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## Suicide & Self-Harm in the LGBT Community

Is the Risk Real? What Can We Do?

## Features

Mental Health of Med Students -Who Will Guard the Guards?

**Reproductive Education Options** 

**Chiari Malformation - A Case Study** 

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## Letters from the TSMJ Committee

#### Dear Colleagues,

It's with great pleasure that I welcome you to the 13th edition of the Trinity Student Medical Journal. The TSMJ is written, edited and produced solely by medical and health sciences students of Trinity College, Dublin.

The Trinity Student Medical Journal is the product of months of hard work and dedication, not only on the part of the TSMJ committees, but also that of the talented and thoughtful students who submitted their work, along with their faculty mentors. In selecting the papers that are found in this volume, we looked for significance, academic integrity, and intellectual originality. We feel that the quality and variety of work presented in this journal reflect the excellence and academic diversity of Trinity College Dublin, Ireland. It is our sincerest hope that the articles, essays and projects contained herein will encourage TCD students to continue to strive for the best in their undergraduate and graduate research and will demonstrate TCD's outstanding potential.

I would also like to express my sincere gratitude to those that volunteered to work as part of our committee. It would be close to impossible to produce such high quality journal without the staggering amount of time and effort they have sacrificed. I would also like to thank all the students who put forward an article for publication, whether they were successful or not. We acknowledge the time and hard work you have invested writing and researching these pieces. With such great volume of submitted that we received this year, unfortunately, impossible to print them all but I continue to encourage those who did not succeed to try again next year.

This year would be my 3rd year volunteering in TSMJ, and I have to say TSMJ has grown and matured over the years. Previous committees have stressed how important sponsorship is for the survival of our journal. This year will be no different. I wish to thank all the patrons of the TSMJ, both old and new for their generous contributions. We could not have done it without their continuing support.

Best wishes,

Sydnee SiewShyuan Lim

Co-Director TSMJ 2011/12

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## Letters from the TSMJ Committee



Dear Reader,

The TSMJ has been the best extra-curricular experience I've had in Trinity, and I'm proud to have the opportunity to be part of such an extraordinary organization for three years. How the committee manages to produce a publication with relatively limited resources in such a short amount of time continues to amaze me.

Last year, we celebrated the tercentenary of the medical school; this year, we build on that legacy for future generations to celebrate. And in doing so, we continue to challenge the status quo, but not without purpose. The goal of the journal has always been to open a constructive dialogue between students, faculty, and all members of the Health Sciences. We would fail ourselves and each other if we skirt the important issues that could shape the future of medical education in Ireland.

Despite the unfortunate animosity that may exist between competing sides, we as health professionals are united by a common goal: the betterment of the health status of individuals and the community. It is important, therefore, to understand why differences may arise in the pursuit of this goal, and what we may do to reconcile these differences, or at the very least, start a constructive conversation between each other so we may begin to understand them.

Regardless of one's religious and spiritual beliefs, we should welcome dialogue between all people, regardless of their inclinations, understanding that we may not always be right. To neglect the hypocrisy of mere mortals, who are leaders of the Church, political parties, and special interest groups that we may associate with, would be hypocritical of me. By neglecting to accept the possibility that we may not always be right, and responding in anger to those who oppose our viewpoints, or maybe even hatred, organizations, countries, societies and yes, even ourselves have acted through ignorance and hubris, failing to do the right thing. Yes, to err is human. Yet while nobody's past is perfect, our future is still spotless, and we need not tarnish it with the same mistakes of the past.

Hate is what is destructive and contrary to our goal; it serves only to sever dialogue, disrupt unity, and not only stall progress, but even reverse it. The sooner we learn to understand and respect each, the sooner we can work towards solutions that are acceptable to all parties.

And so, whatever your beliefs may be, and reactions you may have to the opinions stated in this journal, please understand that while these views do not necessarily reflect the views of the TSMJ as an organization, they are opinions you will undoubtedly face in your professional, academic, and personal life. It is our hope that we have somehow helped you form a well-informed and educated perspective in the matter, so that you may assert your own opinions respectfully, as your fellow colleagues have done in this edition of TSMJ.

And what an edition it is! I could not end this letter without thanking everyone in the committee I have worked with throughout the years in the TSMJ. Once again, thank you Libby Ennis for trusting a 1st year to be your production manager, and in the following year, your successor. To my co-director Sydnee Lim, whose tenacity and assertiveness is matched only by her compassion and empathy for her fellow committee members; your expertise and leadership were exemplary. Thank you for being a great co-Commander-in-chief. To our Editorin-chief Rebecca Weedle, who worked tirelessly as an Executive and an Editor in a time of transition, experimentation, and uncertainty: patient as she is passionate; opinionated as she is talented;

thank you for challenging me to be a better leader.

To our resident miracle workers, Peter Tsakkos, who twice now I've managed to bamboozle into Production, and newcomer Kelsey Tallon: amazing work; the quality of this year's production speaks for itself. Congratulations on a job well done.

The photography in this issue has been provided by Sean Maguire, adding the extra colour to our journal that highlights the unique individuals, organizations, and buildings of Trinity College Dublin. A tradition started with our Tercentenary Edition by Allan Klompas, we hope that its presence serves to add to the journal and our heritage rather than detract from the quality of the scientific articles they serve to supplement.

To Sydnee's Public Relations and Marketing Team: thank you for providing us with the finances to continue to operate. And of course, thank you to our generous donors, including the School of Medicine, for believing in the value that we bring to the community.

To all the editors, especially those who assisted the production team in the formatting process: your work is often tedious and thankless, but absolutely essential to the success of the journal. Thank you for your humble contributions.

Finally, thank you to you, dear reader, for allowing us to share our work with you. We hope you enjoy this issue and the work of your peers; may it inspire you to get involved in the future, whether as a reader, author, editor, producer, marketer, or director!

Sincerely,

Antonio Bueno Co-Director TSMJ 2011/12

## Letters from the TSMJ Committee



The practice of medicine is a dynamic and colourful art. The multi-disciplinary team approach is now the gold standard of medical care. This year's edition of the TSMJ reflects this shift, and proudly contains articles submitted from across the Trinity Health Science Faculty. We all have different insights to offer, and we can learn from the experiences of others. As the practice of medicine is changing, so too are the populations we serve, and the issues they face. This edition presents a discussion on key challenges we will encounter on a day-to-day basis in our professions, and guides us in how to avoid pitfalls in our practice. One of our authors discusses problems faced by the LGBT community, and shows how we as healthcare professionals can be sensitive in our approach to people of all orientations and gender identities. Another highlights for us the oft-overlooked area of sexual health in the elderly.

Keeping abreast of new treatment options is an important component of being an effective health care provider. As novel therapies are constantly coming on stream, we have a duty to our patients to stay informed. The use of doll therapy in the treatment of patients with Alzheimer's disease and the improvement this may provide for them and their families is explored. We also question if FDA-approved medical devices can be trusted. Fresh research emerges daily as we strive to understand the intricacies of the human body and disease processes. One author asks if the autoimmune hypothesis for multiple sclerosis, widely held as the most valid explanation, is indeed correct. Another looks at whether the animal models we have been using for African Sleeping Sickness properly reflect the disease process in humans. We are reminded to never stop questioning what is an everchanging wealth of knowledge.

We are trained to care for our patients, but do we take time to take care of ourselves? Do we take time to reflect on our own journey and education? Mental health among medical students is explored in this edition of the TSMJ, and one international student shares his story of arriving at the gates of Trinity College and what lay ahead for him. An important component of our training is to intelligently consider all aspects of a contentious issue. What are your present thoughts on abortion education for healthcare professionals? One author proposes it should factor in to our undergraduate education, and we include a reply from the School of Medicine as to why it doesn't appear on the current curriculum.

Our time in college will shape our future careers in many ways, so what happens when we get to choose a little bit of our course along the way? Can our author convince you to risk the intensity of the ICU for your elective? Or perhaps the tales from Malawi will be more to your taste... This edition also introduces medConnect, a new resource for medical students looking to dedicate their elective time to work in a developing country.

As healthcare professionals we have to appreciate the myriad influences on our decision making, from public health to economic factors. As the old adage goes, prevention is better than cure, and here we have a discussion about public health initiatives for the prevention of diabetes and the associated ethics. Another author investigates the link between proper dental hygiene and improved glycaemic control. With Ireland in financial crisis, the government is reacting by making cuts, but does this always make sense? A strong fiscal argument can be made for improving access to methadone programmes in Ireland; can the maths be ignored?

On a final note, I'd like to thank all the authors and editors who worked with such enthusiasm and dedication to make such a thought-provoking and enlightening 13th edition of the TSMJ. I'm am heartened and encouraged by the large response from many of our Health Science disciplines, and sincerely hope this will continue to expand so that the TSMJ too can benefit from a multi-disciplinary approach. We will be shaping the future of health care together.

Rebecca Claire Weedle

Editor-in-Chief TSMJ 2011/12

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## Who Will Guard The Guards? – The Mental Health of Medical Students

#### David Mark Kelly & Brenda Murphy, 5<sup>th</sup> Year Medicine



"The ability to empathise with patients, be they medical, surgical or psychiatric, is what distinguishes a great doctor from an average one.

> Why then can't we empathise with our own colleagues?"

Many of us have sat through a psychiatry lecture, heard the symptoms of a condition and thought, "I have that." But how much of this self-diagnosing is accurate? The answer could be surprisingly high. In a 2007 longitudinal study on burnout (defined as adverse reactions to a pressing work environment) among Swedish medical students, 25% of those interviewed had a clinically significant psychiatric diagnosis<sup>1</sup>. Be it depression, anxiety disorder, alcohol abuse or suicidality, the prevalence rates of psychiatric morbidity indicate that statistically at least one student from each year group must be affected. Given that Medicine contains a more homogeneous group of personalities than the general population, its associated predisposing personality types or traits mean that the prevalence of certain psychiatric disorders is unfortunately higher among medical students, even before entering medical school<sup>1</sup>. For any psychiatric disorder, the 3 Ps are examined to identify the predisposing, precipitating and perpetuating factors which contribute to a patient's diagnosis. For a young, perhaps naive and ultimately inexperienced undergraduate, adapting and succeeding at medical school is no mean feat. One's personality traits may be of great help or of great hindrance in surviving the challenges of medical school and coping with the demands of exams, rotations, research and colleagues.

Traditionally, medicine has been known to attract the Type-A personality: organised, stringent and stressed. While most classes thankfully have a more heterogeneous mix of students, HPAT or no HPAT, the demands and ethos of medical school certainly encourage being of this mould in the early days of medical school. However, as the hours lengthen and summers shorten, with more demands being placed on doing rather than learning, the clinical years can be a major stressor for those Type-As. Once at the top of their game, they often find themselves reduced to being the lonely medical student or sole intern of the team. Type-A personality traits and neuroticism have a proven association with the phenomenon of burnout<sup>1</sup>.

Medical educators, through planning the workings of a medical school, aim to expose medical students to the life skills, opportunities and challenges faced by qualified doctors working in the medical field. Consequently, the constraints on time, onus of responsibility and demands on maturity are much more than those placed upon fellow undergraduates in other faculties. Five years of back-to-back 9-5 lectures, immediately followed by blocks of 9-5 rotation, served with a selection of exams covering everything from the ubiquitous Reed-Sternberg cell to ramipril, is surely a recipe for an-



hedonia, fatigue and persistently low mood in anyone of previously good mental health. A 2009 study of TCD & UCD medical students found the prevalence of depression to be over 14%, ranging from mild to moderate to severely depressed, as measured by a self-filled questionnaire<sup>2</sup>.

Thankfully for some, this triad of depressive symptoms is usually reactive and can often lift with the onset of the ever-dwindling summer holidays that haven't yet been consumed by the demands of even more electives/ rotations. With a little self-medicating at the nearest watering-hole, all stressors are surely forgotten about; the one thing medical students are perhaps more proficient at than doctors: "Let's have a drink." The same study of TCD & UCD medical students found that 15.4% met the criteria for alcohol abuse<sup>2</sup>. This statistic is particularly worrying given that medical classes contain a substantial number of non-EU students who are less likely to abuse alcohol. Of this proportion, consider those for whom alcohol is merely another redundant medication, or for whom acute abuse turns gradually and insidiously to addiction over the long years of NCHD training. A survey on the prevalence of alcoholism at an American teaching hospital found a rate of 4% among medical staff, with a further 10% classed as having possible alcoholism<sup>3</sup>. It is grave to ponder how many of our classmates will develop

the same addiction, just because their coping mechanisms involved the support of alcohol rather than family or friends in those early days of medical school.

Time brings change, and medical school is full of changes, with few constants such as school friends, boy/girlfriends, flatmates and even family being able to weather the five-year marathon. This isolation worsens over the years, as the move from campus lectures to hospital teaching to hospital living often further removes medical students both geographically and socially from the familiarity, supports and distraction of undergraduate life. For those with few outlets or social supports, medical school can turn into a timetabled hamster-wheel routine, which when coupled with dissatisfaction with the course and distancing from university life can lead to an all-too-easy downward spiral into melancholia and isolation.

Yet this is news to very few. We are all aware of the pressures that exist in the medical profession; it is what we signed up to, after all, at the wise old age of 18. Many others have gone through the same system before us, many will do so after us, but getting through and managing well are entirely different things. Every year sees its share of students who have to repeat exams or take a year off, sometimes for known reasons such as bereavement or physical illness. However, more often than not, these are reasons that could be attributed to a debilitating psychiatric diagnosis that the (at times indifferent) world of academia fails to acknowledge or accommodate. We all know of at least one friend or classmate who has struggled with a period of mental health deterioration, yet the subject is rarely directly addressed by lectures and can suffer from the same stigma and silence that psychiatry faces in the public domain. Are medical students supposed to be immune to such disorders? Is psychiatric illness something that only affects people in other courses? Psychiatric training heavily contradicts this notion, but perhaps the physician credo of "first treat thyself" is too heavily ingrained.

sort of peer pressure, found nowadays perhaps only in the medical profession, for a doctor to perform beyond the average requirement of a public sector worker. Attitudes are slow to change, especially in Ireland, and the old-school ethos of "In my time as an intern, we worked every single day regardless," can still unfortunately be found in certain specialties. Attitudes devoid of empathy such as these pay little heed to the mental health of medical students, and for anyone suffering from depression, whether mild, moderate or severe, it's the last thing they need. Doctors are not superhuman, nor do they need to be - machines were invented for that reason. The ability to empathise with patients, be they medical, surgical or psychiatric, is what distinguishes a great doctor from an average one. Why then can't we empathise with our own colleagues?

Although the notion of peer mentoring and student-delivered counselling is a valued source of support in college, it is often an inadequate intervention for psychiatric illness, be it an anxiety disorder or florid psychosis. With the student counselling service located on campus, and closed outside of medical teaching hours, it is virtually impossible to attend appointments whilst keeping up with academic commitments. In addition, with one psychiatrist for over ten thousand students, appointments for either service can have a waiting time of over a month. This may seem a trivial amount of time to some, but, to a person experiencing a major depressive episode, such a time lapse can potentially be the difference between life and death. A valid counter-argument would be that medical students are surrounded by mental health professionals every day, and should, in theory, have unlimited access to their advice. Few, however, are comfortable with breaching this age-old masterapprentice relationship. The medical student is, hence, incarcerated in a no-man's land, feeling belittled by their supposed mentors and, subsequently, having no-one else to turn to.

It is the authors' belief that any medical school would benefit from assigning each student a tutor who is a member of the hospital teaching staff, and thus more empathetic to the demands of clinical training. This is as opposed to a college academic, remote in every sense, which is the current situation. Despite a history of suicide within our faculty, there is still no teaching time dedicated towards coping with personal or familial mental illness as a medical student. The importance of psychiatry is clearly acknowledged by our college, as evinced by it counting for one guarter of our medicine mark. We can all take an adequate history of a psychotic or depressive episode, yet we receive no advice regarding what to do if we ourselves are plagued by the burden of mental illness. It must be questioned whether this "emphasis on psychiatry" is a genuine attempt to destigmatise and promote the specialty, or a mere campaign to project the image of such. The provision of in-hospital psychological and psychiatric support services for medical students could prove invaluable in treating mental illness at a time in life when they are vulnerable to depression, alcoholism and isolation. The same approach could potentially prevent mental health deterioration amongst junior doctors and then further down the line as senior physicians, if it were to be instated at the level of medical school.

In conclusion, it is clear that medical students are at a disadvantage when it comes to mental health. Training at such a young age to look after others can often mean that we lose the ability to take care of ourselves, letting our own emotions, hardships and fears slip away through the conscious mind to the abyss of the subconscious, where they are suppressed. There needs to be alternative methods for seeking help made available to students for whom the conventional college measures in place are inconvenient and unsuitable. Realistically, of course, if these changes are ever to occur it certainly will not be tomorrow, so let us at least make a start to approach this indescribably serious topic at a peer level. We know to enquire further when Mister Smith on the ward grimaces with his crushing chest pain, and yet why won't we enquire further when we suspect someone is pained by something less objective? The "SOCRATES" approach does not just apply to

physical insult. So perhaps the question we should be asking our classmates and colleagues is not, "How's it going?" but rather, "How are things, really?" Probe beneath the exterior and you'll undoubtedly uncover more than on general inspection. 3. Seigel BJ, Fitzgerald F.T, A Survey on the Prevalence of Alcoholism among the Faculty and House Staff of an Academic Teaching Hospital, West J Med 1988 May; 148:593-59

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## Abortion Education Now Accessible to Medical Students

Feature by Robert Obara, BSc, MIPH, 3<sup>rd</sup> year medicine TCD



"Abortion is restricted in Ireland (and Northern Ireland) owing to UK laws dating back to 1861<sup>2</sup>."

Medical students in Ireland can now access abortion education thanks to optional new online and in-person reproductive health programmes. The comprehensive evidence-based supplemental training fills the gaps in the standard Irish medical curricula.

Virtually no students in Ireland get exposure to abortion care, despite the significant number of Irish women who have the procedure. Over 4,400 women are known to have travelled to England or Wales for an abortion in 2010 alone, as indicated by UK Department of Health data on women with Irish addresses<sup>1</sup>. Over two-thirds of these women were less than 10 weeks gestation, and 98 percent were less than 20 weeks<sup>1</sup>. Unfortunately, there are no other accessible data on Irish women who have procured abortion elsewhere.

Abortion is restricted in Ireland (and Northern Ireland) owing to UK laws dating back to 1861<sup>2</sup>. Legally, abortion is supposed to be accessible in Ireland under certain circumstances, but finding a skilled provider is a challenge; what's more, medicolegal guidelines surrounding abortion are presently unclear. In 2010, the ABC v. Ireland case by the European Court of Human Rights found the Irish state at fault for failing to legislate an existing right to abortion<sup>3</sup> – a right founded by the Irish Supreme Court in 1992 with the X case<sup>4</sup>. Since the X case, women have had the right to

abortion if pregnancy threatens their lives, including the risk of suicide. This right still has not been legislated.

Having identified deficits in both women's health and medical education in Ireland, a group of medical students set out to find solutions. Though college directors were unable to assist the students with this feat<sup>5</sup>, help soon came from a USbased non-profit organization known as Medical Students for Choice, or MSFC. MSFC is present at most medical schools across North America, and students created the first European chapter here in Ireland.

MSFC Ireland's goals are simple: improve women's health through the education of future medical professionals. Simply raising awareness about reproductive health challenges in Ireland is unfortunately not enough. Thus, MSFC Ireland created a portal website to link medical students in Ireland with free evidencebased online reproductive health training programmes from organizations such as the Association of Reproductive Health Professionals.

Now MSFC Ireland has 'upped the ante' by linking students with the most effective learning method possible: in-person experience at women's clinics abroad through observerships or electives known as reproductive health externships

(RHEs). RHEs are generally 2 – 4 weeks long and can be conducted at a wide range of clinics and hospitals around the world, but traditionally have been centered in the US. For 2012, the British Pregnancy Advisory Service (BPAS) has welcomed medical students from Ireland to complete the RHE at some of their many clinics across Britain. BPAS, a registered charity, provides a wide array of reproductive health services and is the largest single abortion provider in Britain. Since medical students in upper years are expected to complete elective rotations in fields of their choice, RHEs provide a great opportunity to get exposure to the comprehensive abortion care found abroad.

MSFC assists eligible students participating in the RHE by providing up to \$1,000 (£665) to cover travel and other expenses. Exposure to a minimum of 50 combined medical or surgical therapeutic abortion procedures is necessary to be eligible. Applications for the MSFC RHE funding programme can be found online via MSFC Ireland's website: www.msfc. ie.

The RHE is valuable for all medical students, especially future GPs and OB/GYNs, as well as numerous international students in Ireland who plan to practise where therapeutic abortions are conducted. What's more, many physicians currently practising in Ireland would also benefit from such training; UK Department of Health data since 1980 suggest abortion as past medical history for over 148,000 Irish women<sup>1</sup>. As a result, the need for abortion education exists regardless of whether the healthcare failures identified by the European Court of Human Rights are addressed by the expert group recently appointed by Minister of Health, James Reilly<sup>3,6</sup>.

If the State implements the existing right to abortion, the medical community has a duty to respond. Trained GPs and OB/GYNs can prescribe medical abortions to legally eligible women from the comfort, safety, and privacy of their surgery. Surgical abortion may also be safely conduced by trained GPs and OB/GYNs, as is the practice in many other countries.

There is great potential for continuity of care within Ireland, whereas at present, doctors in Ireland are forbidden from even providing referrals for abortion consultations in the UK<sup>7</sup>. Meanwhile, women from Ireland seeking abortion care abroad must independently find, travel to, and pay for these services. The challenges continue upon returning to Ireland, where doctors have not been trained in abortion follow-up care. Fortunately, supportive resources such as the Irish Family Planning Association and Abortion Support Network currently assist, as much as legally possible, those facing crisis pregnancies in Ireland.

Despite the roadblocks, adverse events from abortion are not common; comprehensive data published by the Guttmacher Institute in the US show that first-trimester abortion, at the hands of a skilled provider, is safer than pregnancy itself<sup>8</sup>. Despite its safety, there is still a lot of false information regarding therapeutic abortion. MSFC Ireland hopes that reproductive health education debunks these myths, such as first-trimester abortion causing breast cancer, infertility, or psychiatric illness - for all of which there is virtually no correlation<sup>9,10</sup>. Regarding the latter, the HSE Crisis Pregnancy Agency even published a review in 2008, noting that "legal and voluntary termination of pregnancy rarely causes immediate or lasting negative psychological consequences in healthy women", and that "childbirth itself is eight times more likely to lead to negative psychological outcomes than is abortion"<sup>11</sup>. Simple facts like these are what the medical community needs to be aware of; abortion education is imperative.

With the looming implications of the ABC v. Ireland case, now is the time for medical students in Ireland to access comprehensive training in family planning and reproductive health. Now is the time for improved women's healthcare.

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## A Response From Dr Martina Hennessy

Professor of Academic Medicine & Director of Undergraduate Teaching and Learning

#### Senior Lecturer/Consultant in Medical Education

"We do not provide a *specific* course in abortion, but then neither do we provide specific courses in IVF, sexual assault, miscarriage and a great many other things. To do so would be to reduce our understanding of the patient to a series of specific experiences. This is not appropriate at the undergraduate level. Even at postgraduate level where the subject is more appropriately placed, we must ensure that our understanding of best practice does not become overly contextual and remains patient centred."

#### Dr. Martina Henessy

The emphasis within the undergraduate curriculum should (correctly, I believe) be on the importance of a patient centred approach to Reproductive Health, rather than on any single procedure or intervention. Teaching and learning in Reproductive Health is comprehensively delivered as part of the fourth year rotation in Obstetrics and Gynaecology. A sample of some of the important learning outcomes is shown below. These learning outcomes should form the underlying principles to our interactions with any woman in relation to her reproductive health. They should also be relevant to partners where appropriate.

- Learn about ethics and law in Obstetrics and Gynaecology.
- Understand the importance of consent and confidentiality in clinical practice.
- Develop a patient-centred approach to practice.
- Understand the indications, mode of action and sideeffects of all methods of short-term, long-term and emergency contraception.
- Demonstrate an individualised approach to discussing contraception with patients.
- Develop an awareness of the importance of the multidisci-

plinary team in patient care

- Develop problem-solving and critical thinking skills
- Outline the investigation and management of couples presenting with infertility.
- Understand the care of patients undergoing gynaecological procedures.

In addition, reproductive choice and the professional, legal and ethical issues relevant to that for patients and healthcare providers in Ireland and globally are addressed at different stages throughout the course from PBL in 1st year to jurisprudence in the 4<sup>th</sup> year. Note for example the second year lecture entitled "Ethics of reproductive medicine". Communication skills, consent, and patient safety are all issues relevant to this topic; our intention is that the principles associated with these topics and the skills needed to apply them should be increasingly familiar to students, irrespective of the context, as they progress towards graduation. Similarly, the aftercare of a woman who has had a termination of pregnancy would likely be similar to that aftercare any woman would require following an early ending of pregnancy irrespective of spontaneous or planned.

We do not provide a specific course in abortion, but then neither do we

provide specific courses in IVF, sexual assault, miscarriage and a great many other things. To do so would be to reduce our understanding of the patient to a series of specific experiences. This is not appropriate at the undergraduate level. Even at postgraduate level where the subject is more appropriately placed, we must ensure that our understanding of best practice does not become overly contextual and remains patient centred.

Our primary objective is to produce competent and caring medical graduates who will contribute to innovation and excellence in their specialty (whatever that is), maintain a capacity for lifelong learning and exemplify the empathic skills required to address the problems they face in their practice and in their engagement with the most vulnerable in our society and the broader community. More importantly, we hope they will have a strong commitment to the ethical dimension of medicine and healthcare and an ability to use a comprehensive framework to engage in ethical issues both in their practice (wherever that is) and in society.



## Methadone Treatment in Dublin: In Need of Review

David Greene, 2<sup>nd</sup> Year off-books General Nursing, TC



"Methadone treatment has been shown to be an effective therapeutic intervention for patients attempting to give up heroin; patients with access to methadone treatment have a higher successful cessation rate than those without methadone<sup>2</sup>."

Methadone is a powerful synthetic analgesic drug, which is similar to morphine in its effects but less sedative. It is used as a substitute drug in the treatment of morphine and heroin addiction<sup>1</sup>. Methadone treatment has been shown to be an effective therapeutic intervention for patients attempting to give up heroin; patients with access to methadone treatment have a higher successful cessation rate than those without methadone<sup>2</sup>.

Last summer I had a placement with Dublin GP, Dr Austin O'Carroll in three outreach homeless methadone clinics that he runs through the SafetyNet organisation. This placement gave me the opportunity to explore the effectiveness of methadone treatment in Dublin.

Addiction is a behavioural pattern of substance use, characterised by a compulsion to take the substance, primarily to experience its psychic effects<sup>3</sup>. During my time at the methadone clinics, I saw intravenous drug addicts who were desperate to get off heroin through a methadone programme in order to escape from the chaotic lifestyle that goes handin-hand with heroin use.

Upon looking into the issue a bit further, it became clear that the methadone treatment options in Ireland are not as effective as they could be, and that heroin abuse is costing society more than it should. As the following discussion will show, a few relatively minor changes in policy could significantly improve access to methadone treatment and simultaneously cut down on the costs attributed to heroin abuse in our society.

To commence a methadone programme, an addict must attend a specialist GP authorised to prescribe methadone. There is a cap on the number of patients that can be treated by level one and level two GPs. A level one GP can prescribe for up to 15 patients with methadone, while a level two GP can prescribe methadone up to 35 patients, or a maximum of 50 patients if they are in a partnership with two or more doctors in their practice.

In certain exceptional circumstances these numbers may be increased. Approval for this increase is obtained from the ICGP/HSE review group following an application from the GP or practice in question<sup>4</sup>.

A drug user can also access a methadone programme at the Trinity Court facility on Pearse Street, Dublin. This National Drug Treatment Centre provides rapid assessment for potential methadone patients. No appointment is necessary and selfreferral is usually sufficient. In order to be accepted onto the Trinity Court methadone programme, patients must first provide three 'dirty' urine specimens. The waiting list at the centre has recently decreased from several months to several weeks.

I contacted two methadone clinics, the first in the United Kingdom and the second in Switzerland to compare treatment waiting times. The Methadone Alliance in London said "significantly less than three weeks"<sup>5</sup>, while the Swiss clinic said that "clients who ask for methadone treatment usually can get treatment within a day or two"<sup>6</sup>.

From an economic perspective, Ireland's current methadone treatment strategies are questionable, in that the limited level of access to methadone might be impeding reduction of the number of active heroin abusers. Having more people on heroin amounts to increased policing/jurisdicial expenses, owing to the heightened incidence of crime which so often accompanies heroin trafficking.

The drug users I spoke to that wanted to start a methadone programme had an average habit of between one and two bags of heroin a day. A bag of heroin costs  $\leq 20$  on the street; therefore, one year supply of heroin ( $\leq 40 \times 365$  days) could cost an addict  $\leq 14,600$ . There are an estimated 20,790 heroin users in the Republic of Ireland<sup>7</sup>. Most will either sell heroin or steal to support their habit. This inevitably brings an addict into contact with the criminal justice

system: one night in Mountjoy Prison costs the State €193.19<sup>8</sup>. Therefore, keeping one prisoner detained for a year costs €70,514<sup>8</sup>. This does not take into account the many victims of crime, the huge traumatic psychological impact on the victim, and how much this costs our society.

One 500ml bottle of methadone costs the General Medical Services €12.70. The average addict uses 70-100ml of methadone a day. Therefore, to keep one person on a methadone programme for a year would cost the government €927.

For the purpose of this article, I spoke to several intravenous drugs users, most of whom had been in prison at some point in their lives. The majority of these addicts say that they would like to be on a methadone programme, however, the long waiting list prevents them from taking the necessary steps to do so.

## Conclusion

It would seem that easier access to methadone treatment would work to reduce criminal activity<sup>2</sup> and save funds, which could be used to employ more nurses for our overstretched health care system or solve the current pay issue with rostered 4<sup>th</sup> year student nurses. Keeping 1% (208) of the heroin-using community out of prison for one year could save the government €14,666,984.80 (208 × €70,514). Keeping 1% (208) of heroin users on methadone for one year would cost the government €192,836.80 (208 × €927), which is a potential saving of €14,474,148. A few minor changes in policy could significantly improve access to methadone treatment and simultaneously cut down on the cost attributed to

heroin abuse in our society.

Most heroin users are from a disadvantaged background<sup>2</sup> the bigger solution might well be a change in our social model and a more inclusive society.

#### Acknowledgements

Dr Austin O'Carroll GP, Nurse Denise O'Mahony, Mr Patrick Hawe,

Mr Raul Menendez.

Photo courtesy Mr James Kirwan.

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#### Case study

Previous to this placement, I assisted a client onto a methadone programme in one of the outreach methadone homeless clinics. At the time, the client had a chronic lower leg ulcer ongoing for three years and a heroin habit for seven years. Due to his chaotic lifestyle his compliance with wound care was extremely poor. By chance I encountered the client at the start of my placement. He said that since he started methadone, his life was less chaotic and his leg ulcer had improved hugely. Instead of spending his social welfare on heroin, he could afford to pay for hostel accommodation and nutritious food. He said: "I now feel stable and able to move forward with my life".



## Diabetes Prevention and Intervention: Conflict between Public Health and Individual Autonomy

#### Gillian Crowe, 4<sup>th</sup> Year Medicine, TCD



Diabetes mellitus (DM) is a disorder of metabolism, characterised by chronic hyperglycemia and is accompanied by disturbances of intermediary metabolism. It is caused by defects of insulin secretion, insulin action or a combination of both<sup>1</sup>. DM may be broadly divided into Type 1 DM (T1DM), Type 2 DM (T2DM), Gestational DM and other, rarer forms such as monogenetic forms caused by defects in the insulin receptor or downstream signalling pathways. T1DM is caused primarily by pancreatic  $\beta$  cell destruction, commonly as a result of autoimmunity. The mechanisms underlying T2DM are not clear, however the most definitive causative factors of the disease are obesity and physical inactivity, both of which have been shown to increase insulin resistance, a characteristic feature of T2DM. It has been estimated that there are approximately 366 million people with DM globally, and this figure is expected to rise to 552 million by 2030<sup>3</sup>.

## Implications of the disease for the individual and the state

#### Burden on the individual

Although the various forms of DM vary hugely in their aetiologies, incidences and indeed clinical presentations (particularly those of T1DM in comparison to T2DM), the long-term effects of poorly controlled disease are similar. Both may lead to a variety of serious clinical sequelae including retinopathy, nephropathy, neuropathy and arterial disease which may in turn may result in blindness, severe renal disease, disabilities and amputations. Furthermore, a diagnosis of DM also has significant psychological implications, with DM patients having twice the risk of developing depression than that of the normal population<sup>4</sup>, as well as having higher incidences of anxiety<sup>5</sup>, eating disorders<sup>6</sup> and general psychological distress<sup>7</sup>.

#### **Costs to the State**

Apart from having devastating implications for the individual, DM also places a significant burden on the State. In 2011, it was estimated that there were 191,000 diabetics in Ireland, of whom 14,000 had T1DM<sup>8</sup>. Data from the VHI Healthcare screening<sup>9</sup> suggests that there are an additional 30,000 undiagnosed Type 2 diabetics and a further 146,000 with pre-diabetes in the community.

How do these figures translate into costs to the State? The CODEIRE study which followed health budget spending on the treatment of T2DM for a twelve month period (1999-2000) revealed that approximately 6.4 % of the total healthcare budget was spent on the treatment of diagnosed and undiagnosed Type 2 DM, where 49% of the total 580.2 million euro was spent on hospitalisations. 27% on ambulatory care and 25% on drugs<sup>10</sup>. The diabetic population has grown by 105,000 since the year 2000 (figures by WHO<sup>11</sup>), representing a 122% rise in incidence, and an undoubtedly greater increase in costs to the State.

There is a significant body of evidence to suggest that T2DM is manageable and even reversible with simple weight loss and exercise, and both hepatic and muscular insulin resistance have been shown to improve with even a short period of calorie restriction<sup>12</sup> or acute exercise<sup>13</sup>. Meanwhile, the complications described above can be delayed and even avoided with tight glycaemic control<sup>14</sup>. Both diabetic micro- and macrovascular disease have significant negative impact on health-related quality of life<sup>15</sup>, and are a significant cause of disability<sup>16</sup> and cost to the State<sup>17</sup>. Thus, it would seem that public health interventions and preventative measures targeting these areas would be relatively uncomplicated, and that their implementation would be ethically straightforward because of the expected benefits; however, this is not the case.

### **Public Health Ethics**

In contrast to the primary fiduciary duty of the doctor to an individual patient, the ethics of public health is based on a societal responsibility to protect and promote the health of the community as a whole. However, because of its community-orientated position, public health measures may ignore certain ethical principles. Any potential interference by these measures with human behaviour, such as encouraging behavioural changes by seeking to address weight issues and physical inactivity often gives rise to significant conflict with the principle of autonomy, which is paramount in health care provision.

#### Autonomy, Paternalism and Public Health

Among the public health interventions (PHIs) suggested for the prevention and treatment of diabetes are taxes, excises and advertising bans on fatty foods, tax breaks for those maintaining a healthy BMI, prohibitions (such as on transfats), mandatory screening and restrictive employment policies. Almost all of these interventions can be seen as a restriction of and indeed an assault on individual autonomy. Autonomy, which is described as self-rule, free from the control of external influences; as well as respect for autonomy, run deeply in common morality. Kant described respect for autonomy as arising out of the conclusion that all individuals have inherent unconditional worth. Respect for autonomy creates both positive and negative obligations. In the case of some PHIs, the negative obligation, which refers to the obligation not to interfere with an individual's autonomous choice, is not fulfilled, which results in the possibility of these interventions being described as paternalistic.

Paternalism, defined by Dworkin as "interference with a person's liberty of action justified by reason referring exclusively to the welfare of the person being coerced"18, was completely prohibited by JS Mill<sup>19</sup>, and in recent times has become a focus of much criticism amongst patient groups and others, particularly as the responsibility for decision making in care has shifted to a greater extent towards the patient. The principle of PHIs would seem to be in direct conflict with that of the patient-physician partnership, which has become the ideal relationship in the delivery of healthcare in recent years.

## The Argument for PHIs

However, there exist a number of arguments against the view that PHIs are unethical or paternalistic. Some have argued that PHIs are not paternalistic nor in conflict with personal autonomy, as there is tacit prior consent by anyone who is a member of society to some degree of interference for the good of the community. Others, on the other hand, have accepted that PHIs impinge on autonomy, but argue that it is justified in some cases. Childress et al20 formulated a number of criteria under which PHIs, and thus restriction of autonomy, were justified. The five criteria they identified were effectiveness, proportionality, necessity, least infringement, and public justification. The notion of public justification for a PHI where individuals have a role in deciding if the intervention is justified implies that each individual's views are considered and thus the action is not wholly paternalistic. Another view justifies PHIs on the presumption that the rational individual would consent after the treatment proves to be beneficial, and that unhealthy behaviours are so contrary to one's self-interest that they must be driven by irrational or pathological factors. This view has been termed soft paternalism and heavily criticised on the basis that various individuals will place different values on different things. Thus in the context of PHIs for diabetes prevention, a person may value goals other than healthy eating or physical fitness. Consent should never be assumed on the basis of what someone should or ought to value.

Policy makers and government, rather than defending their policies, have taken a utilitarian view on public health, concluding that the most ethically reasonable course of action is the one that produces the greatest good for the greatest number of people. Furthermore, it has been argued that respect for autonomy in the area of public health could constitute a moral neglect on the part of the community. Many would argue that it is unfair to burden those who have made prudent choices with

regard to their health with taxes and other measures in order to cater for those who have not. This is in accordance with the principle of justice based on moral desert, which is founded on the belief that all should receive what they deserve, where one's desert may be welcome, such as a reward, or unwelcome, such as a punishment. It must be noted that society as a whole bears responsibility for the pattern of distribution of unhealthy behaviours amongst its members, as demonstrated by Marmot and Wilkinson in their research on the extensive linkage between health status and social position, who consistently showed that lower social status was strongly associated with poorer health<sup>21,22,23</sup>. Much of what makes a person is dependent on the community in which he or she was raised, thus it would be morally unacceptable for the same community to relinguish all responsibilities for an individual's subsequent disabilities.

#### Public health and the law

The complex moral arguments surrounding this conflict have given rise to legal precedents; one of the better known ones, the case of Jacobson v. The State of Massachusetts in 1903, justified State intrusion on personal autonomy where there is compelling interest<sup>24</sup>. Apart from directing attention to what defines such an interest, the Jacobson case also highlighted issues pertaining to control of infectious diseases, specifically the legality of a government fine on those who failed to obtain vaccination for their children. Thus the use of this precedent fails to take into account the profound difference between controlling disease agents and controlling human behaviour. Exercising interventions to control diseases are often justified, but actions aimed at controlling people are often not. The main causes of mortality and morbidity are moving away from acute and infectious diseases towards more chronic ones, many of which arise from lifestyle factors, the socalled 'epidemiological shift'25, which has resulted in this deficit becoming increasingly significant.

## The arguments against PHIs

Although there are many arguments in favour of PHIs, empirical evidence showing otherwise must also be considered. Trinity's own Petr Skrabanek raised the point that many PHIs are of dubious benefit and may even cause harm even though they are well intentioned<sup>26</sup>. Skrabanek likened PHIs to mass experimentation, highlighting the paradox that while clinical trials are subject to such an intense level of ethical regulations, State bodies have little or no obligation to inform or gain consent from participants, i.e. the community, for their part in "experimentation of uncertain outcome and potential harm". Thus, as well as impinging on autonomy, PHIs could also inadvertently come into conflict with the principles of beneficence and nonmaleficence. A number of common screening programmes have provided empirical evidence to support this view. A study on the efficacy of mammography screening estimated that less than 5% of women with screen-detectable cancer had their lives saved by screening<sup>27</sup>. In addition, a review of 2 large randomised controlled trials, a quasi-randomised trial, a large cohort study and several case-control studies on breast selfexamination in Canada have shown no benefit, and indeed lead to disadvantages in the form of increased visits to the doctors and benign biopsies<sup>28</sup>. Screening, particularly in healthy populations, has been shown to have negative psychological effects, where in comparison with unscreened controls, screened patients' own assessment of their psychological distress was profoundly increased after three months<sup>29</sup>.

### Conclusion

It cannot be denied that those who experience the greatest degree of autonomy enjoy the best health, while those with the least have the poorest. Autonomy is a defining constituent of the human being, and perhaps, rather than attempting to restrict it through PHIs, it should instead be promoted through education and patient empowerment. The autonomy that should be sought is that of Kant, where autonomy is integrated with responsibility, allowing the individual to be in the position of deciding and not being decided for, and thus being able to select and accept reasonable constraints on their behaviour.

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# GET INVOLVED

## The International

Robert Obara, BSc MIPH, 3<sup>rd</sup> Year Medicine, TCD



On one sunny August day I say goodbye to my partner and parents at the Victoria International Airport, my life packed into two 22-kilogram suitcases. 3 flights, 19 hours and 9,500 kilometres later I land in Dublin – my first time to Europe. Life as an international medical student begins.

Medicine is such a fascinating and multifaceted profession. It is both demanding and rewarding, but the gateway to this allopathic Zen is narrow; many qualified applicants are turned away for every one person accepted into most medical schools.

I was in Australia working on my Masters when I found out that I was accepted into Trinity. I knew that Trinity had an excellent reputation and my newfound spot in Dublin was revered, but I didn't feel the celebration. The daunting €4,000 nonrefundable deposit to Trinity was due one week before I was to find out the results of my post-interview admission decision from the medical school in my hometown.

Staying close to home for medical school would have allowed for much more time with loved ones and much less debt overall. It also would have made life easier as everything would be familiar, from the education system to the grocery store. I knew that the Irish medical schools had a long history of exporting strong matriculates to Canada, but the international student tuition is steep (currently standing at €31,000 per year at Trinity). The fees are, however, comparable to what most medical students pay in the US.

In the end I paid the deposit to Trinity, and I'm glad I did; I was told that my application was one of the near-30,000 rejected by Canadian medical schools in 2009. Rather than spending the indefinite future reapplying in Canada, I found myself standing at Trinity's Front Arch with two heavy suitcases in hand. It was the start of a new adventure and I was fortunate to have Trinity open its doors to me.

I felt like I was in a parallel universe where people drink beer instead of water, drive on the wrong side of the road, and ask questions like, "where is the craic?" Moving into the Cunningham building at Trinity Halls was interesting, what with a communal kitchen, shower, and toilet shared among up to 14 young men and H1N1. I purchased a bicycle for the 5-kilometre commute from the dorms to campus, but before the year's end I had a run-in with a bus that resulted in a broken helmet. suspected scaphoid fracture and €250 visit to A&E – a crude but thankfully benign way of learning about Ireland's healthcare system.

There is a lot to adapt to when one moves across the globe alone, but

it's comforting to know there are others in the same situation. About one third of our 146-member class is composed of non-Irish students, and the majority of us international students come from Canada and Malaysia. One rite of passage that seems to pull us non-EU students together is the annual Garda vetting, where we have to line up outside the immigration office early in the morning (and usually in the rain) to provide paperwork and €150 to the Irish government and subsequently miss a day of classes. Another aspect of life for the internationals is the need for a good Internet connection at home for often-daily video chats on Skype with loved ones across the opposing time zones. Many of us have both endured and enjoyed long-distance relationships thanks to this electronic Cupid.

Studying in Dublin has major benefits. Pizza in Italy or wine in the south of France is just one Ryanair flight away. Dublin itself has a vibrant city centre, and the live music or Saturday food markets are a refreshing change from the parkades and Costcos that symbolize North American excess. One also learns to value sunshine like no other. I haven't found myself feeling homesick, though I desperately miss the affordable and succulent sushi on the west coast of Canada.

There are approximately 650 Ca-

nadians studying medicine abroad (CSAs) in Ireland, and we constitute 'big money' to the Irish education system. Family savings are the topcited main source of funding for CSAs in Ireland, and this is not surprising when roughly one third have a physician as a parent. Still, many of us rely on professional student lines of credit of around \$300,000, for which parents almost always have to cosign. This is on top of Canadian government student loans. The pressure quickly mounts on us to match successfully to a residency after graduation and start paying off the loans; fail to 'make it' and your folks could lose the house.

It sometimes seems like a worrying gamble to be an international medical student in Ireland, especially when there are no post-graduation training spots specifically held for us in any country. Upon graduation, we CSAs are regarded as international medical graduates (IMGs) in Canada. Back home we have to compete for limited residency training opportunities, most of which have mandatory return-of-service contract clauses requiring years of work afterwards in rural underserved areas. We can also apply to train in the United States, where there are roughly one third more residency spots than there are domestic medical school graduates.

To be eligible to apply for residencies in Canada, CSAs have to write the computer-based Medical Council of Canada Evaluating Examination (MCCEE), generally at the start of final year. Also, anyone applying to the US must write the US Medical Licensing Examinations (USMLEs). Strong reference letters from doctors in Canada or the US are imperative, and this puts pressure on us to use our summer clinical elective time productively.

Despite the hurdles, Canadians in Ireland have a good chance of matching successfully to at least one programme somewhere across the North American continent, be it a 2-year family medicine residency in the middle of Manitoba or a 5-year orthopaedic surgery residency in downtown Toronto. One Canadian residency programme director said that, due to how similar the clerkship experiences are in Canada and Ireland, he prefers Irish graduates to those from for-profit international medical schools popping up across the Caribbean, Eastern Europe and the Middle East. Compared to the standard 4-year graduate-entry medical programmes, the extra year of training at Trinity also provides us more time to improve our clinical fitness and finesse. With one or more previous degrees, however, it is a long road.

I enjoy learning at Trinity, as many of our educators are brilliant people who are leaders in their field. Still, the air of prestige and history within the college is accompanied by gusts of haphazardness. For example, the PowerPoint lecture slides (from which we are expected to base our individual studies) from any given lecture may be posted to one of many different websites, it may be e-mailed to us, it may be handed over to a class rep, or it may not be made available electronically at all. Also, the version we do access may not be up to date. Compounding this are last-minute lecture changes and cancellations. But such is life and everything gets done in due time. Us students learn to adapt, relax, and hopefully realise how privileged we are to have such trivial complaints.

Another benefit to studying medicine at Trinity is the variety of people in the class. The biggest difference I see across our cohort is age, given direct entry into medical school right from high school in Ireland. At first I questioned if someone aged 17 was ready to jump headfirst into a lifetime of medicine. But now I see that, regardless of age, we all integrate to share fresh perspectives, rich cultures and even delectable cuisines.

Moving past the snags and expenses, the experience of a medical education at Trinity College is unique and empowering. We have a rich international community that both benefits from and contributes to this novel life founded in Dublin. And what a life it is.



## Medical Devices: How reliable is the FDA's stamp of approval?

#### Christopher Payne, 3<sup>rd</sup> Year Medicine, TCD



The United States accounts for half the global market for medical devices allowing the U.S. Food and Drug Administration's (FDA) approval to influence medical devices developed and brought to the market globally.

The FDA's 510(k) approval system allows for devices that are deemed similar to already approved products to bypass pre-approval trials.

Bioengineered Intervention – A growing field

Mrs. AW, a 67 year old patient is slowly losing her battle with age related macular degeneration. She has also fought with arthritis in her hip for the past few years, placing her in constant pain. In a recent consultation with her ophthalmologist, she is told about a new device which can be implanted into her eye to aid her vision. During a separate consultation with an orthopaedic surgeon, she is advised to undergo a hip replacement. The surgeon suggests using metallic components which would allow her hip to function without pain.

There are over 500,000 medical devices on the market ranging from simple devices like bedpans, to more complex devices, such as pacemakers<sup>1</sup>. The global market for medical devices is worth approximately US\$200 billion, with about half of this spending coming from the United States alone<sup>2</sup>. This allows them to have significant influence over medical device development and in turn those devices available globally. This article will look at the two devices recommended to Mrs.AW which exemplify both the strengths, limitations and safety concerns surrounding bioengineering. It will also look at how medical device approval by the United States Food and Drug Administration (FDA), which governs the safety of medical devices, can affect patients.

## The Ophthalmologist's Recommendation – A feat of bioengineering

Age related macular degeneration (AMD) leads to irreversible blindness and affects over 8 million people in the United States<sup>3</sup>. AMD is of major concern due to projected

 Recent attention has been drawn to this approval process as more and more devices approved through the 510(k) system show many unexpected failures, far outweighing the benefits these new devices were promised to have.

increases in the advanced stages of the disease as the population ages<sup>4-6</sup>. Individuals with end stage AMD experience losses in their central visual field which have been shown to profoundly reduce a patient's ability to carry out physical tasks<sup>5</sup>.

The Implantable Miniature Telescope (Fig. 1) has been designed for patients with advanced forms of AMD. Before the device's approval in 2010, the only devices to aid such patients were magnifying glasses or external telescopes, which often resulted in low patient satisfaction due to their bulkiness and limitations on the patient's field of vision and normal eye scanning. The Miniature Telescope however is designed to be implanted into the posterior chamber of the eye, facilitating movement of the device with normal eye movements<sup>7</sup>. Prior to approval, the FDA required this device to undergo clinical trials. Six months into clinical trials, the device was found to be well tolerated with reports of about 90% of patients having significant gains in visual acuity<sup>7</sup>. The device increased the ability to carry out tasks of daily living and showed the potential to profoundly increase quality of life in patients with AMD<sup>8</sup>.

The Implantable Miniature Telescope is an inspiring example of what the partnership between engineering and medicine is able to achieve, providing a means to overcome the human body's inability to respond to various pathological challenges. Other examples of this dynamic collaboration include drug-eluting stents which have successfully revolutionised the treatment of coronary artery disease<sup>9</sup> and cochlear implants, capable of returning the ability to interpret speech in the deaf<sup>10</sup>. Closer examination of such developments however has demonstrated that interventions which might seem sound on paper or even in initial implementation, don't always go as planned.



Fig. 1. The Implantable Miniature Telescope shown on the tip of a finger (A), being placed operatively into the posterior chamber of the eye (B) and in place within the eye of a patient (C). Fig. 1A,1C adapted from 9. Fig. 1B compliments James Gilman, Ophthalmic Photographer, Moran Eye Centre, The University of Utah

### The Orthopedic Surgeon's Recommendation – A device with too hasty an approval?

Total hip replacements are one of the most commonly carried out surgical procedures in patients over the age of 60. This surgery has the ability to reduce a patients pain and dependence while increasing their ability to mobilise independently<sup>11</sup>.

Interest in metal-on-metal devices for hip arthroplasty has peaked recently due to the advantages these components provide, such as their increased stability and decreased component wear<sup>12,13</sup>. The use of metal-on-metal hips has come under increased scrutiny in the past few years however due to concerns regarding the efficacy and safety of these devices. Though some designs have shown greater success than others, overall revision rates, where surgery is required to replace a prosthesis, have been reported to be consistently higher in metal-on-metal devices than those using non-metal-on-metal devices. Some reports have even shown revision rates to be as high as double that of those seen in other devices using non-metal-on-metal implants<sup>14-16</sup>.

Not only do metal-on-metal prosthesis designs carry the same modes of failure that challenge the use of all load bearing artificial joints, they present their own unique challenges<sup>12,17-20</sup>. Additional modes of failure include: femoral neck fracture, local tissue reactions and early mechanical failure<sup>17,18</sup> (Fig. 2). It remains to be proven whether the advantages of using metal-on-metal bearings outweigh the risks associated with their use<sup>13</sup>.

Why is it though that only now the risk to benefit ratio of using metal-on-metal implants is being considered? Did problems arise in pre-approval trials? The answer is that no trials were required for the approval of these devices by the FDA. So how does the FDA attempt to maintain the safety of such devices without actually evaluating how they performed in clinical trials? To understand this, we must take a look at their approval process.



Fig. 2. Magnetic resonance image showing the presence of a large joint effusion (arrow), an adverse effect occurring with the placement of a metal-on-metal hip prosthesis (A). Intra-operative photo at joint revision showing metallic debris (arrow) around the base of a metal-onmetal hip prosthesis. Fig.2A,2B Adapted from 18

### Medical Device Approval – The role of the FDA

Firstly, it cannot be assumed that a device which has been "FDA-approved" has ever been used in or on a human or has any clinical research associated with it<sup>21</sup>. New devices also generally have much less evidence to support their use than new drugs<sup>22</sup>.

Currently, the FDA places medical devices into one of three classes: Class I, II and III. Class I devices are associated with the lowest risks and include simple devices like bandages. These do not require clinical trials. Class III devices pose the highest risks to patients and include implantable heart valves and implantable cerebral stimulators<sup>23</sup>. All Class III devices require pre-market approval involving clinical trials. Approval is similar to that carried out on new drugs and may involve animal studies, randomised trials or basic research. Class II devices however, may or may not require pre-market approval depending on whether the device can be shown to be similar to an already approved device known as a "predicate". Manufacturers of such devices submit a 510(k) application and if found that significant equivalence exists, approval can be obtained without the use of trials<sup>1,2</sup>. In these instances, the FDA generally does not require safety data for the device and it is assumed to be as safe and effective as its predicate<sup>22</sup>. Interestingly before 1976 and the FDA's Medical Device Amendments, devices were not assessed for safety and efficacy at all. Devices approved before 1976 however, can be used as predicates<sup>24</sup>.

The metal-on-metal hip devices discussed were approved by the 510(k) process and hence did not require clinical trials in order to receive FDA approval. In an analysis of high-risk recalls, those associated with life-threatening risks or posing serious hazards, it was shown that 71% of these recalls occurred in devices approved through the 510(k) process. The large proportion of high-risk recalls in this group of supposedly low to moderate risk devices is alarming<sup>25</sup>. Furthermore, even recalls which are not potentially fatal often require surgical removal resulting in unnecessary costs, not to mention the risks to the patient associated with further surgery<sup>26</sup>.

Much attention has been drawn to this category of FDAapproval because of adverse effects arising in such devices. Such concerns have led the FDA to call for the Institute of Medicine to review the 510(k) approval system. The Institute of Medicine has since advised that this form of approval be abolished. They state that 510(k) approval fosters the production of new devices at a higher cost which may offer only marginal improvements on existing devices. These benefits may also be outweighed by the potential for new risks associated with alterations in design of such devices. It has been suggested that a model-based approach be implemented for testing where randomised trials are not feasible. This would allow for insight into durability and efficacy and even provide information on short and long term effects on health that may not be provided in clinical trials<sup>27</sup>.

## Abolish the 510(k) program? – Choosing between the cost of production and the cost to patient's health

From an economic standpoint, a medical device requiring pre-market approval could cost upwards of US\$12 million for a 24-month trial. If preclinical animal testing and larger trials are required, costs can rocket upwards of US\$100 million<sup>2</sup>.

The requirement of clinical trials for all Class II devices by abolishing the 510(k) approval system would drive the costs of producing these devices up which could stifle the production of many new and promising devices. A recent article in the New England Journal of Medicine however argues that it is the 510(k) system itself that suppresses innovation. Though it does allow for faster device approval, the 510(k) system encourages the production of "copy-cat" devices which are similar to existing predicates and have only incremental benefits if any over current devices<sup>27</sup>. Abolishing the 510(k) approval system is unlikely to affect the production of completely novel devices such as the Implantable Miniature Telescope discussed earlier. Such innovative devices will not have a predicate and could not be approved by the 510(k) process anyway.

## A Brighter Future?

In the United States changes in the FDA's approval of medical devices are a likely scenario in the near future. This would result in a larger proportion of devices requiring clinical testing before approval, consequently increasing the costs required to bring devices to market. Unfortunately, this comes at a time when global recessions are pushing governments to cut medical costs. Even with overheads for production becoming more costly, producers of medical devices are being pressured to create more affordable devices if their uptake into the health care system is to occur. Will investors and inventors be more meticulous in the devices they produce? Will this lead to lower numbers of devices, but ones of higher medical impact? Or, will investment in medical devices slowly fade as production costs rise? Place yourself in Mrs. AW's shoes for a moment. Are you happy to undergo your scheduled hip replacement, knowing the high failure rate of metal-on-metal devices? Would you be at ease receiving any device approved through the 510(k) for that matter? Should we as patients remain content with an approval system rooted in predicates or press for one of innovation and safety? We can only hope that the FDA considers the recommendations by the Institute of Medicine and puts forward a revised plan to cover the identified safety concerns and furthermore, act to encourage progress in the medical field.

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## MedConnect: Using Experience For A Better Experience

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*"medConnect* is a student-run organization with the goal of creating an extensive information resource for students interested in pursuing medical electives in health institutions in the developing world."

Medical electives are a time that every medical student looks forward to. In truth, it's often an excuse to travel, but it also provides an arena for students to be able to learn without the high-pressure environment of laborious exams. This is the time where we finally get a choice. A choice in our location, a choice in what we learn and, most of all, a choice in what we achieve. It's the proverbial bonus-round of medical school, where students can decide for themselves just how hard or how little they want to work. The attitude of the medical school is generally ambivalent towards exactly what you do on your elective, only that you fill in the appropriate forms.

Many students choose to do their electives in under-resourced countries around the world, with the spirit of volunteerism and travel in mind. Though there is excellent support for students regarding administrative issues, information on the thousands of elective opportunities abroad is scarce. This can particularly be an issue for electives in the developing world. Medical volunteerism is not a new business concept; in fact it is a very well-oiled money-making machine. In medical students, they often have the perfect game: students, both young and naive, who've often never left the West, with their parents' money ready and willing to make a difference in the impoverished world. Their game is one

based on fear, giving you the keys to the land rover, a local handler, and a guide book to make sure you only see the impoverished areas, not experience them. These companies charge upwards of €2,000 in administrative fees for these experiences, and it is questionable as to where these companies are allocating these funds. The fear they use is one based on experience; they have been there, they know how things work. You don't.

Students have more resources than they often realise. We use it every day in nearly every decision we make: *experience*. It is through wordof-mouth from previous students that we get our advice. We are our own most under-utilised resource and, with a little organization, we can aim to evolve, learning from past mistakes, and building on past success.

*medConnect* is a student-run organization with the goal of creating an extensive information resource for students interested in pursuing medical electives in health institutions in the developing world.

Common practice for most students is use to the shotgun approach, "cold-calling" as many health centres as possible, and taking whichever one replied back. This has created a huge discrepancy in understanding the role of the medical student at these various health centres, and many anecdotes of students in unacceptable situations have surfaced into med student folklore. Whether it is paying a substantial amount of money for an elective where you end up being treated like a gap-year student, or being sent to a clinic where you are the most medically trained individual with responsibilities that are more suited to a qualified junior doctor. The perceived abilities of undergraduate medical students have been both exaggerated and underestimated, creating uncomfortable situations for both parties. There has also been incongruity in the perceived roles of both the student and the teaching institution.

medConnect has been working with M.O.V.E. (Medical Overseas Voluntary Elective), discussing some of the issues that have arisen among participating students, mostly due to the large misunderstanding of what M.O.V.E. actually is. M.O.V.E. is a student-run charity with the aim of providing fundraising opportunities for students going on elective to developing countries. Their mandate does not go further than this. M.O.V.E. and other students alike discovered that there is a large need and desire for information about their electives, and how to attain them. medConnect's goal is to fulfil this need.

*medConnect* hopes to provide students with the collective experiences of their peers through an easy-to-use online medium. Furthermore, we provide an arena for students to give advice about organizing the peripheral details, such as transport and costs. We also hope to offer brief information sessions on things like the local languages and the specific medical topics to brush up on before going on your specific elective. We hope in the future to establish longterm connections between *med-Connect* and health centres in the developing world, with the aim of establishing a reciprocal exchange.

Though still in our first year, *med-Connect* has thus far been a success. Analysis of medConnect.ie has shown that the number of visitors to our site has steadily increased every month, and receives visitors from five continents almost daily. Being an Irish-grown organization, we have also established connections with the other Irish universities, receiving reports that we are being used all over the island from UCD to UCC. However, it would appear that the lowest amount of feedback is from Trinity College Dublin, which seems almost paradoxical, as we are not just an Irish venture, but one born out of TCD. This is something we hope to rectify by creating more awareness of what resources we have to offer. We plan to do this by providing more information as well as more opportunities for suggestions and critiques.

In our experience at *medConnect*, when discussing with senior lecture staff about addressing elective issues, we were told that "this is the way it was always done" and that the experience of failing was important to one's independence and experience as a medical student. Though there is some logic to learning from one's individual mistakes, there is just as much logic to learning from mistakes en masse. Medical electives are a very under-utilised resource, and can be used to spread ideas and international relations, rather than being used as a one-way sieve for resources. Too much can be gained, and too much money is donated, for this to be a simple learning experience of individual trial-and-error. There is too much we have to offer even as medical students for us to be so selfish. Did the ape, upon seeing its neighbour burn itself with fire, touch the fire himself to attempt his own experiment with self-immolation? No, he learned, or perished himself. And just like the ape, we all, including medConnect, must adapt, grow, and evolve.



## How M.O.V.E. Moved the Small Village of Malindi

#### Lylas Aljohmani, 4<sup>th</sup> Year Medicine, TCD



"I would like to thank M.O.V.E. and my friends for the experience of a lifetime and I would like to thank the people of Nkope and Malindi for their heartfelt welcome and tearful goodbye and unbelievable hospitality during our visit. It was an experience I would never want to change."

Like all great adventures, this one started over a cup of Barry's tea in a friend's kitchen. We had all been talking about organising a great African expedition with some help from M.O.V.E. (Medical Overseas Voluntary Elective), a charity based in Trinity. We began a search to find the perfect place to go, deciding where and to whom our funds would be allocated and looking for the best experience possible. With limited knowledge of what lay ahead, we restricted our search to one continent and began the endeavour of sending e-mails to hospitals in Africa; naïvely, we thought it would be an easy task.

Some responses from potential hospitals in other countries appeared promising, but Malawi proved to be much more intriguing. A small landlocked country of limited resources and industry, Malawi was exactly the kind of place we wanted. A few e-mails and phone calls later, we managed to form a feasible plan. With our flights and accommodation booked, we set off to Malawi.

A few months later, we found ourselves with only one week left before we were due to fly away. Exams were done and it was time to start packing. Armed with the M.O.V.E. cheque, we had to find a way to get it across the world safely, which, though not too bad, still proved harder than we thought. It was surprising that only AIB out of the three major Irish banks recognised Malawi as a recipient of money.

Arriving in Lilongwe was an experience I will never forget; I distinctly remember looking out the window and commenting to one of my friends that it was impossible that we were landing because all I saw were huts and a long dirt track. Not too far from my predictions, the airport was a small humble building with one baggage track for all incoming flights and, unsurprisingly, there were no duty-free shops. Customs simply smiled at us coming in and we were on our way, despite the fact we had an unbelievable amount of medication and over 500 needles for the hospital.

The setup was simple; we were to split up into two small groups and go to two different places. One group started off in the main hospital in Malindi town and my group went to the village, where we worked in a clinic for the first two weeks. The Nkope village life definitely took some time getting used to; I did try my best to adapt, although my friends may beg to differ. Our days consisted of running the outpatient department and maternity ward, shopping in the local market, playing with the local children and visiting villagers who kindly kept us company.

Two weeks without technology and with limited electricity and water

was something I had expected, but something that I forgot I truly had to live. Getting clothes made for me by the tailor and learning how to cook "nesema" (Malawi's main staple) were pieces of cultural experience no book could ever give you. I do also miss the door-to-door service of a fisherman with his freshly caught goods; it wouldn't go amiss in Dublin.

I think the biggest cultural shock had to be the transport; going from buses to pickup trucks proved to be entertaining and not far from lethal at times. Overnight, I had left behind a country where the Road Safety Authority constantly told us not to drink and drive and to make sure to put on our seatbelts, and arrived to a world of pickup trucks which carried 200 people, all of whom were holding on for dear life. Sitting on fish and hoping that a chicken wouldn't bite your foot was the norm in getting from A to B. However, once you get past all the RSA violations, you learn to embrace the environment that you're in.

You really had to be prepared to forget everything Phillippa and Marie (our beloved clinical skills tutors) told you in the safe, enclosed environment of the Tallaght clinical skills rooms. The day-to-day medical practice was so different from our teaching hospitals that you couldn't practise medicine without thinking about all the health hazards you were creating. Surprisingly, we found that when you're no longer in the environment where there is a poster reminding you to wash your hands or dispose of your sharps properly, you start to notice such actions more. Many times, due to limited resources, I saw injections being given to children without using antiseptic wipes to clean the area, or the same needle being used several times until a vein was found, or a cannula being used as a central line. The bare minimum was used in these settings to deliver a much needed health system.

Would you rather have a healthcare facility that is functioning at a very low standard or not have it at all? I asked myself that question endlessly and changed my mind on a daily basis, but when you see a new life being born and thriving despite those conditions, and when you see a child surviving malaria with a haemoglobin level of just 3, then you might for that minute think that maybe having it is better than not at all.

Challenges were too many, from lack of education to lack of adequate medication; it was hard to find a place to start. We had something, but it wasn't enough to solve all of the problems affecting the hospital. We needed a plan, we needed something that would make a difference and we needed it to work. So we sat down with another famous tea (this time it was called Rab's Tea) and we came up with a plan. Dirty water was and is one of the major hazards in developing countries, so we helped fix the water supply to the tanks that would provide clean drinking water for the hospital.

With some money left over, we decided to give the main hospital paediatric ward a bit of a makeover. Putting a proper nurses' station into the ward helped establish the feeling of centralised care and we followed this by adding some new electrical sockets for the O<sub>2</sub> concentrators. Mosquito nets and some new beds rounded off the ward into a better venue for care. As for the village clinic, we managed to get them a steriliser for the maternity ward and an O<sub>2</sub> concentrator along with some other medical equipment they needed. It was a start, but we hope the next group can build on that. I feel that the aim is that someday in the near future the standards can be raised to provide an adequate level of care. We should be building towards a future where we can apply universal healthcare standards to everyday practice and where funding is available to allow for adequate treatment.

An adventure, no less; a world outside my norm. I learned that even modest help can still make a difference; if not to the clinical scene, then to the practitioner's life in the hospital and to the patient's life. We shared a summer of friendship with our friends at St. Martin's Hospital and had new light shed on medical practice outside our hometowns. We have undoubtedly been moved by our experience, our patients and our new-found friends in Malawi. I, for one, have met some people and learnt some things that will stay with me forever and I hope to return someday to the small village of Nkope and to the town of Malindi to see the people with whom I shared this amazing experience.

I would like to thank M.O.V.E. and my friends for the experience of a lifetime and I would like to thank the people of Nkope and Malindi for their heartfelt welcome and tearful goodbye and unbelievable hospitality during our visit. It was an experience I would never want to change.

From assisting in surgery to delivering a baby on my first day, from a 15-hour bus journey across the land of Malawi to a casual swim in Lake Malawi, from screaming at a snake that had found itself a home under my bed to running for dear life while being chased by some elephants, from countless experiences with the "bicycle taxis" to bargaining at fruit markets and window shopping in the black market, what isn't there to love about Malawi? Go for it, jump! Make M.O.V.E. your choice this year.



## An Intense Elective in Critical Care

#### Allan Klompas, 4<sup>th</sup> Year Medicine



"In the summer of 2011 I undertook an elective in a busy ICU at the University of Alberta in Canada, and through my experiences, aim to convince you to consider trading the outpatients clinic for a little adrenaline and a lot less sleep for your next elective."

The Intensive Care Unit is an intimidating place, and because of this, it is an area often overlooked by undergraduates searching for extra-curricular experience. It is a fast paced, demanding specialty that is often poorly understood by students due to the limited exposure that clinical rotations allow. Intensive care, however, has lots to offer students and can help develop essential skills that can be tough to obtain anywhere else in the hospital.

In the summer of 2011 I undertook an elective in a busy ICU at the University of Alberta in Canada, and through my experiences, aim to convince you to consider trading the outpatients clinic for a little adrenaline and a lot less sleep for your next elective.

## What is the ICU?

ICU's generally receive the sickest patients from all over the hospital, including medical and surgical specialties, all with life-threatening afflictions. With the stakes so high, intensive care specialists become experts in managing acute serious injury and disease. Intensive care boils down to one thing: monitoring. More nurses, closer observation and loads of technology allow intensivists to predict trouble before it happens and intervene before things go poorly. This combination provides the perfect opportunity to hone nearly every clinical skill required of a medical student.

## What can I get from Intensive Care?

#### **Data Interpretation**

Each patient in the ICU generates enormous amounts of data ranging from body chemistry and physiology to radiology. Critical care is the perfect location to learn the intricacies of how to interpret lab data, chest x-rays and microbiology culture reports and correlate them to the clinical condition. In addition, the extensive monitoring in the ICU provides a window into the pathophysiology underlying disease and the compensations made to regain homeostasis. A severe case of Acute Respiratory Distress Syndrome (ARDS) requires near hourly monitoring of blood gases, acid status, electrolytes and lactate in addition to frequent chest x-rays to monitor progression. No other department in the hospital will cultivate these skills as often or as well as the ICU.

#### **Master your principles**

Intensivists are masters of applying first principles to clinical medicine and the ICU is the ideal place to integrate all the knowledge you've been learning for the first few years of medicine. Combined with advanced continuous monitoring and frequent lab tests, the ICU becomes a lesson in assimilation. Applying physiology, biochemistry, anatomy, microbiology, and pharmacology to each and every pathological problem is the essence of integration. For example, a complex pneumonia becomes a lesson on microbiology, drug resistance and therapeutics, hypoxia, acidosis, ventilation and chest wall mechanics, and each must be understood to direct effective management.

#### See the Signs

Physical exams are a vital part of the ICU experience that can easily be overlooked with the exhaustive monitoring and highly trained nursing staff's careful observation. From a student's point of view, you couldn't ask for a better collection of pathological signs to learn from, all of which are beautifully integrated with the biodata being recorded. Learning to time cardiac murmurs with continuous ECG, following changes in icterus with daily liver enzyme results, and neon green sputum in a ventilated patient with a Pseudomonas nosocomial infection, are but a few examples. Where at first the huge amount of data can appear overwhelming, it quickly becomes evident that it unlocks the mysteries that help explain the physical signs we're trained to elicit.

#### **Cutting Edge**

Because ICU patients are the sickest in the hospital, they often require the greatest amount of modern technology and pharmacology available. Although it's unlikely to be a finals case, understanding how continuous dialysis, ECMO, or high-frequency ventilators influence the patient's course make the days challenging and produce plenty of elaborate talking points for your consultants in the future.

#### Lending a hand

Critical care is much more than data interpretation and adjusting medications; the ICU is packed with adrenaline filled moments and hands on emergency procedures. Patients in critical care are often straddling the fine line between life and death and often, swift action is needed to intervene when things take an unexpected turn for the worse. Under careful instruction and supervision during my course in the ICU I was intubating patients, siting arterial lines, inserting central lines using ultrasound, performing fluid taps on infected joints, observing colonoscopies and assisting on percutaneous tracheostomies with a consultant surgeon. Few other departments will require such a wide range of procedural medicine, and especially to allow students to get this involved.

#### Tag-team approach

Intensive care patients are complicated and require a diverse team to manage effectively. Although the intensivists are the patient's primary doctors, there are daily encounters with multiple medical specialties, microbiologists, surgeons and radiologists. Nearly all specialties are linked with the ICU and, as a student team member, you can acquire knowledge from all of them. As an undergraduate, this broad exposure can be invaluable when selecting a specialty in the future.

#### Answer the call

Ever wonder what it's like to wake up at 3:30am to a patient crashing on the unit? Some teams may allow you to stay overnight to do voluntary in-house call, and I highly recommend you leap at the opportunity. The hospital becomes a different place at night, and emergencies seem to find you when you least expect it. There is usually a much smaller staff overnight, which often favours a little extra student involvement and teaching as an extra set of hands becomes invaluable. On one occasion I was sleeping on the unit, only to awake to a pound of the door just after 3am encouraging me to respond to an intentional drug overdose that was just helicoptered in. By this time the team was comfortable with me helping out, so I got to insert her arterial line and central line, with a resident at my hip coaching the procedure. On another occasion, a resident and I responded to a call that converted to a code and I found myself performing CPR for 10 minutes

before racing to the ICU to admit the patient. While incredibly intimidating, going on call tests all of your skills as a doctor under pressure, and gives you hours of 1-on-1 time with the team. I can safely say, I learned more about myself and the field of medicine in 30 hours of call than I did in any daytime shift.

#### It's All About Communication

Intensivists are masters of critical care medicine, but they must also be highly skilled at communicating difficult ethical and legal decisions. Patients and their families are highly stressed, filled with emotion, and are often forced to make tough decisions under pressure. Learning to express complex explanations while ensuring patients and their families feel respected is incredibly challenging. I had the privilege to sit in with family meetings and treatment discussions with experts in the field of crisis communication, and the lessons I learned will be applied daily for the rest of my career.

#### **Recognising sickness**

One of the most important skills developed in the ICU is how to differentiate between the extremely sick and the unwell. The severity of an illness is expressed in the patient's face, body position, their vitals and in their story. As students, we rarely get to see severe illness because they are well managed by the time we poke around to take a history. The unpredictability of the ICU demonstrates this distinction, and also fosters recognition of how patients and their families handle it all. This may be the most important reason to train in critical care.

As a student, the ICU also likely serves as the first contact with one of the most privileged situations in medicine: witnessing the end of someone's life. Although rare, some patients in critical care inevitably lose their battle to disease. These experiences introduced me to a side of medicine that is rarely taught and almost never experienced as an undergraduate and I feel fortunate to have been given the opportunity to care for patients in their last hours. Although not a welcome experience, I felt honoured to partake in such an important private moment.

#### Limitations

Although the ICU can offer a wealth of knowledge and experience to vast disciplines of medicine, it cannot provide all the skills needed to prepare for finals. Due to the severity of illness, and the level of injury and interventions, there are often very few histories to be taken. In addition, patient numbers are often small to allow more concentrated focus on each person's complexities. While this limits the case exposure, it opens the door for more full understanding of a case, especially if you are allowed to participate in the management. I was very privileged to 'carry' my own patients under careful supervision, to assess and develop daily care plans, and write supervised orders for medications and investigations. This level of true doctoring is so rare as a student that I treasure each and every opportunity I have been given.

### Conclusions

Critical care is a demanding specialty, and as such, will make a demanding elective. You'll be tested mentally from every concept and specialty in medicine, challenged emotionally as you interact with anxious patients and their families, and pushed physically as you race about the ICU and the hospital tending to the sickest it has to offer; but it is worth every ounce of effort invested. An adrenaline-fuelled elective in Critical Care medicine has so much to offer students that I urge you to challenge yourself to your limits and return more knowledgeable, confident, and more effective on the wards when faced with difficult patients.

## Congratulations to Ailbhe White-Gibson: 2011 TSMJ Poster Competition Winner



Congratulations to Katie Hill, Paeds Prize Winner & Emer Cullen, Obs/Gyn Prize Winner TSMJ 2012



# The effect of amyloid beta on microglia in the aged compared to the young rat brain and the potential exacerbation of ageing in response to abeta infusion.

Ailbhe White-Gibson, 4<sup>th</sup> year medical student, TCD



"Alzheimer's is an irreversible progressive disease that slowly destroys memory and cognitive skills... Recent studies have shown it to involve the activation of microglia due to their interaction with A $\beta$  plaques, as a component of the neural inflammatory response which characterises this neurological disease."

#### Abstract

Alzheimer's is an irreversible progressive disease that slowly destroys memory and cognitive skills. The decline in mental fitness associated with this disease is long established. Recent studies have shown it to involve the activation of microglia due to their interaction with Aβ plaques, as a component of the neural inflammatory response which characterises this neurological disease. It was postulated the exacerbating effects of both age and AB infusion, separately as well as combined, in this study. An increase in microglial activation was reported in the aged rat brain and in the brains of young rats chronically infused with Aβ infusion. However it was found that Aβ infusion in the aged brain attenuated the activation. This is in stark contrast to previous studies in this area and brings into question the relevance of AB infusion in the aged rat brain as a model of AD. However my study confirms the importance of age as a factor in the progression of this debilitating disease.

### Introduction

The decline in mental fitness associated with Alzheimer disease is accompanied by physical changes in the brain, but the pathogenesis of those changes is not clear<sup>1</sup>. The major neuropathological hallmarks of Alzheimer's are extracellular  $\beta$ -amyloid (A $\beta$ ) plaques and neurofibrillary tangle formation. These plaques are insoluble fibres, protein aggregates sharing structural traits. Amyloid precursor protein (APP) is an integral membrane protein expressed in many tissues and concentrated in the synapses of neurons and its proteolysis by  $\beta$  and  $\gamma$  secretases generates A $\beta$ . Its fibrillar form is the primary component of amyloid plaques found in the brains of AD patients.

Gliosis is seen in AD; activated astrocytes and microglia are characteristically found in abundance near neurons and plagues, as first described by Alzheimer in 1911<sup>1</sup>. Many of the microglia in pathologically affected areas of the brain have been found to express major histocompatability complex II (MHC II) suggesting a role for inflammation in AD<sup>2</sup>. When microglia interact with the deposited fibrillar forms of A $\beta$ , it leads to the conversion of microglia into an activated cell and results in the synthesis and secretion of cytokines. Once activated, microglia are capable of producing a variety of pro-inflammatory mediators and potentially neurotoxic substances that could contribute to CNS injury<sup>4</sup>.

To quantify the level of microglial activation, and therefore the extent of neurological insult, various markers can be used such asCD11b, MHC

I and II.CD11b is a strong indicator of microglia cell activation in the presence of A $\beta$  and/or in the aged brain. 8-hydroxy-2'-deoxyguanosine (8-OHdG) is a DNA/RNA addition product (adduct) which is formed to a greater degree when cells are in an oxidative environment. It is a marker of oxidative stress at the genetic level.

Various intracellular pathways including those involving activation of c-jun N-terminal Kinase (JNK) and nuclear factor kappa-light-chainenhancer of activated B cells (NF $\kappa$ B), are also activated in microglia resulting in the release of proinflammatory cytokines<sup>3</sup>.

The aim of the project was to ascertain whether or not ageing exacerbates the response to the infusion of A $\beta$ , while examining the effect of ageing and A $\beta$  individually on neural inflammation. Changes in CD11b and 8-OHdG expression will be measured to look at microglial activation and oxidative damage, respectively. Intracellular signalling pathways JNK phosphorylation and NFkB were also

#### examined. Methods

Groups of young (3-4 months) and aged (22-24 months) rats were randomly divided and treated with a cocktail of  $A\beta_{1-40} + A\beta_{1-42}$ , or the reverse peptide,  $A\beta_{40-1}$ . Animals were anaesthetized with ketamine (75 mg/kg) and xylazine (10 mg/kg).

Pumps delivered a cocktail of  $A\beta_{1-40}$ (26.9  $\mu$ M) and A $\beta_{1-42}$  (36.9  $\mu$ M; aggregated for 24 h at 25 °C or 37 °C for 48 h retrospectively; Biosource, Belgium) or control peptide  $A\beta_{40-1}$ (63.8 µM) intracerebroventricularly at the rate of 0.25  $\mu$ l/h (±0.05  $\mu$ l) for 28 days. All rats were housed in groups of 3 and kept under veterinary supervision in a controlled environment (12 h light schedule; ambient temperature 22-23°C) and all experiments were performed under a license issued by the Department of Health (Ireland) and in accordance with the guidelines laid down by the local ethical committee.

Immunohistochemical analysis of CD11b and 8-OHdG involved Cryostat sagittal brain sections (10µm thick) which were stained for CD11b and 8-OHdG and visualised by light microscopy. The sections to be stained for 8-OHdG were permeabilised in 0.1% Triton-X100 in Tris-buffered saline (TBS) pH7.4. Sections were incubated for 30 minutes at RT in 10% normal horse serum (Vector, UK), 4% bovine serum albumin (BSA) (Sigma, UK) in TBS, to block non-specific interactions and then overnight at 4°C in mouse anti-CD11b or mouse anti-8-OHdG antibody solution in 2% BSA in TBS. Negative controls were incubated for 2 hours at RT in 2% BSA in TBS alone. CD11b sections were counterstained with haematoxylin (RA Lamb, UK), and 8OHdG sections were counterstained with 0.1% Methyl Green, then dehydrated through a series of graded alcohols.

Western blotting was carried out and expression of JNK, pJNK and pIkB were analyzed by SDS-PAGE in homogenate prepared from hippocampus as previously described. After incubation with rabbit polyclonal pJNK antibody (1:1000; Santa Cruz Biotechnology Inc., Santa Cruz, CA), rabbit polyclonal JNK antibody (1:1000; Santa Cruz Biotechnology Inc., Santa Cruz, CA), or rabbit monoclonal plkB antibody (1:1000; Cell Signaling Technology, Inc., MA 01923, USA), membranes were incubated with secondary antibody (1:5000; Jackson ImmunoResearch Europe Ltd.) and proteins detected using enhanced chemiluminescence (Millipore Ltd, Watford, UK). Loading controls were performed with mouse monoclonal anti-b-actin antibody (1:10,000; Sigma, Dorset, UK). Protein bands were quantified by densitometric analysis using FujiFilm dark box (LAS3000; FujiFilm, Dublin, Ireland).

### Results

The age-related increase in hippocampal CD11b staining is down-regulated in Aβ-treated brains. In the progression of age, there is a clear and consistent increase in CD11b as well 80HdG staining in the hippocampus of the rat brain indicating activation and proliferation of microglia. CD11b staining is identified by brown stains amongst purple counterstain which identifies the cell nucleus. The activated microglia display a branching appearance, bushy or 'rod-like', (see figure 1 (iii)). Whereas in their inactive states they are characterised by long branching processes with a small dense cell body (see Figure 1 (ii)). There is a significant increase in CD11b positive cells in aged in comparison to young controls, (see figure 1 (I) v (iii)). Upon chronic Aβ infusion in the young control, there is an increase in stained cells identifiable. However, there is a decrease in CD11b positive cells upon Aß infusion, as seen in the comparison of figure 1 (iii) v (iv).

The age-related increase in 8OHdG staining was attenuated by chronic

A $\beta$  infusion. There is a clear increase in the number of cells positive for 8OHdG staining in aged compared to young control dentate gyrus, (see figure 2 (i) v (iii)). Upon chronic A $\beta$ infusion, there was a consistent increase in staining of 8OHdG seen in young rats. However 8OHdG staining was markedly decreased upon A $\beta$ infusion in the aged rats.

Chronic A $\beta$  infusion decreased JNK expression but not phosphorylation in both young and aged hippocampus. Western blot analysis of JNK showed a marked decrease upon chronic A $\beta$  infusion (Figure 3A; p<0.05, 2-way ANOVA). However the decrease in phosphorylated JNK was not statistically significant (Figure 3B).

Neither age nor  $A\beta$  infusion altered IkB phosphorylation in hippocampus. Western blot analysis of phosphorylated IkB did not show any change statistically significant as a result of either age or  $A\beta$ , or both (Figure 4).

#### Discussion

In this study, I investigated the increase in microglial activation in two different models of neuroinflammation: ageing and chronic infusion of A $\beta$ , and how they interact. The results showed an age-related increase

## CD11b results



**Figure 1.** CD11b staining in the dentate gyrus by light microscopy. The arrow in Figure 1 (iii) indicates an example of a cell positive for CD11b by the ABC method. There is a marked increase in CD11b staining evident in aged (iii) compared with young control (i) hippocampus. Chronic A $\beta$  infusion did not alter CD11b staining in young (ii) hippocampus, when compared to control (i).

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# 80HdG Results



**Figure 2.** 8-OHdG staining in rat dentate gyrus visualised by light microscopy. The arrow in Figure 2(iii) indicates a cell positive for 8-OHdG. There was a significant increase in 8-OHdG staining in aged (iii) compared with young control (i) hippocampus. There was also an increase in staining as a result of chronic infusion of Aβ in young rats (ii) when compared to young control (i). However, there was a decreased level of 8-OHdG staining upon infusion of Aβ in aged rats (iv).





Figure 3 (Left - Top) There was a significant decrease in total JNK as a results of chronic A $\beta$  infusion (p<0.05, 2-way ANOVA)

**Left - Bottom))** but the decrease in phosphorylated JNK was not statistically significant. in microglial activation as evidenced by increased CD11b and 8OHdG staining. The use of aged rats for 28 day chronic A $\beta$  infusion is a novel experiment, but I hypothesized that microglial activation would increase in comparison to aged controls as well as young A $\beta$  infused.

Age itself is a risk factor for the activation of microglial cells. The literature shows that the expression of immunologically important surface antigens, particularly MHCII, increase gradually with normal aging in rodent as well as human microglial cells<sup>4</sup>. However, in contrast to acute neuropathological conditions where microglial activation is fast and may involve proliferation, there is little direct evidence that the total number of microglial cells increase in the case of normal ageing<sup>4</sup>.

Recent findings have shown CD11b mRNA to be increased in the hippocampus of aged rats in comparison with their young counterpart, which is indicative of neural insult<sup>5</sup>. The data presented here showing an age-related increase in CD11b staining in agreement with the literature, displays an increase in specific staining due to the upregulation of CD11b on the cell surface due to microglial activation.

A $\beta$  infusion in young rats increased in CD11b as well as 80HdG staining, indicating increased microglia activation. This is consistent with previous findings which have suggested that the inability of microglia to completely process fibrillar A $\beta$  may result in activation of cells by the residual A $\beta$  and therefore lead to a persistent neuroinflammatory state <sup>6</sup>.

The chronic infusion of  $A\beta$  in aged rats has not been reported before to the best of my knowledge. The CD11b results displayed a decrease in staining, signifying a decrease in microglial activation from figure 1 (iii) to (iv). This is not in keeping with my hypothesis that ageing exacerbates neurodegeneration and inflammation. It also disagrees with findings which indicated that  $A\beta$  infusion induced inhibition of long term potentiation (LTP), coupled with increases in markers of neuroinflammation<sup>7</sup>.80HdG staining was attenuated upon chronic A $\beta$  infusion in the aged rats.

Increased JNK activation has been previously reported in aged rats and was associated with a deficit in LTP<sup>8</sup>. Here we report a significant decrease in total-JNK expression in response to chronic A**β** infusion.

# Conclusion

The purpose of this study was to assess the effect of ageing and chronic A**β** on microglial activation in young and aged rat brains. Results have shown that microglial activation play a hugely important role in the pathophysiology of AD. The hypothesized age-related increase in microglial activation was confirmed which further highlights the relevance of age as a factor in the progression of AD. The results for IkB were also statistically insignificant. Repeating these experiments to increase statistical power may clarify the findings. However, having hypothesized an exacerbation in the response to  $A\beta$  infusion, the results not only disprove this hypothesis but they also call into question the relevance of the infusion of A $\boldsymbol{\beta}$  into aged rats as a model for Alzheimer's, suggesting age and  $A\beta$ independently as the dominant factors involved in the aetiology of this complex disease, rather than their combination.

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# Headache Surgery

#### André Mendonça Madaleno, 5<sup>th</sup> Year Medicine, TCD



"Chiari I malformation is a hindbrain abnormality consisting of cerebellar tonsillar herniation on MRI >5mm causing impaired CSF circulation. While congenital it can present both in children and adults."



Figure 1: Saggital view of DL's MRI brain showing 13mm of tonsillar herniation.

## **Case Presentation**

DP is a 9-year old school boy who was referred to the outpatient neurosurgery services at St Louis Children's Hospital with a 5-year history of recurrent headaches and "zoningout" episodes. These grew more severe and frequent over the last 4 months and were associated with physical activity. The headaches were on the top of the head and were only relieved by lying down and resting. They were associated with loss of ability to retain information and focus at school and his results over the last 4 months have gradually fallen from straight As to Ds and Fs. Over the last month there have been associated episodes of a tingling sensation in the right hand as well as blurry vision and episodic mild abdominal pain. There was no difficulty swallowing, no choking or gagging, no apnoea or weakness, no bowel or bladder dysfunction. He was taking ibuprofen and acetaminophen PRN to help relieve the pain.

DP has a history of frequent ear and sinus infections for which he had bilateral myringotomy tubes inserted. He also has a history of sleep apnoea as a baby, which never required treatment, and has had routine dental work under anaesthesia. There is a family history of seizure disorders as well as type I and type II diabetes mellitus. There is no other history of congenital abnormalities or cancer. The patient lives at home with his parents and four siblings and is well adapted in school. He has no known allergies and is on no other medications.

On physical exam, DP was well nourished and in no acute distress, pleasant and cooperative. He had full range of motion in the cervical spine, moving upper and lower extremities equally and symmetrically. He had normal tone and bulk, and 2+ deep tendon reflexes. Fine touch sensation was intact throughout and there was no clonus present. A cranial nerve exam showed no problems with hearing or smelling, intact extraocular movements, symmetric face, no tongue deviation and pupils were equal and reactive to light.

# Investigations and Diagnosis

The patient underwent an MRI brain, which showed 13mm of tonsillar descent with no evidence of a syrinx in the upper cervical cord. His tonsils appeared somewhat peg-like in shape. The MRI brain was otherwise normal. He also underwent an MRI of the cervical, thoracic and lumbar spine without contrast and a CSF flow study. The spine MRI showed no evidence of a syrinx (hyperintense collection of fluid within the spinal cord). The CSF flow study demonstrated that there was no CSF flow along the posterior craniocervical junction with abnormal movement of the cerebellum and brainstem. There was normal CSF flow along the anterior craniocervical junction. These history and imaging findings are consistent with a Chiari Type I malformation and the patient and family were offered a bone-only posterior fossa decompression. After discussing the benefits and risks of this procedure and the expected hospital course, the parents agreed to proceed with treatment.

# Treatment and follow-up

The patient was then admitted to St Louis Children's Hospital and sent to theatre for a bone-only posterior fossa decompression. After general anesthesia work-up and intubation and under anesthesia, the patient was placed in a prone position in the operating table with the head positioned on a padded Mayfield horseshoe. The occipital region was then clipped of hair near the hairline and a vertical incision was marked from below the inion down to the palpated C2 spinous process. The region was prepped and draped in the usual sterile fashion and a 15 blade scalpel was used to make the skin incision. Bipolar cautery and Bovie electrocautery were used for hemostasis and for the dissection

through the midline nuchal ligament. At this stage, the occipital bone and foramen magnum were exposed in a subperiosteal fashion. The C1 arch was also exposed centrally and then a self-retaining cerebellar retractor was placed. A high-speed pneumatic

drill was used to place two burr holes above the foramen magnum, which were connected using a Kerrison punch and a Leksell rongeur, with special attention not to damage the underlying dura. The foramen magnum, 2cm of occipital bone and the arch of C1 were also removed using a Kerrison punch. After removal of these bony elements, an intra-operative ultrasound assessment of the cerebellar tonsils was made showing scant subarachnoid fluid space posterior to the tonsils and reduced tonsillar motility. The epidural band was then dissected vertically with a curette allowing for relaxation of the craniocervical dura. Another ultrasound assessment showed increased cerebrospinal fluid space dorsal to the tonsils with improved tonsillar motility after the

decompression. Bipolar cautery was used for hemostasis and irrigation was placed in the wound, which was closed using interrupted 3-0 Vicryls in the muscle and fascia and interrupted 4-0 Vicrvls in the dermis. A layer of Dermabond was then applied to the skin edges. No acute complications were recognised. The patient had a good recovery, was afebrile post-op and had a mild episode of nausea and vomiting. He was discharged at day 1 post-op and is due to follow-up at 2 weeks post-op.

# Discussion

Chiari malformations are hindbrain

is partly one of exclusion since there needs to be no intracranial mass lesion, Dandy-Walker malformation or other causes of hydrocephalus that would explain the tonsillar herniation present. However, it is often associated with other lesions such as

syringomyelia and hydrocephalus.

It presents with a variety of symptoms including headaches, usually located in the occipital or upper cervical regions. These are often brought on by neck extension or Valsalva manoeuvre. Other symptoms include weakness or numbness, loss of temperature sensation, and unsteadiness. Often there are associated opthalmologic or otologic symptoms such as blurry vision, nystagmus, extraocular muscle palsies, diplopia, visual field defects, tinnitus, fluctuating hearing loss, vertigo and nausea. **Common signs** include weakness, hyperreflexia, ataxia and lower cranial nerve dysfunction. This, however, does not mean that there are no asymptomatic cases of Chiari Type I, and while a Chiari Type I mal-

**Clinical Points** 

• It can be asymptomatic or present with recurrent headaches, particularly in the suboccipital region and brought on by neck extension or Valsalva manoeuvre, and focal neurological deficits – especially lower cranial nerve and cerebellar signs and symptoms.

• Differential diagnosis for subacute or chronic recurrent headaches includes any congenital or acquired cause of raised ICP as well as encephalitis, giant cell arteritis, tension headache, migraine, cluster headache, cervical root myelopathy, eye strain headaches or drug-induced headaches.

• Treatment is expectant or surgical – posterior fossa decompression. Indications for surgery include a clear history of symptoms with no other cause found and tonsillar herniation on MRI imaging. However, the criteria for when and how to operate remains controversial.

 Posterior fossa decompression may be bone-only (removing part of the occipital bone and posterior arch of C1) or include incision of the dura with addition of a dural patch as well as extrapial coagulation of one or both of the tonsillar tips.



abnormalities ranging from simple caudal displacement of the cerebellar tonsils into the upper cervical spinal canal (Type I) to cerebellar hypoplasia or aplasia (Type IV)<sup>1</sup>. Type I is the most common, with a study of 22,591 patients who underwent MRI brain showing that 0.775% had tonsillar herniation over 5mm<sup>2</sup>. which is often considered as a good borderline limit for identifying Chiari Type I malformations. Its diagnosis

formation present on MRI is probably the cause of these symptoms if no other conditions are present, this is not necessarily the case, and many times there are associated conditions of a medical, surgical or psychiatric nature associated with or partially responsible for the symptoms present<sup>1,3,4</sup>.

Hence, while the only treatment available is surgical – posterior fossa

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decompression – the decision on when and how to treat still remains controversial, especially when there are no associated complications such as spinal cord dysfunction or scoliosis due to syringomyelia or focal neurological abnormalities. In this case, the decision to operate was based on a clear and clinically typical history of headaches with no other identified cause, as well as the presence of neurologic and ophthalmologic symptoms - tingling sensation in the right hand and blurry vision. Moreover, 13mm of tonsillar herniation on MRI is a clear value leaving no ambiguity on the diagnosis, while a value of 3–7mm is often considered a grey area as regards the presence of Chiari Type I. Yet the absence of signs and the chronic, rather than acute, history of headaches led to the decision to opt for a bone-only decompression rather than an intradural approach<sup>5-8</sup>. This approach would involve an additional midline incision on the dura, plus the visualization of veils that may be covering the outlets of the 4<sup>th</sup> ventricle, as well as possibly the visualization of choroid plexus of the 4<sup>th</sup> ventricle to inspect for the need for extrapial coagulation of one or both of the tonsillar tips in order to restore cerebrospinal fluid flow. An insertion of a dural graft is also sometimes considered due to the presumed protective effect on the neural tissues from chemical contamination, pericranium being a common choice of autologous graft<sup>9</sup>.

While in this case the use of intraoperative ultrasound was reassuring of the positive effect of the boneonly decompression on cerebrospinal fluid flow, it is often argued that an extradural approach increases the risk of a need to reoperate based on a lower rate of reduction or elimination of symptoms. However, it is also defended that this approach provides for shorter operative time, reduced blood loss and reduced length of hospital stay, and eliminates the risk of cerebrospinal fluid leak. This trade-off is usually solved by first offering a posterior fossa bone-only decompression and, if symptoms persist, then offering a posterior fossa decompression with duroplasty. While some still advocate an immediate intradural approach, especially in very severe cases (both symptomatically and on imaging),

this is the approach recommended by several authors<sup>5-7</sup>.

In summary, Chiari Type I malformation is an important differential diagnosis of medically unresponsive headache of subacute or chronic history both in the paediatric and adult populations10. Its diagnosis is made based on a complete history, examination and imaging. Treatment is either expectant or surgical. While some controversy remains as to the role of posterior fossa bone-only decompression, a growing number of neurosurgeons now consider it effective and safe enough to be the best surgical option for the treatment of the vast majority of symptomatic Chiari Type I malformations.

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# Helping Out: Suicide & Self Harm Amongst Lesbian, Gay, Bisexual & Transgendered Adolescents

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## Introduction

Lesbian, gay, bisexual and transgendered (LGBT) adolescents worldwide are disproportionately more likely than their heterosexual peers to inflict self-injury, to attempt suicide, and to die by suicide<sup>1,2,3,4</sup>. The particular stressors that LGBT people experience, such as victimisation and homophobia, lead to them being a high risk group for suicidal and self-injurious behaviours<sup>5,6,7</sup>. This literature review aims to explore why the LGBT community are at high risk, and to ascertain what healthcare professionals can do to help in dealing with this reality. I also endeavour to provide a critique of literature which researches this issue.

Three strong themes emerged from the literature, which were: the reality of the statistical gap, the concepts of homophobia and heterosexism, and the contribution of healthcare professionals.

## Clarification

Hereafter the acronym "LGBT" will be used at all times, and I will specify gender/transgender or sexuality when applicable.

# Is there really a difference in numbers?

Research ranging from 1991 to 2009 proves that the discrepancy in the statistics is real. The earlier research suggests that suicide risk factors unique to LGBT youth may exist: Remafedi (1991) proposed that pervasive social stigma attached to homosexuality acted as a stressor for LGBT youth<sup>1</sup>. This research comprised qualitative structured interviewing of 137 males aged 14-21. 30% of participants (41/137) reported at least one suicide attempt, and almost half of these (18) more than one attempt. 75% of all attempts were preceded by self-identification as gay or bisexual. The researchers noted that gender non-conformity was a precipitating factor in the subjects who attempted suicide more than once. Further research by Remafedi *et al* in 1998 showed the same result<sup>2</sup>, and like in 1991, the issue of gender non-conformity was highlighted.

Further studies in America by Blake *et al* (2001) and Remafedi (2002) report a similar trend in the statistics<sup>8,9</sup>. Quantitative research in 2000 by Cochran & Mays recruited 3,648 participants. Evidence emerged of the increased risk of suicidality amongst men who had a history of homosexual experiences<sup>3</sup>.

A UK-based controlled cross-sectional study by King *et al* in 2003 found similar results<sup>4</sup>. The researchers used snowball sampling to reach people who do not attend LGBT establishments or groups. The survey included 1,161 men and 1,018 women. The results showed that more than 25% of the gay men and almost 33% of the lesbians involved had deliberately harmed themselves in the past, compared to 14% of the heterosexual subjects.

Research in both New Zealand and Canada yielded the same result; in each case, LGBT boys and girls were more at risk of suicidal feelings and attempts than heterosexual boys and girls, as well as self-harm<sup>10,11</sup>.

In Ireland, the National Strategy for Action on Suicide Prevention, "Reach Out" (2005-2014) includes the LGBT community as a high risk group for suicide and self-harm<sup>12</sup>.

The search for literature yielded only one item which specifically researched the transgender community. Grossman & D'Augelli (2007) conducted qualititative interviews with 31 male-to-female (MTF) transgendered individuals and 24 female-to-male (FTM) individuals<sup>13</sup>. Almost half of all the participants reported having seriously thought about taking their own lives, and half of those directly related their suicidal ideation to their be-

ing transgender. One participant reported 20 attempts at suicide.

## Homophobia and heterosexism: What are they?

Within a literature review carried out by van Wormer & McKinney (2003) to attempt to identify what American schools can do to help LGBT students, homophobia is defined as

"an irrational fear of homosexuality and homosexuals" and heterosexism as "neglect of, and prejudice against, nonheterosexuals"5. Research by the Gay, Lesbian and Straight Education Network (GLSEN) in 1999 was cited as finding that 90% of students across the USA had heard anti-gay epithets at school (many from teachers), and that 69% of LGBT teens reported verbal and physical harassment at school.

The authors cited research in the UK by Charles (2000) which found that of 190 LGBT youths who experienced bullying in school, 40% attempted suicide or harmed themselves, and that over 16% suffered post traumatic stress later in life. The authors contended that the prevalence of homophobia is by far the most detrimental influence on LGBT youth.

A qualititative Irish study of homophobic bullying in secondary schools was carried out by Norman & Galvin (2006), comprising 125 interviews of students, parents, teachers and principals<sup>6</sup>. The researchers asserted that homophobia and heterosexism are part and parcel of the modern Irish secondary school experience. The students in particular held the view that to be heterosexual was "normal". The research showed that teachers seemed to take it for granted that homophobic bullying happened in their schools, and many chose to ignore it. Students and

teachers alike spoke of homophobic taunts being used in everyday conversation. The parents reported that they would feel sadness upon learning that their child was LGBT, explaining that they felt that life is harder for LGBT people, especially in school.

UK-based qualitative research carried out by McDermott *et al* (2008) investigated the opinions of LGBT youth who engage in self-destructive behaviours<sup>7</sup>. The researchers found that LGBT participants (aged 16-25) care setting.

An investigation into "internalised homophobia" as an explanation for mental health discrepancies between LGBT and heterosexual people was undertaken by Williamson (2000)<sup>15</sup>. In this paper Williamson defined "internalised homophobia" as negative or distressing thoughts experienced by the LGBT individual which are inspired by heterosexism and personal history of victimisation. Williamson proposed that internalised

"The results showed that more than 25% of the gay men and almost 33% of the lesbians involved had deliberately harmed themselves in the past, compared to 14% of the heterosexual subjects."

homophobia is a precipitating factor in LGBT suicide and selfharm, and that it may have an effect on coping strategies employed by the individual, therefore negatively affecting health.

Willging *et al* (2006) conducted qualitative research in Canada comprising ethnographic interviews with 20 rural healthcare providers<sup>16</sup>.

perceived a strong link between distress due to homophobia and selfdestructive behaviour. The researchers suggested that homophobia punishes the individual at a deep level and demands that the LGBT person negotiates life being seen as abnormal because of their sexual practices or gender non-conformity. They also propose that because LGBT people employ individual tactics to cope with stress arising from homophobia, the expectation and utilisation of external support may decrease.

Homophobia pervades all aspects of society, and the hospital setting is no exception. In research by Mayock *et al* (2009), almost 25% of subjects reported that non-disclosure of their sexuality was due to fear of homophobic reactions from healthcare staff caring for them<sup>14</sup>. Furthermore, the presumption of heterosexuality by healthcare staff was highlighted as an issue, as well as the failure or refusal to acknowledge the partners of LGBT patients in the Irish healthThe results included evidence of LGBT clients being denied services, discouraged from discussing sexuality and gender issues, and isolated within residential settings.

## What can healthcare professionals do?

Much attention has been paid to culturally sensitive or competent care; ordinarily this refers to sensitivity to the patient's race or religious beliefs. Scourfield (2008) proposed that culturally competent care be extended to include the LGBT community, and that LGBT youth be prioritised in suicide prevention policies<sup>17</sup>. McAndrew & Warne (2004) provided a discourse on research literature which deals with LGBT youth suicidality, and suggested that UK mental health professionals should turn away from mental health policy which ignores the continual proof of the connection between LGBT experience and suicide risk<sup>18</sup>.

Richardson (2009) outlined a nursing model for paediatric nurses working with LGBT patients, citing Troiden (1989), who proposed four stages of homosexual identity formation, and outlines interventions which can be applied at the nurse's discretion in an age-appropriate manner<sup>19</sup>. These interventions can be summarised as confidentiality, non-judgemental open-mindedness, avoidance of assumption of heterosexuality, and not dismissing or trivialising the patient's feelings or attractions. Richardson maintained that it is not necessary for healthcare professionals to understand why an adolescent is attracted to the same sex, but that it may help to understand the experience of forming a homosexual identity, in order to provide culturally sensitive care. These ideas are mirrored by the NICE Guidelines on depression in children and young people (2005), and the Guidelines on self-harm (2005), wherein a supportive and collaborative relationship is recommended between the patient and the healthcare professional, with special attention given to confidentiality, patient's consent, parental involvement and child protection<sup>20,21</sup>.

The concept of "visibility management" emerged from qualitative research by Lasser & Tharinger (2003), and it is described as the complex, multi-layered process by which LGBT youth decide when to disclose their orientation, to whom, how and where<sup>22</sup>. It is further defined as a never-ending discourse within the LGBT individual, and as being central to LGBT identity development. Lasser & Tharinger suggested that an awareness of this phenomenon is useful to the healthcare professional, claiming the client can be aided in exploring identity, dealing with victimisation, and creating coping strategies. The researchers stressed the importance of the healthcare professional acting as an ally to the LGBT client.

Brown (2002) offers an overview of literature dealing with suicidality and self-harm in LGBT youth, arriving at a model for affirming, sensitive practice<sup>23</sup>. She began by advising the practitioner themselves to analyse their own feelings towards the LGBT community, and cites Davies (1997) to recommend the inclusion of personal attitudes, feelings, fears and prejudices in this self-examination. Further recommendations in this work included familiarising oneself with the language used by LGBT youth, and the provision of clearly labelled information to clients and their families.

Mayock *et al*'s research (above) found that approximately 75% of the research subjects felt that healthcare professionals need to be more aware and more culturally competent when dealing with LGBT clients<sup>14</sup>.

# Conclusion

Research has proven, time and time again, that LGBT youth are more at risk of suicide and self-harm than heterosexual youth. The problematic issue of homophobia and heteronormativity is endemic in society, and forces the LGBT young person to strategically manage their day-to-day life from an early age in a stressful, demanding manner. The healthcare professional can increase his or her awareness of the difficulties encountered by the LGBT individual, as well as arming him- or herself with tools to effectively provide the best care possible to this diverse community. Preserving a sense of the challenge of constructing a healthy homosexual identity, as well as acknowledging the needs of the family unit of the LGBT service user, means the healthcare professional can strive to act as an advocate and an ally for LGBT clients.

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# Sleeping Sickness and the Issue with its Animal Models

#### Anne Rudolf, MSc. Neuroscience, TCD



"This review aims to both describe and critique the animal models presently used in HAT research. To my knowledge, to date no review of animal models in HAT research has been published."

## Abstract

Despite its lethality and pervasiveness, relatively little is known about the underlying pathology of Human African Trypanosomiasis (HAT), colloquially known as "sleeping sickness". This condition is a major cause of death in sub-Saharan Africa. Animal models could provide useful information pertaining to the course and underlying pathology of this disease, and may also help to elucidate the features displayed by the Trypanosoma parasite, which is the causative agent of this disease. This review aims to both describe and critique the animal models presently used in HAT research. To my knowledge, to date no review of animal models in HAT research has been published. Since many trypanosome types also affect animals other than the tse-tse fly, there also exists a small body of literature about research in that domain, e.g. cattle research. This review, however, focuses on research aiming to alleviate the danger of sleeping sickness in humans, a goal that is in urgent need of a more systematic approach.

## Introduction

Sleeping sickness or human african trypanosomiasis (HAT) is a disease threatening people in 36 countries of sub-Saharan Africa, where it is one of the major causes of mortality.

Overall, about 60 million people are at risk for developing it<sup>1</sup>. Two forms of Trypanosoma parasites can infect humans: the East African HAT caused by Trypanosoma brucei rhodesiense and the West African HAT, which is caused by Trypanosoma brucei gambiense<sup>2</sup>. Trypanosoma parasites, transmitted by the bite of infected tse-tse flies, cause a two-stage disease. In the early or hemolymphatic stage, the parasites are present in the blood and lymph, causing inconclusive symptoms such as joint pain, headache, itching, and fever. A challenge for detection and early intervention is comorbidity with a myriad of other diseases that present with similar symptoms. The late or meningoencephalitic stage, which occurs when the parasites have crossed the blood-brain barrier (BBB) and invade the central nervous system (CNS), is accompanied by behavioural changes, confusion, sensory disturbances, poor coordination and, not surprisingly, disturbance of the sleep cycle. It leads to death if untreated<sup>3</sup>. Unfortunately, late-stage treatment is ineffective and highly dangerous itself, killing 5% of people receiving it<sup>1</sup>. Treatment consists of melarsoprol, an arsenic compound that is also used in cancer treatment<sup>4</sup>. Furthermore, presumably since its epicentre is so far away from sites where money is invested into research, despite its fatality and pervasiveness, sleeping sickness is a disease still not familiar to many researchers. As

a result, the pathways by which the parasites can invade the CNS are still not fully understood<sup>2</sup>. This is where animal models provide a novel opportunity to investigate the underlying mechanisms of Trypanosoma infections. The following models are currently used in different stages of the disease.

## The HAT animal model

An animal can easily be infected with any kind of trypanosomes intraperitoneally and displays similar clinical features to those displayed in humans, including a disregulated sleep pattern and locomotor changes<sup>5</sup>. However some research groups use animal parasites like Trypanosoma brucei brucei, which cannot infect humans<sup>5, 6</sup>. Other trypanosomes that can infect animals but which cannot infect humans include Trypanosoma brucei congolense and brucei evansi. The reason researchers have chosen to use these parasites is likely due to safety considerations: no research group should be blamed for not wanting to work with lethal parasites. But the extrapolation of results obtained from these observations to human sleeping sickness should be questioned critically. After all, there is a reason behind the categorisation of different types of trypanosomes, and it is straightforward to believe that different types display different features. Already the two types that can infect humans have distinct characteristics and give rise to distinct clinical manifestations<sup>1</sup>. Also available is the vervet monkey model of sleeping sickness, basically another HAT animal model with a different name. In that model, vervet monkeys were infected with Trypanosoma from a human patient in Uganda<sup>7</sup>, probably mimicking HAT more closely.

# Gene knockout mice models

Various knockout mice models have been used to study HAT, mostly to investigate the involvement of immune system factors. An important example is the IFN- $\gamma$ -knockout mouse, which, when infected with trypanosomes, led to the discovery that IFN- $\gamma$  is crucial for trypanosomes to cross the BBB<sup>8</sup>. Other knockout models used are B-cell-deficient and immunoglobulin M (IgM)-deficient mice and TNF-knockout mice.

#### **Inbred mice models**

tant to trypanosomes<sup>9</sup>.

#### The late stage model

This model is used to investigate the course of disease during the late or meningoencephalitic stage. Animals, e.g. vervet monkeys<sup>10</sup>, are infected with the parasite several weeks before their behaviour or their brains are assayed, or - to test the effectiveness of a new drug – before treatment begins. Twenty-eight days after the infection, a drug to clear the blood from the trypanosomes - berenil - is given. Berenil cannot cross the BBB, indicating that the parasites that already infiltrated the brain can proliferate. When trypanosomes reappear in the blood or cerebrospinal fluid (CSF) samples collected during the next weeks, this is said to be indicative for the late stage of trypanosomiasis (for Ngotho et al<sup>10</sup> this took 98 days in total). This phase is accompanied by additional signs, such as peak CSF white blood cell levels, CSF and serum IgM (antiparasite immunoglobulin M antibodies) and CSF IgG (immunoglobulin G).

Animal Models of HAT – Gene Knockout Mice Models (inbred mice models)



Figure 1: Relation of different animal models to stages of human African trypanosomiasis

These models enable genetic studies of phenotypic differences between different mouse strains. Different breeds show different features with respect to survival after infection and immunological control of the parasites. These parameters also vary with different trypanosome infections, which contributes to a clearer picture of what results might be transferred from animal research to HAT. Interestingly, to date no strain of mouse is considered to be resisAt this point, it is important to note that no clear-cut border between early and late stage has been defined. Every research group is therefore free to decide where to draw the line. Do we call it late stage if the parasites infiltrated the brain, or only once CNS damage is visible? Does late-stage phase occur only when behavioural changes are observable? Comparisons between experimental findings therefore are difficult to draw.

## The PTRE model

The post-treatment reactive encephalopathy (PTRE) model is used to investigate neurological disorders that appear not as a reaction to the disease, but as a consequence of the treatment with the arsenic compound melarsoprol. PTRE is characterised by ischaemic cell changes and fibrinoid necrosis and occurs in about 10% of treated patients<sup>1</sup>. It tends to be fatal in half of these<sup>1,11</sup>. Using mice, different severities of the PTRE can be modelled by administering melarsoprol: medium-to-severe pathogenic CNS invasion occurs after one trypanolytic treatment phase, severe PTRE after a second phase<sup>9</sup>. It is noteworthy that some research groups use berenil instead of melarsoprol to induce PTRE, so what is called PTRE model actually is a late stage model (compare the work of Ngotho *et al*<sup>10</sup> and Kennedy<sup>1</sup>). In other words, in many papers published to date, the CNS damage caused by the disease and the CNS damage caused by the treatment are not clearly separated. Yet another approach is to distinguish the two models by the number of berenil treatments given to mice<sup>11</sup>.

# Summary and conclusion

An overview of the animal models used in HAT research related to their specific disease state is presented in Figure 1. Having described the stateof-the-art models, specifically in the progressed state of the disease, it is quite clear that researchers in this field need to be more precise with regard to working definitions, and that we need to read HAT research results far more critically than we currently do in order to improve our understanding of this fatal disease.

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# Dolls as an alternative therapy for dementia and Alzheimer's sufferers

#### Roseann Murray, 4<sup>th</sup> Year General Nursing, TCD



This literature review looks into the usage of dolls as an alternative therapy for those suffering with Alzheimer's disease or dementia. Ethical difficulties and the way they could be dealt with by family members and caregivers are discussed in relation to the benefits this therapy provides the users. The aim is to ascertain if the benefits outweigh the ethical issues and allow doll therapy to become a standard practice of care for those with dementia and Alzheimer's disease.

## Introduction

With dementia and Alzheimer's on the rise, newer methods of dealing with these diseases must be explored. Little research has been carried out on dolls as an alternative treatment for those suffering with Alzheimer's and dementia. Only one pilot study has been carried out<sup>6</sup>. Art, music and picture therapy have predominantly been the alternative therapies of choice, however, they are not offered in many clinical settings due to budget problems, staffing and time. Doll therapy focuses on the relationship between child and parent, bringing the person back into the parent role which is both instinctive and natural.

Ethical problems exist with this type of alternative therapy. Initial reactions of family and staff believed that doll therapy promoted deceit, infantilised the adult and compromised dignity. However, there are also benefits for the person with dementia or Alzheimer's disease. It can make life easier for the person, family and staff by helping with challenging behaviours, increasing communication, reduce amount of neuroleptics needed and increase happiness. A lot of the evidence provided is anecdotal and there are gaps in the literature resulting in no available set of guidelines for the use of the dolls. This review will explore the ethical issues surrounding dolls as an alternative therapy and the benefits to all of doll therapy. The aim is to decide if the benefits outweigh the ethical 'dilemmas'.

# **Ethical Issues**

## Dignity

Family members had negative views when it came to the idea of dolls as a therapy for dementia and Alzheimer's sufferers. They saw it as demeaning and that it compromised their loved one's dignity. People who observed the

dolls being used were less likely to be concerned about the ethical issues<sup>9</sup>. This shows that it is vital for those with misgivings to witness the use of doll therapy. It is quite common for people with these diseases to display challenging behaviours such as, aggression, agitation, wandering and confusion, which could compromise the person's dignity. These behaviours are managed via sedative methods, but in most cases doll therapy can manage them while maintaining their dignity.

## Infantilisation

Infantilisation 'refers to the societal treatment of old age as a second childhood, with little or no recognition of a lifetime of experiences that separate the elderly from children'<sup>4</sup>. This means that encouraging a person with dementia or Alzheimer's disease to use a doll can be seen as treating them like children. This raises the question if dolls are appropriate and whether or not the benefits can outweigh this ethical issue.

## Validation

'Reality orientation can do little except drag its unwilling subjects back into an intolerable reality – provoking, anger, misery or both'<sup>1</sup>. Validation can be used by family or staff members, by entering into the person's reality and confirming their beliefs that their doll is a 'baby'. Telling the person the truth could compromise their dignity. By telling the person that 'their baby' is a doll can frustrate and confuse them, which can lead to further challenging behaviour. They then become upset and question their perception of reality. 'Validation' is the supporting and confirmation of the patient's concepts of reality, thus maintaining their dignity<sup>1</sup>.

## **Deception v. Truth Telling**

'Deception' can be said to be a large part of doll therapy,

which may cause distress and ethical dilemmas for those involved. Should the user believe that the doll is in fact a baby, then family and staff should validate this. To tell the person different may lead to them becoming confused and upset. It is avoiding an unnecessary truth<sup>9</sup>. The therapeutic value here is the belief that the doll is a real baby<sup>1</sup> and this is 'justifiable benevolence deception'<sup>9</sup>. Staff can avoid this ethical problem by using the name that the user uses for the doll e.g. doll, baby or name<sup>13</sup>.

## Utilitarianism

Utilitarianism is concerned with the results of an action, not the motives. Increases in challenging behaviour will have an unpleasant effect on the person, and other residents. This means that if the end result of doll therapy means that there is less challenging behaviour, increased happiness, increased dignity and increased communication, then deception can be seen as only a minor flaw in a huge break through. This is about the person with dementia and not our preconceptions<sup>11</sup>.

# **Benefits**

Doll therapy works well for dementia and Alzheimer's sufferers because they 'live in the moment'. The values and beliefs they used to have are no longer important to them<sup>13</sup>. Many of the users tend to call the doll after one of the children, believing that they are back in the time when their child was a baby. It is suggested that doll therapy can return a man or woman back to when they themselves had young children, therefore returning to the parent role<sup>4</sup>.

## Communication

People who suffer from Alzheimer's disease or dementia tend to become unsociable and withdraw as the disease progresses. Staff and family found they could communicate and converse more effectively with the person when they had a doll<sup>14</sup>. One event of a resident who rarely spoke would be seen chatting, smiling, stroking the doll and singing lullabies. Prior to the introduction of the doll, the lady would usually sit in silence all day long<sup>5</sup>.

## Improvements in Challenging Behaviours

The term challenging behaviour can be used as an umbrella term for wandering, agitation, aggression, verbal and physical abuse, refusing care and possessiveness. These can cause difficulties for staff, embarrass family and frighten other residents. Dolls distract them from how they are feeling at the time and helps them to communicate more effectively, feel more content, express their needs better, decreases levels of wandering and agitation<sup>10,14</sup>.

## A Non-pharmacological Approach

Research carried out shows that some drugs used to treat agitation in dementia and Alzheimer's, such as neu-

roleptics may increase the speed of cognitive decline and the progression of the disease<sup>5</sup>. One person, after the introduction of the doll, never had to be administered neuroleptics as the challenging behaviour had ceased totally<sup>2</sup>. 'After the introduction of the dolls, those residents using dolls will have been prescribed less neuroleptic medications'<sup>2</sup>.

## **Increased Contentedness**

Staff members and family noted how the majority of the doll users tended to be much happier in themselves and more content. For a lot of people, once they witnessed the impact of doll therapy on the user, the ethical 'issues' no longer seemed to be 'demeaning' as they felt that the happiness of their loved one was more important.

# Disadvantages

Although Doll Therapy may not suit every person with Alzheimer's, it has many benefits and advantages to those who do. There can also be many disadvantages that must be taken into account. Arguments over ownership and compromise of care seem to crop up in long-term care settings. Arguments have occurred in nursing home between residents over ownership of the dolls. The confused person with dementia or Alzheimer's disease would pick up the wrong doll causing the owner to become upset and possibly violent. Also, dolls were being mislaid and then caused extreme stress to the user when they could not find them<sup>5</sup>. Doll therapy can possibly compromise the person's care as they may put the doll's welfare before their own<sup>8</sup>.

# Conclusion

Ethical problems and dilemmas face staff and family when they introduce dolls as a type of therapy for dementia and Alzheimer's sufferers. These problems and dilemmas seem to be outweighed by the benefits and advantages outlined above. The aim was to decide whether or not the benefits outweighed these issues.

As these diseases continue to progress, the individual tends to lose their abilities in reverse order to when they learned them. The use of a doll brings them back to the fulfilling and important role of a parent. They feel that they have responsibility, give them a chance to give care and make them feel needed.

Anecdotal evidence suggests that this aids to slow down the progression of the disease and cognitive decline, improves communication, reduces challenging behaviour, increases contentedness, decreases amount of neuroleptics required while being extremely cost effective. However, the majority of the evidence is anecdotal and it is clear that more research must be obtained to further develop and expand dolls as an alternative therapy for those suffering with dementia and Alzheimer's disease.

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# **Treatment of periodontal disease improves** glycaemic control in Type-1 and Type-2 diabetics: a literature review

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"Two 2011 controlled clinical trials found that periodontal treatment is associated with a decrease in HbA1c levels after 6–8 months in diabetic patients<sup>1,16</sup>."



# Abstract:

Periodontal disease and diabetes mellitus are both complex chronic diseases that have a bidirectional intrinsic link. It has been suggested that the chronic inflammation and infection of pre-existing periodontal disease may impair glycaemic control and hasten the development of diabetic complications. Conflicting results have been shown by the limited number of short-term randomised controlled studies carried out to ascertain whether the treatment of periodontal disease contributes to improvement of glycaemic control. High quality reviews have concluded that small but significant improvements can be expected. Glycated haemoglobin (HbA1c), a haematological indicator of hyperglycaemia, is noticeably reduced in Type-2 diabetics who undergo routine scaling/root planing and oral hygiene regimens when compared to such individuals with no periodontal treatment interventions. Regular and appropriate periodontal therapy leading to any improvement in glycaemic control has the potential to make a significant impact on the quality of life for diabetic patients. The aim of this review is to discuss the literature supporting these arguments.

# Introduction:

Periodontal disease and diabetes

mellitus are two very different but common chronic diseases. The former is a localised infection due to oral bacteria, whereas the latter is a systemic metabolic disorder characterised by abnormal glucose tolerance and hyperglycaemia<sup>1</sup>. A plethora of research has recently been published on the aetiopathophysiological link and bi-directionality of these two diseases, with several hypotheses existing but no definitive mechanisms established as of yet.

The World Health Organization (WHO) estimated that 217 million people worldwide had diabetes in 2005 and that number is set to increase to 366 million by 2030<sup>2</sup>. This growth in diabetes prevalence is principally due to Type-2 diabetes becoming an epidemic<sup>3,4</sup>. It is estimated that between 5-15% of healthy adults from 21-50 years of age and about 30% of those over 50 years of age have severe periodontitis. The prevalence of diabetic patients with periodontitis is estimated to be double or triple these numbers⁵.

In the dental profession, it is now widely accepted that controlling diabetes significantly improves the health of the periodontium. However, it is questionable if treating periodontal disease in diabetic patients assists in improving glycaemic control. A reasonable argument based on current evidence may be made for the inclusion of a routine dental health assessment in order to improve metabolic control<sup>6</sup>. This review summarises the relationship between periodontal disease and diabetes and examines the most recent evidence suggesting how successful treatment of periodontal disease can improve glycaemic control.

# What is periodontal disease?

Periodontitis is a multifactorial disease defined as inflammation and destruction of the underlying supporting tissues of the teeth<sup>6</sup>. It is characterised by the presence of plaque<sup>7</sup>, periodontal pockets, loose teeth, receding gums, bone resorption and eventual teeth exfoliation<sup>5</sup>.

Periodontitis is a silent chronic disease that can lead to tooth loss without any prior symptoms. The resultant unaesthetic smile can negatively influence the patient's quality of life. Treatment is aimed at mechanical debridement (scaling and root planing) of plaque and calculus deposits off the affected surfaces of teeth whilst the patient carries out a regimen of oral hygiene measures to prevent the accumulation of the causative factor – dental plaque<sup>5,6</sup>. Success depends largely on patient motivation and compliance. Surgical treatments involve raising gingival flaps to facilitate access to residual

deep pockets or non-responding pockets<sup>6</sup>. Management of periodontal disease requires strict recall visits every 3–6 months.

# What is diabetes mellitus?

Diabetes mellitus is defined by WHO as a metabolic disorder of multiple aetiologies characterised by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both<sup>2</sup>.

Type-1 diabetes is autoimmune mediated pancreatic ß-cell destruction resulting in the lack of insulin production. The most common type of diabetes is Type-2, which affects approximately 90-95% of the United States diabetic population<sup>7</sup>. It is caused by a disorder in insulin function<sup>8</sup>.

Apart from daily blood glucose tests, glycated haemoglobin (HbA1c) is commonly measured to assess blood glucose concentrations over a time period of 6–8 weeks. Higher amounts of HbA1c indicate poorer control of blood glucose levels and an increased risk of diabetic complications<sup>6</sup>.

Diabetic complications include retinopathy, nephropathy, peripheral neuropathy and accelerated atherosclerosis<sup>6,7,9</sup>. Oral manifestations include xerostomia, recurrent aphthous ulcerations, burning mouth syndrome and destruction of the periodontium<sup>7</sup>.

# Effect of periodontal disease on diabetes

Periodontal disease may perpetuate the chronic systemic state of inflammation<sup>10</sup>. Porphyromonas gingivalis (PG) is a negative facultative anaerobe dominant in periodontal disease associated with diabetes. It has been isolated as the main inducer of proinflammatory cytokines including interleukin-1 (IL-1), interleukin-6 (IL-6), interleukin-1ß (IL-1ß) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) in diabetics<sup>4,7,10</sup>. TNF- $\alpha$  has been reported to interfere with lipid metabolism and TNF- $\alpha$ , IL-1, IL-6 are all reported to be insulin antagonists. Also, PG trig-



Image 1: 36-year old female patient who presented with obvious plaque, gingival inflammation, suppuration and recession in the Dublin Dental University Hospital. This is a typical presentation of periodontitis in a patient with diabetes. B: Results post non-surgical treatment. The inflammation, ulceration and suppuration have resolved. Photographs courtesy of Dr Omar AlKaradsheh, Department of Restorative Dentistry and Periodontology, Dublin Dental University Hospital, Trinity College Dublin.

gers alveolar bone loss in the periodontium<sup>4,7</sup>.

Systematic reviews conclude that treating periodontal disease could delay the onset or progression of diabetic complications by restoring insulin sensitivity and improving metabolic control<sup>4,6,10</sup>.

# Effect of diabetes on periodontal disease

Untreated or inadequately controlled diabetes leading to a hyperglycaemic state exaggerates the inflammatory response to the virulent periodontal pathogenic bacteria<sup>4,5</sup>. Neutrophil adherence, chemotaxis, and phago-cytosis are all impaired resulting in more rapid and severe periodontal destruction and inflammation<sup>7,10</sup>.

Advanced glycation end-products (AGEs) are formed from non-enzymatic glycation and oxidisation of proteins and lipids under hyperglycemic conditions only<sup>4,5</sup>. These products accumulate in the gingival tissues and delay healing by inducing apoptosis of extracellular-matrixproducing cells, which in turn inhibit osteoblast differentiation and collagen production<sup>4,10,12</sup>. Connective tissue destruction proceeds due to the changed collagen structure and the presence of collagenases called matrix metalloproteinases (MMPs) while bone destruction ensues unopposed<sup>7,8,10</sup>.

Hyperglycemia and resultant AGEs formation are considered to be a major causal factor in the pathogenesis

of diabetic complications <sup>4</sup>.

## Mechanisms linking periodontal disease and diabetes mellitus (bidirectional relationship)

Research suggests that systemic inflammation is exacerbated by periodontal inflammation<sup>7</sup>, however it is difficult to define the bidirectional relationship exclusively<sup>10</sup>.

Periodontal bacteria cause the accumulation of AGEs in periodontal tissues, which results in increased tissue destruction. Furthermore, AGEs stimulate the production of proinflammatory cytokines namely IL-1ß and TNF- $\alpha$ , which exacerbate tissue destruction and decrease the capacity for tissue repair. The lipopolysaccharide released from PG induces IL-1ß and TNF- $\alpha$ , which in diabetic patients impairs glucose transport<sup>5</sup>. A linked aetiopathophysiology can be explained to date as a chronic systemic elevation and continued release of proinflammatory cytokines progressing periodontal destruction and increasing the severity of diabetes<sup>13</sup>.

The glucose content of gingival crevicular fluid in diabetics is elevated<sup>7</sup>.



Image 2: Radiograph of mandibular anterior teeth reveals severe bone loss<sup>11</sup>. **A:** Line indicates where bone level in healthy dentition should be located. **B:** Line shows position of bone level due to the destructive effect of periodontitis.

This could provide an altered source of nutrition for periodontal pathogens. Furthermore, the immune response to these pathogens may be compromised in diabetics and leads to the overgrowth of certain species resulting in more severe virulences<sup>7,8</sup> and an increased release of proinflammatory cytokines including IL-6, C-reactive protein (CRP) and TNF-µ.

Genetics has been highlighted as a discernable link between periodontal disease and diabetes<sup>1,14,15</sup>. Both diseases are polygenic disorders with some degree of immunoregulatory dysfunction. A weakened immune system and an altered wound-healing rate in diabetic patients means that repair of periodontal tissues is delayed. Fibroblasts, which are the principle reparative cell in the periodontium, are impaired, resulting in a diminished rate of tissue repair<sup>14</sup>.

A bidirectional relationship has been proposed by Mirza *et al*, stating that a pathway exists from the combination of the infection-mediated proinflammatory cytokine cycle and the AGE-mediated cytokine response to periodontal pathogens. This pathway of tissue destruction suggests that control of chronic periodontal infection is essential for achieving longterm control of diabetes<sup>14</sup>.

# Effect of treatment of periodontal disease on glycemic control in

## diabetics

Two 2011 controlled clinical trials found that periodontal treatment is associated with a decrease in HbA1c levels after 6-8 months in diabetic patients<sup>1,16</sup>. This result has been substantiated by several well-conducted reviews. Darre et al analysed 978 studies and reported a statistically significant mean reduction in HbA1c by 0.7917. A 2010 Cochrane review further concluded that there may be a small but significant improvement in glycaemic control from treating pre-existing gum disease in Type-2 diabetics<sup>6</sup>. However, the authors of this review also acknowledge that there are few studies available and individually these lacked the power to detect a significant effect. Most of the participants in the studies had poorly controlled Type-2 diabetes.

The first group to conduct a controlled trial on the response of periodontal therapy to multiple systemic inflammatory markers was O'Connell *et al.* Significant reductions in HbA1c, and multiple inflammatory markers were noted after 3 months followup. However, the follow-up time was too short, the sample size was small and their diets were uncontrolled<sup>8</sup>.

A well-performed study by Correa et al showed that non-surgical periodontal treatment was effective in reducing the levels of IL-1ß, MMP-8 and MMP-9, and the elastase activity in GCF samples from both diabetes and control groups<sup>18</sup>. It should be noted that because the majority of studies were conducted in Type-2 diabetic populations, data suggests that Type-2 diabetics respond to periodontal therapy but in Type-1 diabetics this response is questionable<sup>5</sup>. The Cochrane review suggests that because Type-1 diabetes is an autoimmune disease, these patients may be too young to develop moderate to severe periodontitis<sup>6</sup>.

# Recommendations for future studies:

Further studies to confirm these findings should be viewed as a public health priority in view of the prevalence of both diabetes and periodontal disease<sup>6</sup>. Studies should also include a sizeable number of Type-1 diabetic participants to determine whether their response to periodontal treatment is similar<sup>6</sup>.

Control groups should undergo their usual periodontal treatment regimens as opposed to no treatment which is unethical<sup>6</sup>.

Confounding factors including smoking, body mass index, diet and baseline characteristics affecting glycaemic control should be better controlled<sup>19</sup>.

Longer follow-up times are needed to properly ascertain the success of periodontal treatment in controlling periodontal disease and simultaneously improving glycaemic control.

# **Conclusion:**

Diabetes is associated with an increased prevalence of periodontal disease and periodontal disease itself is associated with poorer glycaemic control in diabetic patients. Long-term glycaemic control is considered to be of critical importance in preventing and delaying the progression of diabetic complications.

The authors of this review recommend that all Type-2 diabetic patients should be screened for periodontal disease. The loss of teeth and an unaesthetic smile can negatively affect the quality of a person's life as much as systemic diseases themselves. The majority of shortterm studies have proven that treating periodontal disease may assist in improving glycaemic control; thus improving a diabetic patient's overall health. However, these results need to be corroborated over a longer time-frame in more controlled studies.

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# Clinical points: Periodontal disease is a destructive inflammatory condition of the periodontium increasing the mobility and subsequent loss of teeth. Diabetes mellitus is a metabolic disorder characterised by hyperglycaemia.

- Recent studies show that diabetes and periodontal disease exacerbate the effect of pro-inflammatory cytokines, thus worsening the clinical presentation of the other.
- All patients who with diabetes should be screened for and educated about gum disease.
- Treating periodontal disease helps to improve glycaemic control, which in turn helps prevent the progression of diabetic complications.

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# Old People Are Still Doing It!

#### Mary Ní Lochlainn, 3<sup>rd</sup> year Medicine, TCD



"While much has been written about adolescent and adult sexuality, relatively little is available that highlights the nature of sexuality in older age groups."

## Abstract

Research suggesting that a high proportion of men and women remain sexually active well into later life refutes the prevailing illusion that ageing and sexual dysfunction are unequivocally linked. Age related physiological changes do not render a meaningful sexual relationship impossible or even necessarily difficult. Many of these physiological changes are modifiable. There are various therapeutic options available to patients to achieve maximum sexual capacity in old age.

In this article I review the physiological sex-related changes that occur as part of the normal ageing process in men and women. I address the effect of illness on sexual function. In addition. I will summarise the attitudes and perceptions of the media and general public towards sexual activity and ageing. An understanding of the sexual changes that accompany the ageing process may help general practitioners and other doctors to give practical and useful advice on sexuality as well as refute the misconception that ageing equates to celibacy. A thorough awareness of this aspect of older people's quality of life can raise meaningful expectations for ageing patients.

## Introduction

The proportion of people alive over the age of 60 years is growing faster than any other age group<sup>1</sup>. In the UK the population aged 65 years and older is set to increase by two thirds to reach 15.8 million in 2031<sup>2</sup>. Evidently, the healthcare systems around the world will have to learn to cope with the increasing needs of this sector of the population.

Sexuality is broadly defined as the dynamic outcome of physical capacity, motivation, attitudes, opportunity for partnership and sexual conduct<sup>3</sup>. Sexuality may include touching, caressing, fantasy, masturbation, physical closeness and the warmth created by emotionality<sup>4</sup>. Although sexuality is an important means of expressing love and caring in older persons<sup>5</sup> it receives scanty attention in the education and training of health care professionals and is rarely detailed when taking a history and conducting a physical examination. While much has been written about adolescent and adult sexuality, relatively little is available that highlights the nature of sexuality in older age groups.

## Sexual Activity of Ageing Men

Holden *et al* (2005) surveyed approximately 6000 men in Australia;

this study reported 37% of men aged 70 years and older were still sexually active<sup>6</sup>. Baumeister et al (2001) surveyed a broad range of available evidence on the relative strength of sex drive and found that, by all measures, men have a stronger sex drive than women<sup>7</sup>. Lindau *et al* (2010) concluded that sexual activity, good quality sex life and interest in sex were higher for men than for women and this gender gap widened with age. Furthermore, sexually active life expectancy was longer for men, but men lost more years of sexually active life as a result of poor health than women<sup>8</sup>. An increasing number of older men, who retain fertility for life, have the desire for an active sex life and possibly children<sup>9</sup>.

Among men, the most prevalent sexual problems are difficulty in achieving or maintaining an erection (37%), lack of interest in sex (28%), climaxing too quickly (28%), anxiety about performance (27%), and inability to climax (20%)<sup>10</sup>. Chew *et al* (2009) carried out a study in general medical practices in Australia and found that 52% of male attendees aged 60–69 years had experienced erectile dysfunction compared with 69% aged 70–79 years and 76% aged 80 years or older<sup>11</sup>.

Sexual stimulation of the human male results in a series of psychological, neuronal, vascular, and local genital changes. Erection is the ultimate response to multiple psychogenic and sensory stimuli from imaginative, visual, auditory, olfactory, gustatory, tactile, and genital reflexogenic ery man<sup>15</sup>. Thus, lack of opportunity may well account for a large proportion of the gender differences in prevalence of sexual activity. follicle-stimulating hormone levels begin to rise, and menstrual cycles become variable. Postmenopause is considered to begin approximately

sources, which affect several neurological and vascular cascades that lead to penile tumescence and rigidity for vaginal penetration. Significant changes in penile structure occur with ageing. The concentration of elastic fibres and collagen decreases with age. In addition, it is estimated that there is a decrease of up to 35% in the smooth muscle content of the penis in men over 60 years. Mechanical sensitivity of the penis is decreased. These changes may contribute to the development of erectile dysfunction in older men<sup>12</sup>.

Therapies for erectile dysfunction include oral and non-oral treatments. Non-oral approaches include vacuum constriction devices, pe-

nile self-injection therapy, hormone injections, counselling, and penile prostheses. Oral therapy includes medications such as sildenafil<sup>13</sup>.

## Sexual Activity of Ageing Women

The majority of the older population is female. By the year 2050, it is predicted that 65% of octogenarians will be women<sup>14</sup>. The 2006 Irish Census concluded that by age 85 years or older, there are 2.25 women for ev-

# **Clinical Points:**

- The proportion of people alive over the age of 65 years is growing faster than any other age group; in the UK the population aged ≥65 years is set to increase by two thirds to reach 15.8 million in 2031.
- An understanding of the sexual changes that accompany the ageing process may help general practitioners and other doctors to give practical and useful advice on sexuality as well as refute the misconception that ageing equates to celibacy.
- Contrary to common misconception, sexual activity is still highly prevalent among people over 65.
- For ageing women, a decline in sexual interest and desire is frequently reported to be more severe than for ageing men.
- Female sexual dysfunction is divided into four categories: desire, arousal, orgasmic and sexual pain disorders.
- Male sexual dysfunction can include erectile, orgasmic or ejaculatory dysfunction. anxiety and libido problems.



The sexuality of older women is influenced by many factors including general physical and mental well-being, quality of relationship, life situation, marriage status, menopausal status, education, social class, stressors and self-perception<sup>16-19</sup>.

One of the most significant periods in female reproductive ageing is the menopause. The menopause is the cessation of the menstrual cycle and signals the end of female fertility. 'Perimenopause' refers to the period when oestrogen levels begin to fall, one year after the final menstrual cycle<sup>20</sup>. Women live on average 30 years after the menopause<sup>21</sup>. This indicates the importance to healthcare providers of a thorough knowledge of postmenopausal health. Menopausal changes that arise from the loss of oestrogen include decreased vaginal lubrication, vasomotor symptoms, and neurologic and psycho-sexual changes including mood, irritability, anorgasmia, decreased libido and impaired sexual performance<sup>22,23</sup>.

The prevalence of sexual dysfunction is high; Laumann et al (1999) reported 43%<sup>24</sup> while Lindau et al (2007) reported 50%<sup>25</sup> prevalence, illustrating the lack of progress in this area over the course of the decade. In the Yale midlife study (1990) 68% of 130 postmenopausal women reported sexual problems. Specific complaints included vaginal dryness (58%), dyspareunia (39%), as well as decreased cli-

toral sensitivity (36%), orgasmic intensity (35%) and orgasmic frequency (29%)<sup>26</sup>. In 1998, the American Foundation of Urologic Disease Consensus Panel classified female sexual dysfunction into four categories: desire, arousal, orgasmic and sexual pain disorders<sup>26</sup>. These include Hypoactive Sexual Desire Disorder, Sexual Arousal Disorder, Orgasmic Disorder and Sexual Pain Disorders such as dyspareunia (genital pain with intercourse) and vaginismus (involuntary muscle spasms of the outer third of the vagina).

Therapies for female sexual dysfunction include dilators to improve dyspareunia, vaginal lubricants and topical or oral oestrogen may help with vaginal thinning and dryness<sup>27</sup>.

# The Influence of Illness on Sexual Activity

Physical illness can affect sexual function directly by interfering with endocrine, neural and vascular processes that mediate the sexual response, indirectly by causing weakness or pain and psychologically by provoking changes in body image or self-esteem<sup>28</sup>.

Males and females can experience sexual dysfunction secondary to diabetes mellitus, cardiovascular disease, hypertension, peripheral vascular disease and tobacco abuse<sup>29</sup>. Dysfunction is also associated with psychological disorders. Depression, low self-esteem, anxiety, obsessivecompulsive disorder, chronic stress and a history of sexual abuse can all negatively impact on sexual function<sup>30</sup>. Medications can also play a role; Feldman et al (1994) reported above-average prevalence for erectile dysfunction among men treated with vasodilators, cardiac drugs, antihyperglycaemic and antihypertensive agents<sup>31</sup>. Good health and high quality of life are strongly linked to a satisfactory sex life.

## Role of the Healthcare Professional in Sexual Activity and Ageing

Lindau et al (2006) reported in the U.S. that most women thought that doctors should ask about sex (75%), yet only 55% reported a doctor discussing sex with them since they turned 60 years<sup>32</sup>. It is likely that this figure is lower in the United Kingdom and Ireland. A study by De Boer et al (2005) in the Netherlands found that 85.3% of men with erectile dysfunction wanted help, but only 10.4% of men received medical care<sup>33</sup>. Reasons given by care providers for rarely initiating conversation about sexuality included: prioritisation of competing interests, limited time, sex not perceived as a concern of the patient and lack of expertise in the discussing sexuality issues. Providers assumed older couples would be less interested in sexuality and intimacy, yet these issues were raised as important uniformly among patients and spouses of all ages<sup>34</sup>.

Physicians can provide education about alternative means of achieving intimacy with old age such as masturbation, alternative positions for intercourse, holding or kissing<sup>35</sup>. An understanding of the sexual needs of older people should become an integral part of the training and continued education of health care professionals. This should improve patient education and counselling, as well as the ability to clinically identify a highly prevalent spectrum of health-related and potentially treatable sexual problems.

## Attitudes towards Sexual Activity and Ageing

Many people and the media have a negative attitude toward sexuality and ageing<sup>36-38</sup>. In reporting the findings by Lindau et al (2007) on sexuality and health among older adults, NBC wrote "many older people are surprisingly frisky" and older people take part in "intimate acts that would make their grandchildren blush"<sup>39</sup>. Holden et al (2005) concluded that older persons tend to be excluded from studies because they are considered to be at a low risk of HIV/ AIDS, have negligible contraceptive needs and are often perceived to be sexually inactive<sup>40</sup>.

Attitudes towards sex are both a product and a cause of social and sexual experiences, choices and behaviours. Negative societal attitudes about older people's sexuality may inhibit the discussions between patients and their doctors<sup>41</sup>. With the existing stereotypic image of older people being sexually inactive, improved research, education and policy is needed to ensure that agerelated barriers to seeking information and treatment for reproductive health issues do not persist for older adults.

# Conclusion

I conclude that regular sexual activity is a normal finding in advanced age. Many older men and women are sexually active despite the increase of sexual dysfunction with age; appropriate consideration must therefore be given to the needs of the ageing population in the planning and delivery of healthcare, institutional and support services to help sustain their right to a sex life after 65. The last few decades have seen a marked increase in mean life expectancy in the developed world. This has made older people and their quality of life a matter of ever-increasing medical concern. It is imperative to understand the sexual behaviour and concerns of older adults and to ensure that education programmes, research, policy and services are available to both the public and professional communities in order to provide a more comprehensive service to this growing sector of the population.

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# The TSMJ Committee: Open to All Students of the Health Sciences Faculty

## Multiple Sclerosis — is the Autoimmune Reaction all Smoke and Mirrors?

#### Andrea Weitz, 3<sup>rd</sup> Year Medicine, TCD



"Recently, an alternative theory based on neuropathology of acute MS lesions has been proposed that may argue against the autoimmune hypothesis. It suggests that the initial pathology is oligodendrocyte apoptosis, while the subsequent inflammation that is "autoimmune-like" may in fact be a secondary phenomenon."

## Abstract

The most widely accepted hypothesis of MS pathogenesis is the autoimmune hypothesis. Recently, an alternative theory based on neuropathology of acute MS lesions has been proposed that may argue against the autoimmune hypothesis. It suggests that the initial pathology is oligodendrocyte apoptosis, while the subsequent inflammation that is "autoimmune-like" may in fact be a secondary phenomenon. This new evidence of a potential pathogenesis may have major implications in terms of treatment options. Instead of using Disease Modifying Treatments (DMTs) we can focus on targeting the initial oligodendrogliopathy and therefore halt the progression of disease before it starts.

# Introduction

When asked what causes Multiple Sclerosis (MS) by our patients, almost by reflex, medical students and doctors alike answer that it's an autoimmune disease that leads to the loss of neural functions<sup>1,2</sup>. The idea of molecular mimicry, a phenomenon of self-directed immunity by microbial epitopes<sup>3</sup>, has been implicated as the initiating trigger that results in an autoimmune reaction. The autoimmune hypothesis has dominated MS research since the late 1950s<sup>4</sup>, so much so that biotechnology companies have solely focused drug treatment options on autoimmunity and inflammatory targets<sup>3</sup>. Although this theory has been accepted for over 50 years it has never been proven, nor the initiating events elucidated<sup>2</sup>. Novel studies using neuropathology have implicated a potentially new pathogenesis and hypothesise that MS is an oligodendrogliopathy disease<sup>4</sup> in which the inflammatory response may in fact be secondary to the apoptosis of oligodendrocytes (OLs). OLs are the myelinating cells of the central nervous system<sup>5</sup>, and play a critical role in brain development and neuron function<sup>6</sup>.

It has been suggested that MS may even be a heterogeneous disease that encompasses both pathologies of autoimmunity and oligodendrogliopathy<sup>7</sup>. The idea that there is a variation in the pathology could not only shift diagnostic approaches for MS, but also shift treatment focus towards novel therapeutic strategies that protect oligodendrocyte progenitor cells (OPCs) and rescue mature myelinating OLs from apoptotic triggers<sup>1</sup>. The implications of this could be life-changing for the 2.5 million individuals<sup>8</sup> that are currently afflicted with this debilitating disease.

## The Autoimmune Hypothesis

The most popular theory linking autoimmunity to MS is that there is a triggering infection caused by a microbe that induces molecular mimicry<sup>9</sup>. The theory is that naïve myelin antigen-specific CD4-positive T-cells are primed in the peripheral lymph nodes by dendritic cells, or antigen presenting cells, which present myelin or myelin cross reactive epitopes. Once these primed T-cells (now Th17 cells) penetrate the CNS parenchyma and are reactivated by macrophages that express myelin epitopes, they secrete cytokines that are toxic to the myelin and induce demyelination<sup>10</sup>. Essentially, it is thought that the mechanism responsible for myelin destruction involves CD4 T-cell-dependent macrophage activation directed against a myelin or OL antigen<sup>11-14</sup>. Therefore, the autoimmune theory proposes that our immune system is problematic, with an influx of immune and inflammatory cells that ultimately causes demyelination and neuronal death. Although one may wonder if our highly intricate immune system can be so easily duped into destroying our own neural network, there is precedence for such a scenario. Campylobacter jejuni, for example, is the causative agent in inducing molecular mimicry in acute motor axonal neuropathy, a subtype of Guillain-Barré syndrome<sup>15,16</sup>.

In terms of MS, a prevalent hypothesis is that a virus causes this "hit-and-run" molecular mimicry<sup>3</sup>. It has been

# **Clinical Points**

- Multiple Sclerosis (MS) is an immune-mediated demyelinating disease of the human central nervous system (CNS).
- The autoimmune hypothesis of aetiology of MS has yet to be proven and it still remains to be determined if inflammation is a primary or secondary event in the degenerative process.
- A novel oligodendrogliopathy hypothesis demonstrates that apoptotic cell death of oligodendrocytes (OLs) may be the initial event in new MS lesion formation as well as the initiator of inflammation in acute MS.
- Failure of remyelination after an acute attack may occur due to OL and oligodendrocyte precursor cell (OPC) death, and the inability of OPCs to differentiate into myelinating OLs.
- The focus of treatment may be shifted to an approach that targets this initial olidodendrogliopathy rather than disease modifying treatments (DMTs) that focus on inflammatory molecules, which may in fact be a consequence rather than a trigger of MS.

noted that the protein sequence on some viral proteins present a homology with an autoantigen sequence in the CNS, such as the Hepatitis B virus (HBV). The viral protein in HBV is homologous with a segment of myelin basic protein<sup>17</sup>, a protein believed to be important in the process of myelination<sup>18</sup>, but to date, no virus has been unequivocally implicated. However, even with a hypothesis that a virus can be implicated in MS, one must keep in mind that both viral infections and autoimmunity can induce T-helper cell type 1 inflammation and consequently similar signalling pathways. Therefore, could our focus on autoimmune theories of MS be clouding the possibility that the viral infection itself could instead be inducing OL apoptosis and oligodendrogliopathy<sup>3</sup>?

## The Oligodendrogliopathy Hypothesis

The hypothesis of oligodendrogliopathy suggests that primary OL death causes the demyelination. The subsequent inflammatory response that appears to be "autoimmunelike," may in fact be a mere epiphenomenon that acts to clear away the myelin debris that is present from the demyelination<sup>4</sup>. The oligodendrogliopathy hypothesis arose from neuropathological studies of MS lesions, but due to the rare occurrence of rapidly disabling and consequently fatal MS lesions<sup>3</sup> there is difficulty in obtaining appropriate MS specimens. As a result, studies that utilise human tissue affected with MS are far less reported than those that use

experimental autoimmune encephalomyelitis (EAE). EAE is the animal autoimmune model for MS<sup>4</sup> and the experimental foundation upon which the autoimmune theory is based.

One such study that provided pathological examples was conducted by Lucchinetti et al in 2000. It suggested that MS may have heterogeneous pathological mechanisms, and it was noted that there were two patterns with the characteristic autoimmune pathology as well as two patterns with an oligodendrogliopathy pathology<sup>7</sup>. These four patterns of demyelination that were found were heterogeneous between patients, but homogenous within each individual patient, indicating that disease pathogenesis does not change within a single patient<sup>7</sup>. Although this study may demonstrate heterogeneity of MS, in both its causation and course, it is also possible that the four different pathological pictures may only reflect differences in the timing of the biopsy or autopsy<sup>4</sup>. It would be interesting to see if these lesional patterns remain constant throughout the duration of the disease course, or if they change as time progresses and the disease changes from acute to chronic phases.

In 2004, Barnett and Prineas analysed several MS lesions, with the earliest autopsy case being only 17 hours after the onset of symptoms<sup>19</sup>. These cases were exceptionally acute cases and provided a unique insight on the pathology of relatively newly diagnosed lesions. In all 10 lesions, the earliest structural change that was shared was extensive OL apoptosis and early microglial activation, but few or no infiltrating lymphocytes or myelin phagocytes were present<sup>19</sup>. This study implies that the initial event in MS lesions is apoptosis of OLs, as opposed to an autoimmune insult.

In a separate study done by Henderson et al in 2009, twenty-six active lesions from 11 patients with early MS were serially sectioned and immunostained. In the sections stained, parenchymal T- and B-cells were mostly absent in areas of initial OL loss, as well as in areas of degenerate and dead myelin infiltrated by myelin phagocytes. However, areas of complete demyelination, which were packed with lipid macrophages and in some lesions regenerating OLs, revealed large numbers of Tand B-cells and IgG-positive plasma cells. These results demonstrate that the prominent feature in rapidly expanding MS lesions is the early loss of OLs, while macrophage activity is simply a scavenging response to the dead and degenerate myelin. The T- and B- cells seem to appear later in response to recently demyelinated tissue<sup>11</sup>. Perhaps these immune responses are not toxic but permissive for oligodendroglial regeneration and remyelination<sup>4</sup>. This suggestion supports the evidence found in experimentally demyelinated animals which demonstrated that when there is remaining myelin debris, remyelination is impaired<sup>20</sup>. This is yet another implication that lesion formation in MS may have some other basis other than destructive cellmediated immunity directed against a myelin or OL antigen<sup>11</sup>.



Fig 1: The two hypotheses and their relation to DMTs. (A) the autoimmune hypothesis and (B) the oligodendrogliopathy hypothesis. Current DMTs are designed to primarily target T-cells. Therefore, the development of new treatments that inhibit oligodendrogliopathy may result in a better clinical outcome if the latter hypothesis holds true<sup>4</sup>.

# What causes the Oligodendrogliopathy?

Possibilities for the aetiology of demyelination include a viral infection of the OLs<sup>3, 7, 21</sup>, hypoxia stress secondary to ischemia, an immunemediated vascultis<sup>22,23</sup>, or lastly, secretion by activated microglia of cytokines that have shown to selectively damage OLs<sup>24</sup>.

Nakahara et al reveals some insight regarding remyelination. In previous studies, it has been shown that there is a differentiation block in the OPCs which is a major determinant of remyelination failure in MS<sup>25</sup>. Nakahara et al demonstrated that the TIP30 protein, a proapoptotic protein, is abnormally over expressed in OPCs in chronic MS lesions. This overexpression arrests differentiation into mature OLs, thereby causing the pathogenesis of remyelination failure<sup>26</sup>. Unfortunately, this study does not address the initial causation of demyelination, which still remains to be shown.

## MicroRNAs-a novel treatment for a novel hypothesis?

Alternate mechanisms are important when considering treatments, as theoretically MS patients with oligodendrogliopathy type lesions may not fully respond to current disease modifying therapies (DMTs)<sup>4</sup>. One current example, Alemtuzumab, uses a humanized monoclonal antibody that targets an antibody on all mature lymphocytes and consequently depletes all T- and B-cells, including auto-reactive lymphocytes<sup>27</sup>. Therefore a therapy that may be useful for patients with one form of the disease may in fact be suboptimal in another<sup>7</sup>.

Alternatively, it may be useful to focus on new approaches of treatment that target the preservation of OLs as well as induce their remyelination. Recently it has been shown that MicroRNAs (miRNAs) may be novel regulators of OL differentiation and myelin maintenance. They do this by inhibiting negative genes that maintain the undifferentiated state of OPCs, thereby increasing the number of OPCs and subsequently OLs, resulting in remyelination<sup>6</sup>.

# Conclusion

The biggest challenge for both researchers and patients is to understand the cause of MS. Even though both of these hypotheses provide much insight, they are still largely unproven. Are these two theories describing completely different pathologies of the disease? Can they be unified into one theory to explain the entire disease course? Is it possible that MS is not an autoimmune disease caused by an environmental factor, but instead what appears to be the autoimmune response could just be a secondary phenomenon? Perhaps it is time to think outside the box with an investigative frame

of mind rather than support a longstanding hypothesis of autoimmunity that has been so difficult to prove.

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# Paediatric Palliative Care

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"Paediatric palliative care is not about dying"

Palliative care for children is a current, dynamic topic in society. At present, there are many changes happening in the area of paediatric palliative care, affecting issues such as the role of the nurse, the development of national policies and recommendations for the future of paediatric palliative care<sup>1</sup>. This article will discuss palliative care for children with life-limiting conditions, highlight national and international developments in this area of health care, describe current services provided and make recommendations for future development of paediatric palliative care in Ireland. It will also make reference to clinical nursing practice, the role of the children's nurse and outline the provision of care for children and families.

# Paediatric palliative care

Paediatric palliative care is not about dying; the emphasis is on providing comfort and enhancing the quality of life for the child, while helping children and their families deal with their medical conditions and enable them to live life to the fullest<sup>2</sup>. Palliative care aims to make a child's end-of-life experience more dignified and should be accessible in any setting; home, hospital or hospice<sup>3</sup>. The World Health Organization (WHO) describes palliative care (see Table 1) as encompassing the physical, emotional, social and spiritual elements of the individual.

According to the DoHC<sup>4</sup> a life-limiting condition is "any illness in a child where there is no reasonable hope of cure and from which children or young people will die". Lifelimiting conditions are divided into four categories (see Appendix 1) and children in each of these categories can have palliative care needs. Currently, there is no national database in any country which identifies children with life-limiting conditions; government publications and needs assessments are therefore based on estimates and actual figures are likely to be underestimated<sup>4</sup>. There are approximately 1,400 children living with a life-limiting condition in Ireland, and life-limiting conditions account for approximately 350 of the 490 childhood deaths that occur per year<sup>4</sup>. These statistics emphasise the need for adequate palliative care services for children and their families and the nurse has a fundamental role in providing this care.

Palliative care should run alongside curative treatment, beginning at the diagnosis of illness. However, Brandon *et al*<sup>5</sup> state that "offering palliative care to infants and children who are continuing to receive curative therapy is a challenge for the healthcare provider team and family because it is perceived as 'giving up hope' for recovery or cure".

# **Palliative Care Principles**

Fundamental principles of children's palliative care include providing family-centred care, alleviating suffering and enhancing quality of life and maintaining good symptom control<sup>2</sup>. Palliative care adopts a holistic approach and should be multidisciplinary, available to all children regardless of diagnosis and documented correctly to ensure continuity of care. Every healthcare professional should act as an advocate for and in the best interest of the child. Respite care and support should be readily available when necessary and bereavement care should be provided throughout the whole process of palliative care<sup>2</sup>.

# **Palliative Care Developments**

The United Kingdom has led many developments in paediatric palliative care<sup>6</sup>. The need for paediatric palliative care was first highlighted in the 1980s when Sister Frances Dominica discovered that families with dying children needed support, assistance and respite breaks from daily routines<sup>7</sup>. In 1982, she opened Helen House Hospice which started an international drive to develop palliative care services for children. Palliative care was initially

#### Table 1: The WHO (1998) Definition of Palliative Care for Children

[as cited by the Department of Health and Children (DoHC) 20094]:

- "Palliative care for children is the active total care of the child's body, mind and spirit, and also involves giving support to the family.
- It begins when illness is diagnosed, and continues regardless of whether or not a child receives treatment directed at the disease.
- Healthcare providers must evaluate and alleviate a child's physical, psychological and social distress.
- Effective palliative care requires a broad multidisciplinary approach that includes the family and makes use of available community resources; it can be successfully implemented even if resources are limited.
- It can be provided in tertiary care facilities, in community health centres and even in children's homes."

associated with oncology services but has recently been developed to focus on all life-limiting conditions<sup>4</sup>. However, there are more resources and supports available for children with cancer and society must adapt to create better resources for children suffering from other life-limiting conditions.

Following on from the developments in the UK, palliative medicine became recognised as a medical specialty in Ireland in 1995; however, children's palliative care is a more recent development<sup>4</sup>. Benini *et al*<sup>8</sup> credit medical and technological progress for allowing children with life-limiting illnesses to survive longer than in the past, but not necessarily to recover. These children will require long-term support and appropriate palliative care.

Children's palliative care is unique<sup>9</sup>. The needs of children are different to those of adults (see Appendix 2) and therefore palliative care for children is significantly different to that for adults<sup>4</sup>. Children should be included in decision-making where possible, as emphasised in The National Children's Strategy<sup>10</sup>: "Children will have a voice in matters which affect them and their views will be given due weight in accordance with their age and maturity." Where appropriate, the child should be consulted about their treatment plans and given a choice about where they receive their care. The nurse must be mindful of this and allow time for the child to express their concerns, fears and wishes surrounding death and dying<sup>11</sup>.

Adolescents have different needs to children, including the desire for independence and the need to create a social identity, and they are more influenced by their peer groups<sup>12</sup>. The nurse must be aware that adolescents require a greater level of privacy and more involvement with decision-making. The nurse should always consider the best interests of the child when planning and implementing care<sup>13</sup>.

In Ireland, palliative care services are structured into three levels of specialisation (see Table 2), which are important for establishing roles and responsibilities in palliative care.

In 2001, the DoHC highlighted the need for policy development regarding palliative care for children and published the 'Report of the National Advisory Committee on Palliative Care'14. This illustrated the needs of children who required palliative care and the need for a review of palliative care services for children. This document is regarded as "the blueprint for the development of palliative care in Ireland and has been adopted as a national policy"4. The major findings of the report included the need to maintain the best possible quality of life and to incorporate palliative care as early as possible and highlighted that all three levels of palliative care specialisation should be available to each child and family.

Following on from this report, the DoHC published 'A Palliative Care Needs Assessment for Children'<sup>15</sup>, which symbolised the foundations and began the development of a nationwide paediatric palliative care service. The findings obtained from this study were consistent with results found in other countries. The key findings included the need for equity in service provision, co-ordination of services, development of home care and community services and accurate data collection regarding prevalence of life-limiting conditions and mortality. An identified 'key worker' for each family should be established to ensure consistency of care. Other recommendations included increased education, training and development for healthcare professionals regarding symptom management and control, information on local services and how to access them, improving counselling and bereavement skills and increased access to local respite facilities. The report provided guidance and direction for further policy development.

The evidence gathered during the compilation of the report illustrated that there is no data available regarding the number of children living with and dying from life-limiting conditions in Ireland. Current services are inequitable and vary according to diagnosis and geographical location and there is an inadequate availability of respite at present. There is a lack of children's palliative care services within the health system, with some children receiving care by adult specialist palliative care services. Further resources, education and funding are needed to create an appropriate service provision for children in Ireland.

# Hospital versus Community Care

The number of children living with life-limiting conditions being nursed at home and in the community is increasing<sup>17</sup>. It is widely documented in the literature, both nationally

#### Table 2: Levels of Palliative Care Specialisation<sup>1,4,14,16</sup>

Level One – Palliative Care Approach

This approach is informed by principles of palliative care and should be incorporated into all practice. At this level, many patients will have their care needs met without the necessity of referral to specialist palliative care. This approach is an integral part of all clinical practice and should be a fundamental skill of every healthcare professional, particularly nurses, both in the hospital and the community. The aim is to promote both physical and psychological well-being.

#### Level Two – General Palliative Care

At this level of practice, those providing palliative care will have additional training, knowledge, experience and expertise in this area. This is viewed as an intermediate level, where engagement in palliative care is part of the health professional's caring role but does not define it.

Level 1 and 2 can be referred to as non-specialist palliative care and can be delivered by all healthcare professionals in hospital and community settings. The main focus is on quality of life and providing holistic care, which includes effective symptom control, open and sensitive communication and family-centred care.

Level Three – Specialist Palliative Care

This level refers to those professionals whose core activity is limited to the provision of palliative care. Caring for patients with complex and demanding palliative care needs requires a greater degree of training, knowledge and other resources. This support is available through primary care, acute hospital settings, specialist units and hospices.

and internationally, that in most circumstances, the home is the location of choice for end of life care; here, the patient is surrounded by loved ones with adequate professional support including the public health nurse<sup>4,18,19</sup>. The nurse has a fundamental role in working to achieve this wish for the families who express a desire to care for their child at home in the last few days, weeks or months. Home care allows the child to participate in routine family activities and offers social opportunities<sup>1</sup>. Rowse highlighted the importance of availing of community resources when providing palliative care and believes palliative care can be successfully implemented even if community resources are limited<sup>20</sup>.

The role of the nurse is expanding from caring for children in a hospital setting to the advancement of community nursing roles. The nurse must help the child to live well and die peacefully when there is nothing more that can be done, whilst assisting the family and managing the issues surrounding death, dying and bereavement<sup>21</sup>. Davies *et al*<sup>22</sup> discovered barriers to the delivery of palliative care including limited access to speciality care, legal and ethical issues, uncertainties in prognosis and treatment outcomes and lack of communication. A partnership must be obtained between health professionals and the child's family to overcome these barriers and meet their needs in an individualised way<sup>23</sup>.

Caring for a child at home can be challenging for the family and healthcare professionals. Willis states that "palliative care is about helping children to live before they die"24. When providing palliative care in the home, the nurse should encourage the family to focus mainly on spending quality time together and creating memories rather than on the child's illness. The care provided should be adaptable to meet the needs of the current family situation; through family-centred care, including negotiation with parents regarding their wishes to be involved and to what extent, holistic care can be provided. The importance of adequate communication between the nurse and family shouldn't be underestimated,

and the benefits of a team-orientated approach are crucial to successful palliative care<sup>25</sup>. Effective communication is the cornerstone of paediatric palliative care<sup>13</sup>.

Palliative care involves managing distressing symptoms, providing respite care and supporting the child and family through death and bereavement<sup>26</sup>. An initial comprehensive assessment of the child and their condition is necessary and the nurse needs to continuously reassess and monitor the child for deterioration. The nurse must assist the family while striving to maintain normality within the family unit and encourage hope where possible. Zelcer et al<sup>27</sup> found that parents face many struggles when a child is diagnosed with a life-limiting condition including competing responsibilities of other siblings, work and financial commitments and the need to become 'expert parents' and care-givers in order to meet the needs of their child.

# Family-Centred Care

Pearson highlights that the nursing care provided should be holistic, incorporating the child's physical illness as well as their psychological, emotional and spiritual needs<sup>28</sup>. Pontin & Lewis emphasise the importance of 'knowing the family' and acquiring knowledge regarding the child, family members and available community resources in order to provide appropriate care and facilitate care delivery when the child moves into the end stage of palliative care<sup>17</sup>. The nurse must consider the needs of all members of the family when providing palliative care<sup>29</sup> and provide appropriate bereavement support which begins before death and continues after death<sup>4</sup>. Every family member will grieve differently and will require different levels of support at different times<sup>1</sup>. It is important that the nurse gives the family time and space to grieve and enlists further professional support when necessary.

The nurse must adapt to meet the changing needs of the family and be aware of the needs of the siblings<sup>9</sup>. The care provided needs to be tai-

#### Table 3: Future provision of palliative care<sup>15</sup>

1. Inclusiveness: All children regardless of diagnosis, location and age should be able to access appropriate care and specialist palliative care as required.

2. Partnership: The active participation of all participants in the child's care should be encouraged, including in areas such as decision-making and planning. Participants include the child, parents and healthcare professionals.

3. Comprehensiveness: Holistic care should be provided, focusing on the physical, psychological, emotional, spiritual, social and educational needs of the child and their family.

4. Flexibility: Care should be individualised, not specific to a particular location and be adaptable to fit the changing needs of the child and family.

lored to the needs of the individual family<sup>30</sup>. The nurse should include the family in care if possible, communicate openly, share information, listen to their wishes and work with the parents to ensure effective care<sup>28</sup>. O'Brien *et al* illustrate the impact of chronic illness on the child's siblings and the importance of strategies such as intervention programmes to provide information which allow them to express their emotions in a supportive environment<sup>31</sup>. Support groups may also prove beneficial to siblings<sup>2</sup>.

Erichsen et al highlight the importance of nurses remaining honest and open surrounding issues of palliative care when caring for children and their families<sup>32</sup>. The nurse may face multiple challenges while caring for a child at end-of-life stage. The nurse should aim to create "an atmosphere of openness in a supportive environment that encourages truthfulness", advises Dunlop<sup>33</sup>. Brook & Hain support this and found families benefit from an honest, open environment in which they get to make informed choices<sup>34</sup>. A trusting relationship needs to be formed between the child, family and multidisciplinary team<sup>28</sup>.

In 2009 the DoHC published 'Palliative Care for Children with Life Limiting Conditions'<sup>4</sup> which aims to ensure coherent support and care is provided to children and their families. The policy focuses on addressing the findings and issues arising from the needs assessment<sup>15</sup> in order to build a responsive service and provide a framework for care for children with life-limiting conditions and their families<sup>4</sup>. This policy provides "a foundation upon which children's palliative care services can be developed in Ireland"<sup>4</sup>. The policy strives to ensure that all children will have the option to be cared for at home with the support of a multidisciplinary team.

## **Role of the Nurse**

The nurse has a vital role in palliative care in providing support for the family throughout the illness, managing distressing symptoms, providing respite care and supporting through the bereavement process when the child passes away<sup>35</sup>. The nurse must maintain the privacy and dignity of the child when providing safe care, ensure confidentiality, provide comfort at the end of life, foster hope, assess, plan, implement and evaluate care which is tailored to meet the individual needs of the child while continuously monitoring and adapting the care given to suit the changing needs of the child<sup>16</sup>. For nurses and other healthcare professionals providing children's palliative care, appropriate education, knowledge, skills and competencies are required to provide holistic care (see Appendix 3).

Nurses must provide appropriate, sensitive care to children receiving palliative care and should recognise that they also need to continue to grow and develop<sup>36</sup>. The nurse must holistically view the child as part of the family unit and incorporate family into care. The nurse can enlist the help of voluntary organisations to allow children to make wishes to ease suffering<sup>36</sup>. An example of an organisation is the 'Make-A-Wish Foundation', who grant wishes of children living with a life-threatening condition, aiming to enrich life with strength, hope and joy<sup>36</sup>. Psychological support is paramount and must not be underestimated. The nurse should empower the parents and child to become active participants in care with open, honest communication and support.

Clarke & Quin highlight that due to the uncertain disease trajectory of life-limiting conditions in children, some children and their families may "move back and forth between boundaries of critical illness and management of chronic illness before reaching the final stage, when death is deemed to be imminent"<sup>37</sup>. The nurse should be aware of this and recognise the importance of providing adequate support and explanation to the child and family throughout these phases.

Keene et al illustrate the importance of bereavement care for healthcare professionals providing palliative care in order to deal with feelings of grief and loss, including the use of bereavement debriefing sessions<sup>38</sup>. Rushton discovered nurses can face many emotions including pain, stress and burnout when caring for dying children<sup>39</sup>. Hylton Rushton *et al* also found suffering and loss are inevitable dimensions when caring for a child with a life-limiting condition<sup>40</sup>. Particular emphasis was placed on the importance of increasing nurses' competence and confidence in providing paediatric palliative care and increasing their ability to manage and cope with grief responses, in order to restore and maintain a sense of personal and professional integrity.

According to Malcolm *et al*, "Children's hospices are one of the many fundamental palliative care services, and they provide much needed specialist care and support to children with life-limiting conditions and their families"<sup>9</sup>. They also provide a range of services including respite, play therapy, sibling support and activities, symptom control, end-of-life and bereavement care. Play is a key aspect of paediatric palliative care as it ensures emotional and sensory development. However, the DoHC did not see the development of a children's hospice as an immediate priority, as parents may not want to be separated from their children in their last few days and would rather care for them at home<sup>15</sup>.

The DoHC<sup>15</sup> suggested four principles on which future service developments regarding palliative care should be based (Table 3). These must be incorporated into future care planning and the provision of services for children and their families.

The DoHC highlight recommendations for the future development of palliative care<sup>4</sup> (see Appendix 4). Palliative care is available in every county in Ireland; however, there is varied access to specialist inpatient units and multidisciplinary involvement and support. There have been many recent developments regarding palliative care for children in Ireland which are important steps in creating an effective, appropriate palliative care system for all who require it.

Ireland's first children's hospice, the 'LauraLynn House', is in the final stages of completion and aims to provide respite care, practical and emotional support and medical and emergency care, while providing families with a choice when death is approaching and providing ongoing support after the child has passed away. The vision of the hospice is about putting "life into a child's day, not days into a child's life"<sup>41</sup>.

To enable children to die at home in familiar surroundings, a 'Children's Hospice Home Care' programme has been developed by government agencies. The aim is to provide appropriate care at home as a substitute for acute hospital care<sup>4</sup>. Developments in this programme included the appointment of Ireland's first Consultant Paediatrician with a Special Interest in Paediatric Palliative Medicine and the establishment of palliative care courses funded by the Irish Hospice Foundation for nurses and other healthcare professionals. A network of Children's Outreach Nurses will be developed throughout the country. These are important developments in paediatric palliative care, as O'Leary stressed the importance of children being cared for by appropriately trained staff<sup>42</sup>.

In conclusion, paediatric palliative care is very topical in society at present. Romesberg states the function of palliative care is to add life to the child's time, not add time to the child's life<sup>43</sup>. Palliative care incorporates maintaining the best quality of life possible for the child and is the responsibility of all healthcare professionals. Morgan recognises that although palliative care is stressful for nurses, it can be rewarding and by providing holistic care "nurses have the power to create a brighter journey for patients and families" <sup>44</sup>.

Although progress has been made in recent years regarding children's palliative care services in Ireland, further development needs to occur in order to continue providing holistic care. The recommendations for future practice include the creation of specialist palliative care teams incorporating paediatric consultants and community palliative care nursing positions, combined with further education and training in paediatric palliative care. These will assist with developing adequate children's palliative care services which should be provided by appropriately trained and educated paediatric healthcare professionals. The development of community palliative care roles will assist with achieving one of the ultimate goals of palliative care: allowing the child to spend their last few days in their own home, surrounded by loved ones and supported by healthcare professionals.

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# Appendix 1

# Categories of life-limiting conditions in children:

(Source: DoHC 2009<sup>4</sup>)

**Group 1:** Life-threatening conditions for which curative treatment may be feasible,

but can fail. Where access to palliative care services may be necessary when treatment fails children in long term remission or following successful curative treatment are not included. (Examples: cancer, irreversible organ failures of heart, liver, kidney).

**Group 2:** Conditions where premature death is inevitable, where there may be long periods of intensive treatment aimed at prolonging life and allowing participation in normal activities. (Example: cystic fibrosis).

**Group 3:** Progressive conditions without curative treatment options, where treatment is exclusively palliative and may commonly extend over years. (Example: Batten disease, mucopolysaccharidoses, muscular dystrophy.)

Group 4: Irreversible, but non-progressive conditions causing severe disability leading to susceptibility to health complications and likelihood of premature death. (Examples: severe cerebral palsy, multiple disabilities such as following brain or spinal cord insult.) Appendix 2

## Children's palliative care differs from adult palliative care as:

(Source: DoHC 2009<sup>4</sup>)

- The number of children dying is small.
- The conditions are extremely rare with diagnoses specific to childhood.
- Predicting a prognosis can be difficult.
- The palliative phase is often much longer and can be episodic and unpredictable.
- Children may experience several apparently terminal phases.
- Care embraces the whole family and uses a model of familycentred care.
- Parents requiring adequate resources to support them with the heavy responsibility for personal and nursing care.
- Siblings are vulnerable and parents must continue to provide care for them while often providing 24-hour care to a sick child.

- Conditions are sometimes familial – other children in the family may be living with, or have died from, the same condition.
- Children's ability to communicate and understand varies according to their age or stage of development.
- The provision of education and play when a child is sick is essential.

# Appendix 3

## Competencies required for nurses to work with children with lifelimiting conditions:

(Source: ACT UK adapted for use from DOHC 2009<sup>4</sup>)

#### The ability to:

- Comprehensively assess and recognise the needs of the child and the family and actively monitor the child's condition.
- Listen to and respect the parents' choices, wishes and beliefs.
- Deal with specific problems and symptoms associated with the life-limiting illness.
- Communicate effectively and age appropriately with children and families to allow for shared decision making regarding care choices.
- Provide family-centred care and support throughout illness and beyond death to all family members, particularly siblings.
- Act as an advocate for the patient and family to secure additional services, funding and resources.
- Maximise the child's developmental potential, both physical and emotional, and enhance quality of life.
- Anticipate future problems associated with the life-limiting condition.

- Assess and manage symptoms throughout the duration of the illness including pain, dyspnoea, nausea, vomiting, constipation, anorexia, pruritis, fatigue, urinary retention and seizures<sup>2</sup>. Treatments include analgesia, anti-emetics, oxygen, laxatives and small frequent meals<sup>45</sup>.
- Assess and manage the psychosocial needs of the child and their family.
- Meet the spiritual needs of the child and family whilst respecting cultural and religious beliefs.
- Have the knowledge of the available facilities and resources and make referrals to these when necessary.
- Work efficiently as a member of the multi-disciplinary team to provide holistic care and coordinate services for the child and family.
- Deliver information in a timely, appropriate fashion regarding prognosis, treatments and side effects of same<sup>5</sup> which will allow for informed decision-making<sup>37</sup>.

# **Appendix 4**

## Recommendations for future practice in relation to paediatric palliative care:

(Adapted from DoHC 2009<sup>4</sup>)

- The creation of a hospitalbased specialist palliative care team is necessary, including consultants, clinical nurse specialists, nurses and social workers.
- A Consultant Paediatrician with a Special Interest in Palliative Care should be appointed who will have access to inpatient beds in a hospital setting.
- Paediatric Palliative Care services should be based in the proposed new national paediatric hospital when it is

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operational.

- 8 regionally based Outreach Nursing posts should be created to facilitate integration of care across multidisciplinary services including occupational therapy and physiotherapy and provide support in the community.
- Respite care and supports should become more readily available for children and their families, both in the home and outside the home.
- Children's Hospice-At-Home teams will be developed by the HSE.
- Palliative care should be provided by paediatric-trained medical and nursing staff with the support of specialist palliative care services.
- Paediatric services should work closely with specialist adult palliative care services to provide appropriate care.
- Primary care teams and multidisciplinary network services should be created and should be available at community level.
- Further developments are needed regarding education and training for healthcare professionals in order to be able to adequately address the needs of children requiring palliative care.
- Further developments of bereavement services are recommended.
- Education and play should be incorporated into the delivery of palliative care.
- The development of standard protocols and guidelines are needed to ensure a standardised level of care given across all settings.
- A National Development Committee should be created to provide a national forum for the development of services and ensure these

are available to all.

 The development of a National Database of children with life-limiting conditions is necessary to assess the need for palliative care and continuously improve the delivery of care.

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- The Jack & Jill Children's Foundation <u>www.jackandjill.</u> <u>ie</u>
- <u>www.rainbowhospice.org</u>

# MDG 5: Far from Simple, Far from Certain

#### Emer Cullen, 5<sup>th</sup> Year Medicine, TCD



"The best judge of whether or not a country is going to develop is how it treats its women. If it's educating its girls, if women have equal rights, that country is going to move forward. But if women are oppressed and abused and illiterate, then they're going to fall behind." – Barack Obama<sup>10</sup>

'Improve maternal health'. This was the 5<sup>th</sup> goal at the UN Millennium Summit in 2000 when all 193 countries of the United Nations ratified the United Nations Millennium Declaration. The aim was to decrease maternal mortality by 75% and to provide universal access to reproductive health care by 2015<sup>1</sup>. With only three years to go until the 2015 deadline, only 23 countries are on target<sup>2</sup>.

940 women die each day from pregnancy-associated complications<sup>3</sup>. That's over 350,000 women per year, or the equivalent of the populations of Cork, Galway and Limerick cities<sup>4</sup>, dying from mainly preventable causes. The top 5 causes of death, accounting for over 80%, are haemorrhage; sepsis; unsafe abortion; obstructed labour; and pregnancyrelated hypertensive disorders<sup>5</sup>; all of which should have a low mortality if recognised and treated appropriately. For every woman that dies, more than 20 others suffer from serious complications related to pregnancy or childbirth, such as chronic infection and obstetric fistulae<sup>6</sup>. In Sierra Leone, the lifetime chance of a woman dying in childbirth is 1 in 8<sup>7</sup>. It is one of the top five countries with the highest maternal mortality ratios, along with Afghanistan, the Central African Republic, Malawi and Chad<sup>8</sup>, each of which have a MMR of over 1000 per 100,000 population. This is not just a health issue. This is

a violation of Article 25 of the Universal Declaration of Human Rights which enshrines the right to medical care, emphasising that 'motherhood and childhood are entitled to special care and assistance<sup>49</sup>.

The Millennium Development Goals cannot be achieved in isolation. The eight goals work in tandem. Poverty (MDG 1 & 7), lack of education (MDG 2 & 3), gender inequality (MDG 3) and lack of access to health services are all intertwined in preventing MDG 5 from being achieved. Number 3 is particularly important in achieving all the other goals. It endeavours to 'Promote Gender Equality and Empower Women'. Unless women are treated as equals within their communities and families, none of the other issues that are precipitating maternal mortality can be fully addressed.

"The best judge of whether or not a country is going to develop is how it treats its women. If it's educating its girls, if women have equal rights, that country is going to move forward. But if women are oppressed and abused and illiterate, then they're going to fall behind." – **Barack Obama**<sup>10</sup>

Part of MDG 3's aim was to abolish the gender discrepancy in all levels of education by 2015. In 2008, 96 girls were enrolled in school for every 100 boys. This is an improvement compared to 91 in 1990.<sup>11</sup> Education is vital for independence in the future.

Women account for only 19% of elected representatives in parliaments. Only nine of the 151 elected heads of state and 11 of the 192 heads of government are women<sup>12</sup>. In Ireland only 15% of TDs are female<sup>13</sup>, while in Rwanda 56% of parliament seats are held by women<sup>14</sup>. Therefore female participation in politics may not necessarily correlate with a lower MMR, but worldwide this trend shows the inequality between genders. MDG 5 can never be achieved when women are still seen in many countries as second-class citizens. Prior to the Marital Power Act of 2007, women in Botswana still needed their husband's consent to own property or to apply for loans<sup>15</sup>. In Kyrgyzstan, only 15% of women have complete control over their property, inhibiting them from personal independence.

If women are made to be solely dependent on their fathers, brothers or husbands for income and survival, they can never truly have a voice. Gender equality is essential for women to make their own decisions regarding reproduction and to demand that their right to health care is not withheld.

#### **Poverty**

Even in the most developed countries, women from lower socioeconomic backgrounds and ethnic minorities have higher maternal mortality rates. Amnesty International recently published a study which shows that African-American women in the US are four times more likely to die due to pregnancy-related causes than Caucasian women<sup>16</sup>. Women from poorer backgrounds have less access to reproductive healthcare and present later to antenatal clinics, which leads to worse outcomes for both mother and baby. Globally, poverty stops women accessing vital healthcare<sup>17</sup>. Even in countries where maternal healthcare is supposed to be free, women may be expected to pay for medicines and medical supplies. In January, there were reports claiming that women were being detained for not paying hospital fees in Zimbabwe, despite free access being announced by the Zimbabwean government in October<sup>18</sup>. The cost of even getting to a clinic is too much for some families, especially in isolated communities. Transport costs account for almost 50% of the total spent on a normal delivery in Tanzania<sup>19</sup>. In Sierra Leone, the government is encouraging communities to create a pooled fund for obstetric emergencies but even giving to this fund can push families further into poverty<sup>20</sup>. Seasonal variation in income can also have a huge impact on a family's ability to pay, especially in rural farming communities.

These women are also at an increased risk of infections such as malaria and typhoid, because of lack of sanitation and basic things such as mosquito nets. Poverty also impacts on nutrition. Malnutrition often affects female children more so than other family members. Approximately 50% of girls in developing countries are nutritionally anaemic<sup>21</sup>. Anaemia potentiates the complications of haemorrhage, as an already low blood count means even a small bleed could be life-threatening. Uneducated women are less likely to know that adequate nutrition is essential to a healthy pregnancy. Poverty and lack of education go hand

in hand and impact dramatically on health. Women's health especially suffers, which further cements the inequalities women face.

## **Education**

"Knowledge is power. Information is liberating. Education is the premise of progress, in every society, in every family." – **Kofi Annan** 

Educated women are less likely to have large families, decreasing the risk of complications associated with pregnancy. They are more likely to be able to work and therefore are wealthier. Literacy is a major factor in increasing awareness and knowledge surrounding peri-natal care. They are also more likely to be empowered to ask for and receive the care they deserve. This includes the availability of quality antenatal care, and having a skilled birth attendant present during labour.

Knowing when to ask for help is one of the most important determinants of survival. In the developing world 37% of women give birth without a skilled birth attendant<sup>22</sup>. Although this number has decreased since 1990, it is still too high. The majority of these women live in remote villages and rely on family members to help them through their labour. Those living in isolated communities are more likely to be uneducated and unempowered. They may not even realise that they are entitled to healthcare. Medical facilities are often too far away to save these women if complications do arise. Women and their families, due to lack of education, may also be unaware of warning signs that should prompt urgent medical attention.

### **Teenage Births**

Adolescent mothers are a particularly vulnerable group. 15 to 19 year olds are twice as likely to die during pregnancy as those over 20 and those younger than 15 are at five-times the risk<sup>23</sup>. Complications of pregnancy account for the main causes of death for girls aged 15 to 19 years old globally<sup>24</sup>. In Yemen, 14% of girls are married by the age of 15 and 52% by 18 years old<sup>25</sup>. Women who marry early generally have more children. There are many social pressures to prove fertility. They also have children at shorter intervals which increases the risk of death or disability due to childbirth<sup>26</sup>. Younger girls have not matured physically or psychologically and are at an increased chance of prolonged, obstructed labour. Without emergency obstetric care, the outcome is often death for both mother and baby.

Child marriages occur for a number of reasons. In some communities, especially in Africa and Southern Asia, it is a tradition that girls marry soon after puberty. In others it is an effort to reduce financial burdens on a family or as a form of protection of their daughter's purity. Regardless of the reason behind it, marriages before the age of 18 without proper consent are in violation of the Convention of the Rights of the Child<sup>27</sup>. In these societies, when girls marry they are then seen as adults leaving behind any added protection they would have as children in the eyes of the law. This means that although it would be illegal for a grown man to have sex with a 14 year old, as long as it is within a marriage it is condoned.

In many areas where teenage marriage is common practice, young girls are married to much older men. This can contribute to unequal power-sharing within the household. Teenage wives are less likely to be allowed to make decisions for themselves, including visiting family and friends and whether or not they work. They also have less access to contraception and reproductive services without their husband's sayso<sup>28</sup>. Young girls are more accepting of domestic violence, including marital rape, which increases the number of pregnancies and complications.

Lack of education potentiates early pregnancies. In Niger, 75% of women are illiterate. 80% of women are married before the age of 18<sup>29</sup>. Higher levels of education have been shown to be protective against early marriages<sup>30</sup>. In societies where girls stay at school, they are less likely to be married against their will at a young age. In Tanzania, girls who went to secondary school were 92% less likely to be married by the age of 18 than those girls who only completed primary school in a 2005 report by UNICEF. This again emphasises the importance of education in the empowerment of women. In developed countries, increases in education and career choice, coupled with more effective means of contraception, means that the number of teenage births halved between 1970 and 2001<sup>31</sup>. However, progress has slowed down in lowering teenage pregnancies in less developed countries<sup>32</sup>.

#### Contraception

"Birth control is the first important step woman must take toward the goal of her freedom. It is the first step she must take to be man's equal. It is the first step they must both take toward human emancipation." – **Margaret Sanger**<sup>33</sup>

Contraception is a vital component to lowering maternal mortality and morbidity rates. It is estimated that 1 in 10 pregnancies result in unsafe abortions<sup>34</sup>. Adolescent girls in developing countries alone undergo between 2.2 and 4 million unsafe abortions each year. 40% of these occur in sub-Saharan Africa. It is estimated that 13% of all maternal deaths are due to unsanitary or unsafe abortion practices and lack of appropriate follow-up<sup>35</sup>. The majority of abortions take place due to lack of knowledge about modern contraceptive methods or lack of access to them. The use of reliable forms of contraception is lowest among the young, the poor and the uneducated. Worldwide at least 215 million women would prefer to postpone or prevent becoming pregnant but they do not have access to modern or effective forms of contraception. A lack of modern contraception accounts for nearly 82% of all unintended pregnancies<sup>36</sup>. It has been estimated that if reliable contraception was provided to all those who wanted it, it would reduce the number of maternal deaths by 33%. Women have the right to make the choice about whether they want children or not. Education and empowerment would guarantee that this right is upheld. Contraception is also necessary in

order to decrease another huge contributor to maternal mortality: HIV.

#### HIV

In 2008, over 64,000 maternal deaths were caused by HIV infection<sup>37</sup>. This accounts for 1 in 5 deaths, and is a main factor for the lack of decrease in MMR in eastern and southern areas of Africa. Approximately 16.6 million women worldwide are infected with HIV and over 76% of these reside in sub-Saharan Africa<sup>38</sup>. HIV contributes to both direct and indirect maternal mortality. It is directly associated with increased numbers of anaemia, postpartum haemorrhage and sepsis. HIV-positive women are also more susceptible to opportunistic infection such as TB, malaria and Pneumocystis carinii pneumonia, which may progress faster in pregnancy<sup>39</sup>. Appropriate treatment of HIV with antiretrovirals is essential to decrease its bearing on maternal mortality. Education is once again an important factor in the fight against HIV. A survey of married women in Yemen showed that only 60% of women interviewed had heard of AIDS<sup>40</sup>. It also showed some of the misconceptions and discriminatory views about HIV/ AIDS, including the belief that HIV can be passed on by mosquito bites and that teachers who are HIV-positive should not be allowed to continue working. These kinds of biases are detrimental to the fight against AIDS. People are less inclined to avail of testing and treatment when these beliefs are prominent. In many societies, it is acceptable for men to have multiple partners. Young women are also at an increased risk of violence and rape, which increases their risk of contracting the virus. Gender inequalities may also impede women's ability to get tested and treated and overall HIV/AIDS disproportionately affects women<sup>41</sup>. Societal norms are a huge contributor to this fact.

#### **Involving men**

Maternal mortality is not an issue that can be tackled by women alone. Parenthood is a partnership and so too should the process of becoming parents. Men are more prominent in local and national governments a key role in implementing legislation and assigning funds to reproductive health projects. As religious, community and political leaders, they can control access to reproductive information and services. To effectively include men in this process, it is important that gender prejudices are addressed. In many societies, children are taught that aggression and dominant behaviour towards women are acceptable for men. They are not encouraged to take an active caring role in their families and so may find it difficult to communicate effectively with their wives, especially in terms of contraception and family planning. In Harare, Zimbabwe, Padre is a forum for men that are encouraging the breakdown of traditional gender roles. A poster in its headquarters bears the slogan 'Men Do Cry'. Similar projects are being supported by the UNFPA in many developing countries, encouraging men to support their wives through pregnancy and beyond<sup>42</sup>. In Niger, over a hundred 'Schools for Husbands' meet together twice a month to discuss specific reproductive issues in their local regions. Since the introduction of the schools in the Zinder province 4 years ago, the numbers of women accessing the local maternity services has increased dramatically. An important aspect of these projects is the backing of local authorities as well as traditional and religious leaders, including the Sultan of Zinder<sup>43</sup>.

worldwide than women and so play

### Conclusion

MDG 5 aims to improve maternal health. It is a complex and multifaceted process. A profound societal change in attitudes towards women is a fundamental part of achieving this goal and MDG 3 rightly promotes equality between men and women. This is integral to any process.

Low education levels with associated information deficits, along with poverty, increase a woman's chance of dying in childbirth. Inequality also prevents women accessing contraceptive information and services, which also increases the rates of pregnancy and HIV infection.

As previously stated, all the Millen-

nium Development Goals must be achieved in tandem. However, MDG 3 is particularly pertinent in the achievement of MDG 5. Unless gender equality can be achieved, women will always be poorer. They will be more likely to be victimised. They will always have less access to education and poorer access to services than their male counterparts, and this includes access to reproductive health. This is why MDGs 3 and 5 are so intricately linked.

MDG 5 is a fundamental right. It is imperative that we all support disadvantaged women through any and all ways that will help effect the changes for full MDG 5 implementation.

"When women thrive, all of society benefits, and succeeding generations are given a better start in life" – **Kofi** Annan

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## See You Next Year!

