 'arbitrarily' in the ICCPR text restricts deprivation of life without regard to the facts and circumstances, which means there may be situations where choice or judgement is applicable to the continuation of life. If assisted suicide were to be made lawful, it would enable an otherwise unable patient to exercise the right to choose to end their life. Vitally, this would not be inconsistent with the rights imposed by these articles.

In contrast, article 2 of the European Convention on Human Rights states:

> *"Everyone's right to life shall be protected by law. No one shall be deprived of his life intentionally save in the execution of a sentence of a court following his conviction of a crime for which this penalty is provided by law.*
>
> *Deprivation of life shall not be regarded as inflicted in contravention of this article when it results from the use of force which is no more than absolutely necessary:*
>
> *(a) in defence of any person from unlawful violence;*
> *(b) in order to effect a lawful arrest or to prevent escape of a person lawfully detained;*
> *(c) in action lawfully taken for the purpose of quelling a riot or insurrection."*[2]

This does not provision for the additional right to die to be conferred, unlike the Universal Declaration of Human Rights, the ICCPR or the Bill of Rights Act because it explicitly states the situations that do not contravene the order that "No one shall be deprived of his life intentionally". That the right to life implies a right to choose to not continue living may still be inferred however, as was argued in Pretty v United Kingdom:

> *"…the Article recognises that it is for the individual to choose whether or not to live and so protects the individual's right to self-determination in relation to issues of life and death. Thus a person may refuse lifesaving or life-prolonging medical treatment, and may lawfully choose to commit suicide. The Article acknowledges that right of the individual. While most people want to live, some want to die, and the Article protects both rights. The right to die is not the antithesis of the right to life but the corollary of it, and the State has a positive obligation to protect both."*[6]

This argument was rejected by the European Court of Human Rights, concluding that the right to life is unconcerned with what a person chooses to do with their life:

> *"Article 2 cannot, without a distortion of language, be interpreted as conferring the diametrically opposite right, namely a right to die; nor can it create a right to self-determination in the sense of conferring on an individual the entitlement to choose death rather than life."*[6]

Arguing that the right to life also grants a right to death may be unfounded, but there is compelling reason to support an additional right to choose whether to live or die. It seems that the right to life is not inconsistent with a right to die, but is not sufficient to protect assisted suicide alone.

FREEDOM FROM DISCRIMINATION

People should not be prevented from enacting their own decisions with regard to the manner of their death and this is illustrated by the legality of suicide and many life-threatening behaviours. A patient should not have to endure a painful or undignified death only because their status or physical state prevents them from executing a painless or dignified suicide. For example, commission of suicide by starvation or suffocation may be the only legal options available to a patient, both of which would be considerably more uncomfortable and less humane than administration of a lethal dose by a cooperating physician.

The right to freedom from discrimination in section 19(1) of the Bill of Rights Act supports this position.[3] This right of a patient, that is physically unable to commit suicide, is contravened by prohibiting assisted suicide because they are deprived of the choice of suicide, while others that are able-bodied are allowed to do so. Non-discrimination rights call for reasonable assistance to be provided to a disabled patient in order to exercise their liberty and it is a breach of these rights to withhold such an option. In Rodriguez v British Columbia, Lamer CJ of the Canada Supreme Court held the view that:

> *"…persons with disabilities who are or will become unable to end their lives without assistance are discriminated against by that provision since, unlike persons capable of causing their own deaths, they are deprived of the option of choosing suicide."*[7]

It is accepted that universal prohibition of assisted suicide is not directly discriminatory. However, non-discrimination rights extend further to ease the burden placed on those that are placed in an unfair situation due to disability. The purpose of non-discrimination rights:

> *"…is not to punish the discriminator, but rather to provide relief for the victims of discrimination…if its effect is to impose on one person or group of persons obligations, penalties or restrictive conditions not imposed on other members of the community, it is discriminatory."*[6]

The counter argument raised in Pretty v United Kingdom was that the option of suicide was not a right. Furthermore, the legality of suicide does not intend to condone the act, but is because a suicide victim cannot be charged and penalty for attempted suicide does not act as a deterrent:

> *"The law confers no right to commit suicide. Suicide was always, as a crime, anomalous, since it was the only crime with which no defendant could ever be charged."* [6]

There is acceptance that a form of discrimination may take place in restricting the choice to die, but because that choice is legal only for the intent of preserving life (in the case of suicide attempt), it cannot be concluded that the State is obligated to protect it.

FREEDOM OF THOUGHT, CONSCIENCE, AND RELIGION

Section 13 states that "Everyone has the right to freedom of thought, conscience, religion, and belief, including the right to adopt and to hold opinions without interference".[3] The rights extended by section 13 of the Bill of Rights Act can be interpreted as a requirement that the State does not interfere with a patient's belief in assisted suicide. While there is no argument that a person is free to hold beliefs and opinions, this right does not allow corresponding actions to be defended on the same grounds. Assisted suicide as a manifestation of a belief in it was likened to "attack[ing] places where experiments are conducted on animals" by Lord Steyn in response to arguments on behalf of Dianne Pretty. [8] The right is certainly not grounds alone for conferring a right to die, but is still an important point against all moral and spiritual arguments for prohibition of assisted suicide. Furthermore, the right to freedom of thought is declared as an explicit human right rather than one that is inferred from other protections. It is also distinct from freedom of expression. Without expression, thought cannot be monitored, which brings into question the rationale behind the right if it cannot be practically revoked and laws against it cannot be enforced. Perhaps as mankind's greatest asset, thought is protected above all else and interpretation of the right should be able to extend to action in some circumstances.

RIGHT TO PRIVACY AND AUTONOMY

The Bill of Rights Act does not affirm a right to privacy, but the right exists in article 17 of the ICCPR and article 8 of the European Convention. Given that the manner and timing of a person's death is a private affair, it may be argued that respect for a patient's private life may protect them in exercising their choice to seek assistance to end life.

Respecting the decision to end one's life is coupled with concepts of security, dignity, liberty and autonomy, which are fundamental principles underlying human rights. With regard to the right to privacy, the European Court of Human Rights "considers that the notion of personal autonomy is an important principle underlying the interpretation of its guarantees."[6] This demands that with regard to the right to privacy, the State respects autonomy: "the ability to conduct one's life in a manner of one's own choosing".[6] Based on this principle of autonomy, one may exercise the choice to die by refusing medical treatment and this holds to exercising the choice to end life. A right to autonomy was acknowledged by the European Court, accepting that a law against assisted suicide interfered with Dianne Pretty's privacy rights and that the law would therefore have to be justified under art 8(2) of the European Convention:

> *"The applicant in this case is prevented by law from exercising her choice to avoid what she considers will be an undignified and distressing end to her life. The Court is not prepared to exclude that this constitutes an interference with her right to respect for private life as guaranteed under Article 8(1) of the Convention."*[6]

Article 8(2) allows interference of privacy by a public authority where it is "in accordance with the law and is necessary in a democratic society… for the prevention of disorder or crime, for the protection of health or morals". [2] Similar provision is made for lawful interference in the ICCPR. As judgement is made by the State on what constitutes lawful interference with privacy and therefore autonomy, this right is not breached by prohibition of assisted suicide for the purpose of protecting health. In response, it was argued that Mrs Pretty did not need protection, and that the ban did not take into account her situation as a mentally competent adult, who was not vulnerable:

> *"The applicant argued that it was disproportionate to impose a 'blanket ban' which applied both to those who did and to those who did not need the protection of the law."* [8]

The Court did not consider the ban disproportionate, due to the seriousness of the risk of abuse and harm that the ban aimed to prevent in addition to the flexibility of enforcement:

> *"The Government have stated that flexibility is provided for in individual cases by the fact that consent is needed from the [Director of Public Prosecutions] to bring a prosecution and by the fact that a maximum sentence is provided, allowing lesser penalties to be imposed as appropriate."* [6]

Dianne Pretty's case went no further with this argument, but it was again raised in Purdy v Director of Public Prosecutions in 2009, where the flexibility of enforcement was queried. As enforcement is meant as a deterrent and should be in the public interest, it was held by the Court that policy detailing the flexible process of enforcement should be provided to Ms Purdy. Though this result did not find a direct right to die, it did require a thorough and transparent justification to interfere with Ms Purdy's autonomy right. This right to autonomy respects the right to choose to die and act on this choice in private, only to be subject to interference that is consistent with act 8(2) of the European Convention.

CONCLUDING REMARKS

Human rights are testament to the progress of civilisation. They aim to protect the good aspects of human nature, allowing mankind to live as equals, while placing as little restriction as possible on absolute liberty. When the wording of documents affirming human rights is argued to great extent as in the Pretty and Purdy cases, it is disappointing that civil law can encroach on so many vital freedoms that are often taken for granted. When the ICCPR and European Convention were ratified, degenerative disease and certainty of diagnosis did not exist as they do today. That a right to die was not provisioned then does not mean it would remain absent if the drafts were proclaimed today or in 50 years' time. On the contrary, the values of freedom and security that founded these rights may not exist today as they did in the aftermath of the world wars. Faith must be placed in the human rights framework as a set of principles that can be enforced and will ensure, to the extent that is possible, that the progression of civilisation will continue to yield a better world. That the above cases were decided by law, rather than bias, power or emotion is a positive result and highlights the success of the framework. Though it may seem inherently human to assist another in their death to end their suffering, the consequences of the Court breaching human rights would be to undermine their very achievements. In a world where human rights are not observed by every State, it is important to stand, and even suffer, by them if by example it may one day mean that the entire world can enjoy what is right. A right to die has not been inferred by the human rights affirmed, but nor has an obligation been bestowed on any State to prohibit all acts of assisted suicide. New Zealand therefore has the freedom to decide democratically if death should be a legally accessible right.

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How does the methodology of obtaining and justifying scientific knowledge inform medical practice?

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Scientific knowledge is obtained from results of the construction of scientific theories, which are derived from facts observed from nature that are tested in experiments.[1] Such observations are made by humans with their perceptual faculties. These are our five senses: sight, touch, hearing, smell and taste.[2] Because scientific knowledge is ultimately based on the observations made, the way these observations are obtained, that is through our perception, becomes important.

Perception can present problems because it is not infallible. I will focus on sight for now because most observations in science are made through sight. Sight is the capturing of photons of light by the retina, which are then converted into nerve impulses that are passed to the brain, which produces the images we see. This means that what we see depends on the objects our eyes are resting upon. Two people looking at the same object will see the same image (under normal circumstances). However, humans do a lot more than just see an image of the object in front of them. We will take that image and analyse and interpret it, and it is the interpretation of what we see which renders perception problematic. How the image is interpreted will be dependent on the person seeing the image, and the specific characteristics of that person. Characteristics may include cultural and educational background and experience. For example, if we were to show people a pair of earphones, most people in developed countries will know what they are and what they are used for, and link that object to music and iPods which are part of their daily lives. However, if we were to show the same pair of earphones to people living in the Third World, who do not have such access to electrical devices, then they would not associate it with music and iPods; they may think it was a special type of string to tie things with, or whatever their imagination takes them to be.

This presents a problem in medical practice. I will use diagnosis as an example. Diagnosis is the identification of disease in a patient by the doctor through a combination of knowledge of the patient's medical history, symptoms, physical examination, and investigations. It is evident that the patient's symptoms and signs manifested by a physical examination both need to be perceived by the doctor. As they are based on perception, it is possible for these to be interpreted differently by people with different backgrounds and different experience. For example, a patient may present with an abnormal gait and loss of dorsiflexion of the right foot. A neurologist who has extensive experience with neuropathies may be confident in diagnosing this patient with foot drop, which is a lesion of the deep fibular nerve, because she is experienced in this field and knows what signs she is looking for. However, if the same patient was presented to a medical student with little experience in neurological disorders, although he is seeing the same abnormal gait, he may not make the connection between the abnormal gait to a loss of dorsiflexion or it may take him a much longer time to notice there is a lack of dorsiflexion of the right foot. It is evident that the knowledge and experience possessed by the doctor and student may render differences in their interpretations of what they are seeing in the same patient. It follows from that, that the interpretation of one's perceptions requires the appropriate knowledge and the ability to apply this to the observation.[2] Without the appropriate knowledge, perceptions may be less than useful.

With perception and the information obtained from it, comes the question of whether these beliefs are justified. There are two approaches to answering this question. The traditional approach is that knowledge has to be a "justified true belief"[2]; that is, for something to be knowledge, one has to believe it is true, and one has to have justification for it. The non-traditional approach is similar in the sense that in both, the justification of knowledge must guarantee that something is not true due to luck alone. However, the two approaches differ in what can be regarded as proper justification. Justification in the traditional definition is belief in something when taking something to be true and it is rational judging from one's own point of view. One must have evidence of experiencing something to believe that something is true. Experiences are of things perceived through our five senses, introspective experiences, memories and intuitions. Because these form part of our mental state, justification is internal according to traditional knowledge. This kind of justification may present problems in medicine, which will be described further on.

On the other hand, justification according to the non-traditional approach holds that it is not based solely on experiences which are the evidence, but also on the reliability of the origin of these experiences. The origin of these experiences, cognitive processes and perceptual faculties must be reliable enough for them to have a high probability of giving rise to true beliefs for them to be sufficient justification. Because the reliability of these experiences is not internal, it follows that justification in this approach is external, even though the experiences themselves are internal. [2]

In my opinion, justification should be determined by evidence from reliable processes rather than any evidence in possession. What is important in terms of knowledge and beliefs is the pursuit of truth; and one's own experiences or mental states are not always concordant with the truth. Memory is an example of this kind of evidence. Memories are not always reliable and it is possible to have memories of an event for instance that did

not actually occur. For instance, my earliest memory is playing with a doll on a bed in the house we were living in at the time. But I am not sure if this is because it actually happened or because I have seen photos of the house and the doll. Therefore, I cannot believe that I once played with a doll on a bed in that house is true, based solely on my memory of it.

The internalist approach to justification could present problems in medical practice. The type of evidence I will focus on here is introspective experience. Firstly, introspection is the ability to know one's mental state; for instance, we know if we are happy, tired, or in pain. Also, it is difficult for someone to have an introspective experience, for example a headache, when they in fact do not have a headache. Therefore it is less likely for introspective experiences to be fallible than perceptual experiences. However, that is not to say that all introspection is reliable. We are all familiar with the placebo effect, which is the phenomenon of perceived or actual improvement in a medical condition associated with receiving an inert substance. Due to this, if we were to trial a new drug, introspective experiences alone cannot provide sufficient justification for the efficacy of any one treatment. The reliability of introspection is questionable because one's introspective experience is variable depending on many factors. For instance, the placebo effect is variable in its magnitude among different people at different times, because it depends on a person's perception of the treatment and their expectations. It therefore makes the evaluation of new treatments more difficult. To overcome this problem, clinical trials often have a control group who receive a placebo, and are double-blinded.

I stated earlier that with knowledge comes justification. It is important to consider the structure of the two; whether beliefs are built upon each other or if they are more like a network of truths interlinking one another. One way of understanding the structure of justification is that there is a foundation of beliefs that do not require justification from beliefs, which can provide justification for other beliefs. This is called foundationalism[2]; and the 'foundation' of beliefs which other beliefs rest upon is called basic beliefs. What makes them 'basic' is that its justification does not come from other beliefs but rather because it cannot be falsified or corrected by anyone else. For example, beliefs about one's own perceptions or introspective experiences could be considered as basic because if a person believed they were thirsty it would be difficult for another person to prove that that person was not thirsty. Beliefs external to one's own perceptions or mental states would not be basic because they can be falsified; for instance a belief about an apple being sweet would not be basic, but a belief about the apple tasting sweet to you would be basic. If one was an evidentialist, one would allow the basic belief of the experience of the apple tasting sweet alone be justification for the non-basic belief that the apple is sweet. That is one way in which beliefs are stacked upon one another. One reason for foundationalism is the regress argument.[2] This is when a belief is justified by another belief, which is justified by another, which is justified by yet another; unless this chain of beliefs terminates at a basic belief, there will either be an infinite number of beliefs in this chain or the chain will loop back onto itself onto the first belief. The regress argument states that either possibility is unsatisfactory therefore, basic beliefs must exist.

Another approach to the structure of justification is that the beliefs a person holds are an interconnecting web in which the justification of one belief depends on the justification of surrounding beliefs. Therefore there are no basic beliefs because all justification would stem from beliefs. This is called 'coherentism' because beliefs must be coherent with other beliefs.[2] For a coherentist, the belief that the apple is sweet would be justified by the belief that the apple tastes sweet, which is justified by the belief that your taste perceptions were reliable, which would be justified by the belief that you have a good record of your taste perceptions being reliable in the past. These beliefs would all be in the epistemic vicinity of the belief that the apple being sweet.

In terms of the sciences, I believe that justification is coherent. Science is not one theory but a set of theories, and no theory sits alone. For instance, the germ theory of medicine is a theory which postulates that micro-organisms are the causes of disease. In order for this theory to be justified, it must not contradict other existent theories such as those of evolution, genetics, and reproduction. Therefore, theories in science must relate to other theories. Applied to medical practice, coherentism can be compared to treating a patient by recognising that all aspects of their well-being relate to each other and affect a person's health (for example, the Te Whare Tapa Whā model of health).

In describing the methods of obtaining scientific knowledge, I have shown some problems with perception and introspection, mainly that both are not infallible. This has the potential to lead to diagnosis of patients using these two methods being problematic, because the obtainment of knowledge must come with the ability to apply this knowledge appropriately. Following the obtainment of knowledge is the justification of it; I described the two approaches to justification of knowledge and I have shown my opinion that justification should be external by the example of the placebo effect. Lastly, two ways of understanding how justification is structured was described: foundationalism and coherentism. In terms of scientific knowledge, I believe that justification is coherent.

As for the medical practitioner, this knowledge encourages us to continually educate ourselves so we are adequately equipped to interpret the things we perceive, to recognise that introspective experiences can be unreliable, and to treat patients from a holistic point of view.

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Figure 1: *Street children sitting on their makeshift bedding in Banepa, Nepal.*

One fine Saturday in Nepal

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David Short is a final year medical student based at the Christchurch School of Medicine. He entered medicine as a post graduate student having gained an honours degree in Molecular Biotechnology from the University of Otago. Next year he will be working as a House Officer in Christchurch and hopes to persue a career in Wilderness Medicine.

My medical elective has been and gone. I spent the New Zealand summer of 2011/2012 in Nepal and Tanzania sampling different cultures and gaining a new appreciation for how fortunate I am to come from a small country at the bottom of the world with a functional health system and a non-corrupt government (as far as I know).

But something happened in Nepal. It all started on a Saturday.

I was placed in a homestay in a small town called Banepa, about 25 kilometres away and two hours of mad driving southeast of Kathmandu. The family I was placed with were typical Nepalese. The father worked in accounts at the local hospital; the mother kept the home in good shape and prepared food for her two children and the variable hoards of foreign students and volunteers who stayed with them. I joined the household the same day as a midwife from Canada. Together with a retired nurse from England and a young nursing student from Australia we settled into the family ready to begin our respective placements.

Prior to my arrival, Sue, the intrepid retiree, had identified that there were about 30 homeless 'untouchables' living rough around the place. She thought it would be nice to help them out a bit so organised and personally funded something of a health day. It was scheduled for the first Saturday after my arrival – two days into my placement. The plan was to take the children, in a bus, down to the local river where they could wash. Following this they would all receive new warm clothes and shoes. We then planned to bring them back into town for some lunch, and in conjunction with a local women's health clinic perform rudimentary health checks to see if there were any problems that could be addressed despite their limited means.

Having turned up just two days prior to this planned event the entire organisation had been done, so I offered to help in whatever way was

needed. Sue teamed me up with the Canadian midwifery student and together we tackled the health checks. Well what an experience that was!

Prior to starting, I did not really have any idea what I may find or what I should look for so using the stethoscope and otoscope I had brought with me seemed like the best approach. I began by demonstrating the use of the otoscope on my Canadian friend. She had perfect ears and made the process look so much fun that I was soon mobbed by children who all wanted me to look in their ears too. In the first ear of the first boy there was a gaping hole in his ear drum! I was shocked at what I saw and I despaired at what else I may find. Fortunately it did get better and I only found one other perforation but it was almost universal that their ears were filled with gunk (specific medical term for ear wax or cerumen).

Next I looked at their teeth. Again it was almost universal that their teeth were riddled with cavities. Some of these cavities were so large that the actual tooth was eroded down to the gum line. Some children had three or more teeth that were this badly affected. It is difficult to imagine the pain they must feel every time they eat.

Then I came to their chests. At least five children had good sounding crackles/wheeze/general consolidation and one child did not seem to have any breath sounds at all on his left side. Upon looking at his back, I discovered the reason. Apparently two years ago he had fallen from a balcony and by the looks of it actually broken his back and most of his ribs on the right side; there was an enormous bulge and severe scoliosis. Outwardly he was as normal and happy as the other children but you can only imagine the pain he must have suffered at the time. Finally, there was a little girl in a pink jersey with a murmur so loud I could hear it despite a room full of thirty screaming children. After waiting for everyone else to leave and the room to be quiet I listened again and sure as day there was a murmur – ejection systolic to be exact. What should we do with this girl? I had no idea. I asked the adults in attendance to get her referred to a big hospital in Kathmandu but any consultation would need to be paid for since there is no government funding for health care in Nepal. We did plan to follow up the boy with a deformed chest by getting an X-ray (NZD$2.20) and a consultation with a local orthopaedic surgeon.

Figure 3: *Jessie Ma (Christchurch School of Medicine) helps a young girl comb the knots from her freshly washed hair*

Following on from this first encounter we visited the Banepa street kids three more times. During the initial screening and health checks the children all carried their details around on a little piece of paper. This worked well on the day because we were dotted around the classroom and would have found it difficult to collate the information in any other way. In true Nepali fashion and through some hilarious miscommunication, all the children left that day with the information in their hot little hands and not with us. This left us with an obvious problem. So we went back to gather the information. On two consecutive days following their afternoon school session we turned up and screened every child again. Fortunately by then I had been joined by two colleagues, Matt and Jessie, also from the University of Otago's Christchurch School of Medicine who were able to share the work load. On the first afternoon through another miscommunication our Nepali helpers/translators did not turn up so the ensuing chaos meant we could not hear their chests properly nor were we sure we had recorded the children's details correctly. So we returned the next day with the helpers in attendance and tightly controlled the excitement long enough to hear what was going on. This worked well and we were able to pass the information on to the women's clinic we were working alongside.

Figure 2: *A young girl poses for a photo having just washed her hair in a bucket.*

Figure 4: Nepalise health workers assist a young boy to get dressed after his close shave with the local barber.

Throughout this exercise we had been keeping an eye out for the kid with the deformed back but he did not show up. Fortunately for us, their sleeping location was near where we were staying and they tended not to stray far during the day. We went and found him one morning and then walked the short distance up to the local hospital to see the orthopaedic specialist. One of the greatest strengths of the otherwise uninspiring Nepali health care system is that you can simply turn up, and provided you wait in line, you can see whomever you wish. So this is what we did, and as it turns out wearing a white coat gives you line skipping privileges. A morning consultation with the junior doctors followed by an X-ray, then an afternoon consultation with the specialist and all I have to report is that he has been referred to a spine specialist. The images showed that some of the vertebra in his back had suffered wedge compression fractures but were now stable. The boy did not report any neurological symptoms so it may be the case that nothing will be done in the long term. He is still young so I am left wondering how things will change as he enters puberty and begins to grow.

A few weeks later, Sue, the mostly retired nurse again organised for the street kids to have breakfast but this time also planned for the children to get a haircut and a wash. This was another great occasion filled with laughing and contented faces. Of course we found lice infested hair and again had to wash off a few weeks of grime but it was a morning I will remember for a long time to come.

I have thought about this experience a lot since returning to New Zealand. Despite our efforts, I feel that whatever we achieved was transient and ultimately futile. However, the same would not be true for efforts focused on addressing poverty in New Zealand. There are already many organisations that attempt to do just that. Address poverty. I don't plan on setting up an organisation, nor do I plan to commit to any one 'run-the-length-of-the-country' fundraising event. I plan on sticking to my strengths and using my skills as a future doctor to help those who are less fortunate than myself.

Figure 5: Jessie Ma and David Short (both Christchurch School of Medicine) comb knots out of a young boy's hair in Banepa, Nepal.

I left Banepa shortly before Christmas bound for Tanzania, Africa. The work that was started was continued in the short term by the Sue and then hopefully by the local women's health clinic. How well that arrangement is going I have no idea. I am afraid that Nepali miscommunication, corruption and disorganisation may combine with limited funding to ensure that no further progress is made but there is at least a foot in the door for the future of these children. Namaste from Nepal.

My elective placement was organised through Hope n Home, Nepal. They offer a cost effective, safe and comprehensive programme for medical students to complete their placements. You can visit their website for more information: http://www.hopenhome.org/

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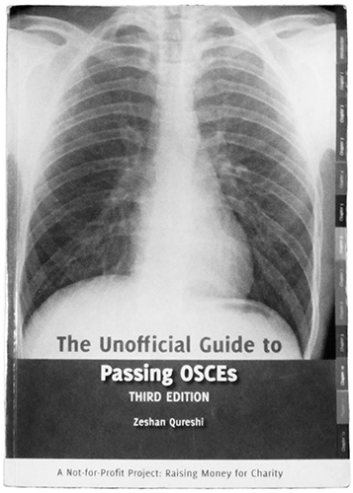
Craig Riddell is a fifth year medical student currently praying he makes it through the last hurdles to receiving the TI grant. He is interested in medical education and healthcare systems.



The Unofficial Guide to Passing OSCEs, Third edition
Editor: Zeshan Qureshi
ISBN: 978-0957149908
Publisher: Zeshan Qureshi
Year: February 2012
RRP: Approximately $55-60 on Book Depository and Amazon.

If the proof of the pudding is in the eating then surely the merit of a book titled *The Unofficial Guide to Passing OSCEs* should be judged on how I do in short cases coming up in a week's time. In lieu of having that result I will tell you that this text is ideal if you are a second or third year student looking for a basic clinical examination guide that will last you throughout medical school. Oh, and did I mention that all proceeds from the book are donated to charity?

The Unofficial Guide goes far beyond medical examination in its scope, with chapters on history, examination, basic prescribing, and practical skills. The clinical scenarios provided are a mixture of physical examination and history-taking which cover all of the major medical, surgical, and orthopaedic examinations as well as some more bizarre choices (for example, an acromegaly-specific examination?). There are also separate chapters on paediatrics, psychiatry and obstetrics and gynaecology, which are often missed by more medically-focussed texts.

It is impossible to consider a clinical examination textbook without reference to Talley and O'Connor's *Clinical Examination*, which, now in its sixth edition, is still a goliath figure against which other textbooks struggle mightily. So how does the content stack up? In three words: shorter and sweeter. With the sheer volume of potential material available *The Unofficial Guide* has artfully stripped down each examination to its essential components. While some examinations and sections may focus on more low-yield OSCE areas, these extraneous sections can easily be skipped.

Being shorter (it's only 292 pages long) does not necessarily imply a dearth of information though. There are lots of clear photographs displaying spot-diagnosis signs and how to perform the more difficult techniques of each examination. Can't figure out if the clinical picture points to aortic regurgitation or stenosis? No worries, there are plentiful tables to help you interpret signs and select diagnoses based on your findings. I think that this is a book best bought in pre-clinical years and used to get your basic examinations flowing as it clearly lays out a systematic method to approaching patients requiring examination of each system.

In short, this book succeeds in its goal of being probably the best reference if your aim is simply to pass all of your OSCEs throughout medical school. If however you're looking for distinction then you might want to keep using your copy of Talley and O'Connor's in all its 460 pages of glory.

Editor's Note: Craig did indeed pass his fifth year examinations.

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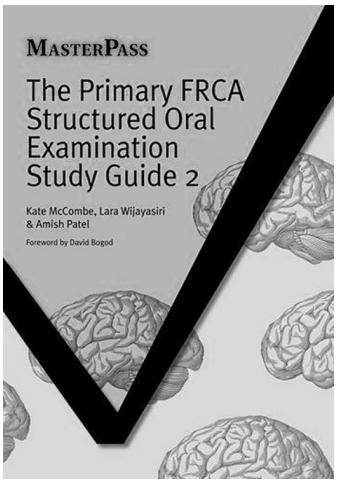
Karen Chiu is a 5th year medical student from the University of Auckland, currently based at Waikato Hospital. She has an interest in pursuing Anaesthesia as a future career, but at the same time is keeping her options open.



The Primary FRCA Structured Oral Examination Study Guide 2
Author: Kate McCombe, Lara Wijayasiri, Amish Patel
ISBN: 9781846194344
Publisher: Radcliffe Publishing Ltd
Year: April 2010
RRP: $53.99 on fishpond.co.nz

The Primary FRCA Structured Oral Examination Study Guide 2 is a text I wish I had with me while I was on my selective in anaesthesia. It is designed specifically for candidates preparing for the FRCA Primary (Primary Examination of the Diploma of the Fellowship of the British Royal College of Anaesthetists) structured oral examination. The authors originally set out to cover all the topics listed in the Royal College's guide to the FRCA Primary in their own exam preparation, but found it too daunting a task in the limited time they had. After passing their Primary, the authors returned to complete what they had set out to achieve, thus this guide was born. It provides answers to the questions regularly posed by the examiners in the structured oral examination.

The guide is divided into three sections, which are sub-divided into stand-alone topics consisting of one to two pages of short notes. Each topic starts with a quick introduction that defines the topic and the material is then presented in bullet point format under question headings. The Pharmacology section, which makes up the majority of the book, is good revision for material we have covered in medical school but may have forgotten; for example, pKa values, phase II metabolism by the liver, inverse agonism and distribution. The authors have created 'spider diagrams' for an extensive list of commonly used drugs in anaesthesia, which display their pharmacokinetics, pharmacodynamics, metabolism and effect. An example of a spider diagram for cyclizine is shown in figure 1.

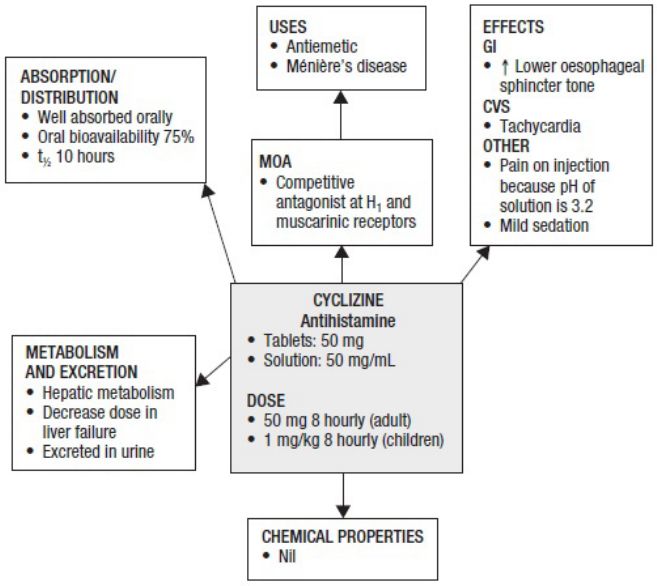


Figure 1: Spider diagram for cyclizine. Taken from The Primary FRCA Structured Oral Examination Study Guide 2.

The second section, *Special Patient Groups*, covers topics such as diabetes mellitus, Jehovah's Witnesses and neonates. It also includes special considerations in each case in terms of preoperative assessment, during anaesthesia, and post-operative management. The last section, *Critical Incidents*, covers complications in anaesthesia such as anaphylaxis, aspiration, malignant hypothermia and failed intubation, and their management.

Overall the text is an easy read, well-indexed, with the material presented in a succinct, bullet-point format. For a book that is aimed at trainee anaesthetists preparing for the FRCA Primary, its content is surprisingly not difficult for a clinical medical student to understand. Most of the principles, and even some of the actual content of the book, have actually been covered in our pharmacology and anaesthesiology lectures. The spider diagrams and special cases help the student understand the anaesthetist's selection of drugs and approach to patients with different co-morbidities in theatre. However, as expected, the guide goes into more detail than is required at medical school level.

I would recommend this text to fellow medical students who are interested in anaesthetics. For those on an anaesthetic attachment, it can be used as a quick clinical reference or a good light read during the downtime in theatre.

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Process

All submissions will be subedited for spelling, grammar and clarity. They will then be sent for expert reviews. Authors will be required to revise their articles during this process.

Final article selection for publication will be made in conjunction with our academic advisors and editorial board once the review and revision process is completed to a professional publishing standard.

Acceptance of an article into the review process does not constitute a guarantee of publication. It is the intention of the NZMSJ to provide authors with the benefit of external review and revision processes that are standard internationally for published journals. This is in keeping with our educational aim to assist medical students in making the transition from writing for medical school to writing as a graduate.

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