# Australian Medical Student Journal

## Watch your mouth . . . How your language affects your patients



Alan Finkel: Australia's Chief Scientist discusses medical research Preventing HIV transmission through PrEP Advocating for newly arrived refugees

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ISSN (Print): 1837-171X ISSN (Online): 1837-1728

Cover designs by Jason Vicary (James Cook University)

The Australian Medical Student Journal is an independent not-for-profit student organisation.

The Australian Medical Student Journal can be found on EBSCOhost databases.

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Australian Medical Student Journal Volume 7, Issue 2 | 2016



## Volume 7, Issue 2 | 2016

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## AM SJJ

## Editor's welcome: The future of Australian medical research

**Mr. Lewis Fry** Editor-in-Chief, AMSJ Final Year MBBS, Monash University

Welcome to Volume 7, Issue 2 of the *Australian Medical Student Journal* (*AMSJ*). Here, we have the privilege of publishing the best research, opinions, reviews, and insights from medical students and junior doctors around Australia.

We feature outstanding guest articles from influential leaders across the medical landscape. Dr Alan Finkel AO, Australia's Chief Scientist, looks optimistically ahead with an incisive commentary about the future landscape of medical research. With the rise of artificial intelligence and robots with far superior decision-making power in patient care, research skills will become increasingly valuable as a clinician, and will help us happily and healthily live to 100 years of age.

Dr Chris Nickson of *lifeinthefastlane.com*, SMACC, and FoamEd fame provides you with the essential skills to maximise the everdeveloping resource of Free Open Access Meducation – a must read to increase the efficiency and effectiveness of your learning and engagement.

Prof. Kingsley Faulkner AM, Chairman of Doctors for the Environment Australia (DEA), writes on climate change, health, and our responsibility to act. Forget whatever government might threaten Medicare – climate change is the greatest crisis for human health and we need to find a voice and translate this into action.

Once again, we have received topical and original articles of excellent standard over a range of topics. Sharna Kulhavy, in her original research article, highlights the deficiencies in knowledge in women taking the oral contraceptive pill in a rural setting. This adds to previously published work by this journal in the area of health literacy and its impact on patient care. Obert Xu reviews the efficacy of, and issues, surrounding the impending implementation of pre-exposure prophylaxis (PrEP) in the Australian setting. Considering the potential effectiveness of PrEP as a public health strategy in combatting HIV infection, this is something all future practitioners should be aware of. In a succinct review, Ronny Schneider evaluates the current and emerging evidence for persistent occiput posterior in labour.

Finally, our feature articles and letters highlight a range of current issues, for example, refugee health, and the health profession's use of language with patients. It is with exception we publish a letter anonymously, on a student's experience of harassment in medicine. It is vital to share these stories to confront this scourge that discourages, discriminates against and disillusions our best and brightest. It is an indictment of our culture that the author feels the need to write incognito for fear of the personal impact of speaking out, however I commend her courage to write at all.

The AMSJ is a national publication staffed by committed volunteers from medical schools throughout the country. Each issue requires many hours of work from editors, proof readers, and publications and IT teams. All this is not possible without the work of a great team of university representatives, publicity, and sponsorship and finance teams, all lead by our capable executive. My thanks to each and every person listed in this journal that has given their time to promote student research and national collaboration.



We thoroughly enjoy working with our authors and peer reviewers – thank you all for your submissions and feedback. Funding for medical research continues to be difficult throughout Australia, but there are exciting times ahead. I would like to thank our readers and sponsors for their ongoing support to provide the environment to encourage and develop the budding leaders in medicine and research with the commitment to submit to this publication. On behalf of the AMSJ, I hope you enjoy this issue.

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### Thank you to AMSJ Peer Reviewers (Volume 7, Issue 2)

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### Aiming for one hundred

Dr Alan Finkel AO

Australia's Chief Scientist

Dr Finkel commenced as Australia's Chief Scientist in 2016. He has an extensive science background as an entrepreneur, engineer, neuroscientist, and educator. Prior to becoming Chief Scientist, he was the Chancellor of Monash University and President of the Australian Academy of Technology and Engineering. Dr Finkel was awarded his PhD in electrical engineering from Monash University and worked as a postdoctoral research fellow in neuroscience at the Australian National University. In 1983 he founded Axon Instruments, a California-based, ASX-listed company that made precision scientific instruments. After Axon Instruments was sold in 2004, Dr Finkel became a director of the acquiring company. In 2006, he returned to Australia and undertook a wide range of activities including co-founding Cosmos Magazine.

A few months ago, I went to a public lecture that was the best I've ever had the privilege to attend. The speaker was Alan Alda – Hawkeye from the popular television series  $M^*A^*S^*H$  – now 80 years old, and thriving. And so is the subject of his talk: his love life. He just happens to be in love with science.

My dream is for a future in which we see heroes like Alan Alda, perhaps 100 years old, standing ramrod straight at the podium. They'll speak out with a clear voice, bright eye, sharp mind, and strong heart... and that rarest of miracles, no notes. And we'll marvel at their wit, but barely notice their age – because living in rude health to 100 will be the norm.

Am I too bold to tack 20 years onto average life expectancy? Perhaps. Yet, look at how swiftly our expectations progress. A woman born in Australia in 1900 could expect to live to 57; and a man (even excluding those killed in war) to just 54. So the average Australian born in 1900 would die before the modern Australian has quite done with their midlife crisis.

In just four generations, we've added more than 25 years to the average female life, and close to 24 years for males. Even better, as our lives extend, so too has the period we expect to enjoy disability-free. Which is just as well, given the size of the superannuation balances we've now got to accrue to fund two or three decades of sprightly 'retirement'.

Science advances, and societies adjust. The challenge is to do it again. And if we achieve another 20 years, it will be in large part a testament to you: the doctors, researchers, and policymakers of the future.

You will be aided by an unimaginable suite of scientific instruments and artificial intelligence programs. Some commentators will tell you that these tools will displace the flesh-and-blood doctors we rely on today. Don't believe them. Remember what they said about the fitness industry. First television was going to kill the local gym. Then workout videos would nail the coffin. The same for FitBits and Wi-Fi enabled rowing machines. Yet, we still choose to pay a premium for gyms and personal trainers. That premium buys the things we humans require, over and above the information we could access online: discipline, insight, and motivation. Doctors who provide those keys to health will always be in demand.

For early-career researchers, the age-old challenges of forging a career still stand. Investing in the right skills. Making the right contacts. Working out where the interest, and the money, is likely to be. Managing one of those three would be impressive. Managing all of them may not be enough in the competitive environment we operate in today.

I have seen the process of applying for a National Health and Medical Research Council (NHMRC) grant likened to *The Hunger Games*. I can't speak to the experience of the young grant applicant today, but I can read the success rates, and I understand why early-career scientists express their frustration.



Dr Alan Finkel AO

As Chief Scientist, I cannot offer easy answers. I do commit to work with all research funders and providers – public and private – to maximise the opportunities for Australian medical science.

There's an old rule of thumb that science turns money into knowledge; and innovation turns knowledge into money. I've found that it focuses our politicians' minds. There is bipartisan commitment at the Commonwealth level to an innovation policy framework that fosters growth in the medical device, biotechnology, and pharmaceutical sectors. It is backed by rising investment from venture capital funds in biomedical startups; and new approaches to collaboration from Vice-Chancellors and CEOs.

But all of it always comes with a rider: great science needs great equipment and great people.

If we want to build the critical mass to attract new investment in both facilities and staff, we need to keep the quality bar set high. We can pursue sensible regulatory systems that minimise the costs, for example, of clinical trials – and we need to do so to remain competitive. At the same time, our brand in the global market is excellence and reliability; a brand with particular resonance in the Asian markets we seek to develop.

Maintaining that brand calls for clarity of vision and continuity of investment. This is the principle I will emphasise across the many lines in my 2016 to-do list.

At the top of that list is the task of mapping Australia's research infrastructure needs for the decades ahead, including the nextgeneration facilities. For too long, we have drifted without a long-term bipartisan commitment to funding and operating principles for our critical scientific equipment. The price we pay for uncertainty is the loss of our best people. I am honoured to be leading this landmark review, and welcome the contribution that medical researchers have already made.

#### So what would be my advice to you?

First, pursue medical science because you love it. Learn your discipline deeply and don't rely on the plethora of fact-finding tools. When you are dealing with a nervous patient you need the knowledge at your fingertips. Trust me, it's the same with a footloose investor. And when you're brainstorming ideas with your supervisor, or lying in bed with ideas surging through your mind, deep knowledge takes the training wheels off your imagination.

Second, keep the doors of opportunity open. If you love research, why not consider an industry role? If you love making things, why not make a product or a startup? If you love engineering systems, why not engineer a company as the CEO? If I had one wish, it's that Australians would see all the valuable transferrable skills that come with science training, and most of all, a science PhD. Employers will only be able to see those skills if graduates recognise and cultivate them within themselves.

Third, be strong in pursuit of that precious 20-year extension to the average Australian life. We need all the advocates for evidence-based science we can get, given all the snake oil we're ingesting today. As a society, we'll progress no further than our shared understanding of the values science allows. Stand with Alan Alda, in the advance guard.

So, I'm aiming for 100. My grandchildren will aim for more. My greatgreat-grandchildren might ring in the 23rd century. I thank you today, on their behalf, and wish you well.



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### Hacking Medical Education with FOAM

#### Dr Christopher Peter Nickson

Intensivist, The Alfred Hospital, Melbourne, Australia Chris is an Intensivist at The Alfred Hospital in Melbourne and is the Monash University SPHPM-Alfred ICU Education Practitioner Fellow. He is also an emergency physician and has completed further training in clinical toxicology and clinical epidemiology. He coordinates The Alfred ICU education and simulation program, and teaches on many other Alfred ICU courses. He is cocreator of free open-access medical education (FOAM) projects such as Lifeinthefastlane.com and the SMACC conference, and is @precordialthump on Twitter<sup>™</sup>.

"There's no charge for awesomeness..." — Kung Fu Panda

#### **Hacking Medical Education!?**

'Hacking Medical Education with FOAM'... 'What?' I hear you whisper under your breath. A title like that deserves an explanation, I agree.

To many of us, hacking means "gaining unauthorised access to data in a system or a computer" [1]. This works for me because I have often found that access to knowledge, and how to make the most of it, is not always transparent in medicine. However, the definition of 'hacking' that I like the best is, "to modify or write... in a skillful or clever way" [1]. I think FOAM or Free Open-Access Med(ical Ed)ucation helps do these things [2,3].

I should also clarify what I mean by medical education. I don't mean medical school... Or at least not just medical school, which is somewhat arbitrarily bound by examinations and assessments. Indeed, I have to agree with Sir William Osler who claimed that *"Perfect happiness for student and teacher will come with the abolition of examinations, which are stumbling blocks and rocks of offense in the pathway of the true student"* [4]. Yet, even the great Osler, the man who brought bedside teaching to North America, knew that 'assessment drives learning': *"I do not know of any stimulus so healthy as knowledge on the part of the student that he will receive an examination at the end of his course. It gives sharpness to his dissecting knife, heat to his Bunsen burner, a well worn appearance to his stethoscope, and a particular neatness to his bandaging"* [4]. However, what I am really writing about is how FOAM can be used to achieve lifelong learning in medicine, learning that begins in medical school but, hopefully, continues forever after.

#### FOAM

FOAM is a dynamic collection of free educational resources available online and largely shared via social media [2,3]. These resources include blogs, podcasts, videos, tweets, graphics, animations, and more. However, FOAM is more than just resources; it is an interactive community of like-minded individuals bound by a common ethos. The FOAM ethos holds high quality educational resources that can and should be available, free of charge, to anyone who helps people with health problems.

There are now at least 316 blogs and podcasts creating these resources worldwide in my specialties of emergency medicine and critical care alone [5]. It has also culminated in the Social Medical and Critical Care Conference (SMACC) [6], which provides a physical meeting place for this community and releases all talks as FOAM. The next SMACC will be held in Berlin, Germany in June 2017.

Importantly, these resources are available to anyone, anytime, anywhere. This makes them ideally suited for 'just in time' learning at the point of care. They help provide interpretations of the published literature by practicing clinicians as well as approaches to problems when there is no good evidence informing the topic. They also provide an additional means of tacit knowledge sharing, the 'on the job' 'know how' that can never be found in textbooks or journals [7]. Furthermore, FOAM is another way in which we can socially construct knowledge



Dr Christopher Peter Nickson

and learn from, and with, our peers [8].

#### Arghh, information overload!

Given this explosion of resources, many people worry about information overload – but that is a myth - the real problem is 'filter failure' [9]. If you determine your knowledge needs, and connect with other people you trust – via TwitterTM, for instance, the high quality, relevant resources will 'bubble up' through your network of filters making it likely that you will find what you need. Try searching for the #FOAMed hashtag (not #FOAM!) to see what is out there [10]. Alternatively, if connecting with people is not your thing, you can use the GoogleFOAM search engine [11] or read 'The LITFL Review', a weekly FOAM summary on *lifeinthefastlane.com* [12]. Some people argue that they don't have time to use social media for medical education. Others would respond that, if used correctly, you don't have time *not* to [13].

#### Is there a curriculum?

The bare facts of life as a learner in medicine are that you have to earn your stripes – usually through passing exams... and many exams await the medical trainee. FOAM can help students master the medical school curriculum and pass the inevitable exams. Indeed, there are now resources such as FOAMmedstudent.com specifically designed for medical students [14]. However, FOAM itself has no defined curriculum, and it does not need one [15]. To do our best for our patients we must all create our own 'internal curriculum'. This is the path of learning we each must journey along to become the doctor we want to be, practicing the type of medicine we want, and looking after the particular patients that we will actually encounter. Textbooks and prescribed curricula are not sufficient – we must learn from our patients, our colleagues, the published literature, and FOAM.

#### Goodbye, bedside mentor?

As a learner it is easy to get caught up in the engaging nature of FOAM resources, the fancy graphics, and the funky podcast intro music. However, FOAM is just an adjunct to learning and nothing ever replaces the bedside mentor. One of my own former teachers was Aucklandbased pathologist, Professor Tim Koelmeyer, who would constantly remind us that the patient is "our first, last, and only teacher" [16]. What he meant was that real learning takes place at the bedside, where it is facilitated by experienced clinicians who help students make sense of what patients are trying to teach them. Similarly, these experienced clinicians are vital for helping the inexperienced make sense of FOAM resources. In particular, junior trainees must always be supervised and should never institute what they have learned from FOAM without discussion with their seniors first. This is important because medical knowledge (regardless of the source) can be taken out of context and does not apply to all settings or may require a specific skill set to be safely used. In turn, learners can help their teachers by suggesting that engaging FOAM resources be used in a 'flipped classroom' model [17]. Learners can watch, read, or listen at home and then come prepared for meaningful discussions and active learning sessions in the workplace facilitated by an expert. In this way, FOAM does not replace the bedside mentor, but helps learning happen.

#### **Caveat Emptor!**

Critical thinking skills, for some reason, are often not explicitly taught in schools or universities [18]. However, I firmly believe that critical thinking is the hallmark of the expert clinician. Critical thinking and decision making skills are what link evidence from the literature, to clinician expertise, the patient's individual circumstances and the setting in which it occurs [18]. Importantly, if we want to thrive in medicine – and have our patients thrive too – we need to learn from multiple sources of information and we have to critically evaluate them all rather than blindly applying them. Which raises the question, how do we know if a source of information is reliable?

I have developed a brief list of questions that I use to assess the quality of FOAM resources before using them, though they can be applied to almost any source of information.

- 1. *Is the author identifiable?* (If a FOAM resource is anonymous, sound the alarms!)
- What are the author's qualifications? (This does not mean a student's blog should be ignored, it just helps put it in context. At the other extreme, beware of 'Arguments from Authority' that lack any other basis.)
- Are there conflicts of interest? (Beware of financial conflicts in particular, including Big Pharma's influence on the published medical research.)
- 4. Does what I know check out? (I'm reassured to an extent if the author has written about topics that I do know about and did a good job, however, an expert in one sphere is not necessarily an expert in another!)
  5. Is it logical?
- (Does the author commit logical fallacies?)
- 6. Is it referenced? (Claims should be referenced appropriately so they can be verified.)
- 7. Is it supported by trusted recommendations?(Do other people I trust rate the resource highly?)
- How does the author respond to criticism? (No one is right all the time – and if we truly base our knowledge on science, then nearly everything we know will be falsified or revised in the future. I am reassured by authors

that respond to constructive feedback openly and are willing to make improvements as part of a post-publication peer review process.)

Critical thinking is perhaps the most useful medical education hack in your armoury. It is a pre-requisite for using FOAM, or any other source of information, effectively. Unfortunately, for various reasons, even most published medical literature is false [19,20]. FOAM can be a mixed bag. Caveat emptor!

#### Learn using learning science

Now is an exciting time to be a learner because scientists are actually figuring out how people learn effectively [21,22]. Although much of this work from the cognitive science and educational psychology literature has yet to be validated in the world of medical education, we are silly if we ignore it. Fortunately, FOAM can neatly integrate with many of the principles of the new science of learning.

First, cognitive scientists tell us that we are actually quite good at putting things into our memories, then the challenge comes when we try to recall them at the right time and in the right form. To get good at memory retrieval, we have to practice retrieving. This can be done by testing oneself, using the so-called 'test effect' [21,22]. Retrieval practice is even more effective when it takes place in similar contexts to that which we are training for, such as the examination hall or the patient's bedside. FOAM resources such as the case-based 'show-hide' answer blog posts on Lifeinthefastlane.com, BroomeDocs.com, and INTENSIVEblog.com are well suited for such practice [23-25]. Retrieval practice is even more effective when we combine the test effect with spaced repetition. We make stronger, more retrievable memories if we exercise our recall when we are just on the verge of forgetting. Spaced repetition software are available that have built in algorithms that allow us to do this with virtual flashcards [26]. Fortunately, FOAM resources, which are free to reuse and modify with appropriate attribution, can easily be cut-and-pasted into flashcards or linked from them for this purpose.

FOAM also lends itself to 'interleaving', another effective learning strategy [21,22]. An analogy is, the batsman who will see greater improvements during practice if they do not know what type of delivery is coming next. This is because they will get better at discriminating between different types of deliveries and thus perform better under real world conditions. Similarly, we can better prepare ourselves by mixing up problem types and topics when preparing for an exam and/ or when preparing to work in the real world of medicine. Progress may seem slower, but the long-term benefits are likely to be greater.

Becoming a FOAM creator is also an effective way of boosting your own learning, and was a major motivation for my own involvement as a trainee. Education scientists tell us that we need to engage in reflection by taking the time to review experience so that we can learn from it [21,22]. The creation of a blog is an excellent tool for reflection, but we must ensure that anything we write is fictionalised and never based on a particular patient unless valid consent is obtained. Patient safety and confidentiality must never be compromised, whether inadvertent or otherwise.

Calibration is the last principle of effective learning that I will mention. Without calibration we can easily become self-deluded learners. Calibration involves the learners aligning their own judgements of their state of knowledge or learning with objective feedback [21,22]. This is another reason why testing yourself on questions is so effective for learning. Being subjected to post-publication peer review through the creation of FOAM resources is also a powerful learning experience. Few things sharpen your understanding or thicken your skin better than open dialogue with intelligent people about something you have just created.



#### Last words

There you have it, my tips for 'hacking medical education' using FOAM with the support of insights from the evolving science of learning and an emphasis on the importance of critical thinking skills. Ultimately, we must always remember that FOAM is simply an adjunct to learning that aims to help, rather than to replace, our bedside mentors. Furthermore, these 'hacks' are not shortcuts. There is no easy way in learning, indeed Osler said that, 'work' was the 'Master Word' in medicine [4]. True learning is always hard work, but this hard work is worth it, as through it we can improve patient outcomes, relieve suffering, and save lives.

"It is up to us to save the world!"

- from Peter Safar's Laws for the Navigation of Life [27].

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I have no financial conflicts of interest to declare.

I am heavily involved in the creation of FOAM resources and the FOAM community described in this article. I am co-creator of the following FOAM resources mentioned in this article: Lifeinthefastlane. com (http://lifeinthefastlane.com), SMACC (http://smacc.net.au) and INTENSIVE (http://intensiveblog.com).

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## Climate change: the challenge to medicine in the 21<sup>st</sup> century

Professor Kingsley Faulkner

AM MBBS FRACS School of Medicine, University of Notre Dame, Australia Professor Faulkner is the Chair of Doctors for the Environment Australia. He is a Professor within the School of Medicine, Fremantle at the University of Notre Dame, Australia. He was formerly President of the Royal Australasian College of Surgeons from 2001-2003 and Chairman of Australian Council on Smoking and Health. He is committed to addressing the major challenges of environmental degradation and its many consequences.

#### Climate change: the challenge to medicine in the 21st century

Medicine in the early decades of the 21st century offers great promise, powered by ready access to knowledge, innovative imaging and interventional technologies, sophisticated research, and personalised pharmaceuticals. Despite this, doctors of the next decades will be faced with unique national and global challenges that they are currently ill equipped to deal with.

Climate change is predicted to be the greatest challenge to global health in the 21st century, threatening agriculture, stable food and water supplies, infrastructure, coastal communities, the economy, and national security. Optimistically, however, this also presents the greatest opportunity for prevention of harm to human health if effective and adequate actions are urgently taken.

Climate change has become fundamentally a moral problem. The scientific evidence is now so powerful and the consequences for current and future generations so dire that those who ignore, obstruct, or corrupt that evidence are guilty of great intergenerational injustice. The merchants of doubt, as Naomi Oreskes branded them, have become intellectually marooned and morally exposed [1].

#### Questioning the evidence

It is the nature of science to continually question, however, it is also the role of science to draw conclusions to be acted upon. Today, we are presented with objective measurements demonstrating a changing climate. For instance, CO2 levels exceeded 400 ppm for the first time in human history and are still rising, the average annual global temperature has reached a record peak, and the average temperature during each of the past four decades has exceeded the decade before [2]. Human activity has been shown to be the major factor causing these problems [3]. Apologists for inaction trawl through the literature hoping to find some variation in predicted changes such as rainfall levels, or some slight defect in methodology. In contrast, the latest International Panel on Climate Change (IPCC) Report, based upon an enormous volume of evidence from highly qualified climate scientists, has sounded a clarion call for urgent and adequate political action [4]. When we are faced with irrefutable evidence of climate change, it becomes far too dangerous to argue that the evidence is too weak to take bold and decisive action.

The obvious purpose of climate change deniers or doubters is to confuse the public, weaken political resolve, stifle transition to more sustainable economies with innovative renewable energy technologies, and encourage rampant expansion of fossil fuel mining, extraction, transportation and eventual combustion within Australia or overseas.

#### Health effects of climate change

It is the most vulnerable and least powerful who are increasingly bearing the brunt of climate change. Children, the elderly, and those with chronic diseases usually suffer the most. In Africa, this is mediated through the increasing likelihood of droughts, dehydration, heatstroke, declining agricultural output, starvation, diarrhoeal diseases, and vector borne diseases [5].



Professor Kingsley Faulkner

Pacific island nations like Kiribati are facing existential threats from sea level rises and storm surges causing abandonment. At this stage, environmental refugees are not recognised by the UN Convention on Refugees [6]. Europe is already staggering from refugees fleeing conflict and starvation. Australia will not be immune from the plight of environmental refugees if further global warming is not addressed, placing unique demands on our social and health care systems.

Extreme weather events are being felt with increasing regularity. Countries in Europe, Asia, and the Americas have experienced more than usual episodes of flooding, blizzards, tornadoes, and cyclones of increasing intensity in some regions and droughts in others [7]. The Arctic ice cap and glaciers continue to melt and the Great Barrier Reef coral is dying [8].

Australians are now realising that heat waves will become more frequent and more intense resulting in not only increasing discomfort and dehydration but also major cardiac and respiratory consequences. In major heat waves such as that in Victoria in December 2009, twice as many vulnerable people died prematurely from those effects than died in the associated devastating bushfires [9].

Most Australian state and mainland territories are experiencing bushfires of increasing frequency and severity with great loss of pastures, forests, livestock, native animals, homes, and human life on many occasions. There are virtually no climate change deniers among firefighters battling those bushfires.



#### **Scientific solutions**

Despite recent funding cuts to many successful programs, scientific studies into climate change and its effects in Australia continue to enhance the evidence. Technological advances in the quality, economic feasibility, and quantity of solar photo-voltaic (PV) panels continue to deliver increasing energy outputs nationally and globally (87% rise delivering 47 G W in 2015) [10]. Batteries able to spread solar generated energy over 24 hours are becoming much better, cheaper, and more available. These technologies will soon enable thousands of households, commercial ventures, and institutions to be freed from the need to be linked to coal powered electricity grids.

Although there has been lukewarm political support and pockets of local opposition, land based wind turbines are becoming cheaper and more available, supplying 63 GW towards global energy needs in 2015 [10]. Large solar –thermal fields have been installed in several counties whilst wave, tidal power, and geo-thermal research and development advance in many centres.

Electric cars powered by energy generated by renewable energy technologies with battery storage facilities are about to become much more widely available with major manufacturers investing heavily in these technologies. They have real potential to revolutionise motorised transportation.

Carbon capture research and development, tree planting projects, and similar measures may help but will be hopelessly insufficient. The most effective, efficient, and necessary carbon capture available is to leave most fossil fuels in the ground. Around 80% of known reserves must remain there. Renewable energy technologies need to replace fossil fuel economies and workforce dislocations must be managed adroitly during the transition process.

#### **Political responses**

What factors are now preventing urgent and adequate action in Australia on climate change? Current ideology states that unrestricted progress must be pursued for the greater economic good. This is seen in the mantra of 'growth and jobs' and the need for increasing consumption. Concepts such as limited resources and the need for sustainability are often regarded as radical. Environmental harms are barely mentioned, while the direct and indirect health consequences virtually unheard of when expansions of fossil fuel mining and extraction are promoted. Effective action must challenge this ideology.

Prestigious government agencies such as the CSIRO in Australia, NASA in the USA, and similar agencies in Europe and Asia have produced a wealth of valuable data about climate change. Government restrictions to their funding can cause great harm and damage the independent advice that they should provide.

Powerful rallying calls have been made internationally, such as the latest Lancet Commission Report on the health impacts of climate change last June, followed by the UN Climate Change Conference in November 2015 [11]. The Pope's Encyclical on climate change gave additional moral weight to that call [12]. National agreements signed in the Paris Accord and recently ratified at the UN may not be legally binding but they are already being heeded. The USA and China, the two largest polluting countries on Earth at present, and many other countries, have firmed up their commitments to act urgently and on a scale designed to drive down emissions sufficiently to limit average annual global temperature rises to no more than 2.0 degrees Celsius (and hopefully below 1.5 degrees Celsius) above pre-industrial levels.

Unless our nation faces this local and global challenge with far more wisdom, vigour, and determination than present policies will deliver, the consequences will be increasingly severe, and those governments that are responsible will be rightly condemned by succeeding generations.

#### Democracy, divestment & individual action

Impatient with the current short-sighted national leadership, many individuals and organisations are utilising social media and acting on a variety of fronts. The divestment from fossil fuel movement is gaining momentum. Millions of individuals, thousands of corporations, multiple universities and medical organisations, philanthropic foundations, banks, and even the large Norwegian sovereign wealth fund have divested [13]. The inevitability of stranded assets in this sector has influenced astute investors.

Individuals can and are taking action to live more sustainably but political inertia is the major block. In a democracy such as Australia, with financially powerful vested interests undoubtedly influencing public policy, individuals and the organisations to which they belong still have a say. Medical practitioners and medical students, and their professional bodies, must use their intelligence, knowledge, energy, and voice to demand of governments urgent and adequate policies for tackling climate change.

#### The future

World citizenry is now a reality, driven by increasing global connectedness and common challenges. Medical practitioners and medical students have great opportunities and responsibilities to provide expertise and leadership. Global healthcare inequity is already great – for example, 5 billion people currently lack access to safe, timely, effective, and affordable surgical, gynaecological/obstetrical and anaesthetic care [14]. That inequity will worsen if climate change and related environmental hazards are not tackled urgently and adequately. Your generation must be at the forefront of doing so.

Medicine is a wonderful profession and I wish you all well throughout your careers.

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### I am a medical student, and I am afraid to report bullying and harassment

A pseudonym has been used to protect the author's privacy.

The president of the Royal Australian College of Surgeons (RACS) has apologised on behalf of surgeons for discrimination, bullying, and sexual harassment [1]. The Australian Medical Association (AMA) has released a position statement on workplace bullying and harassment [2,3]. Despite this, Dr Caroline Tan still does not work in any major public hospitals and I, a final year medical student, am still afraid to report bullying and harassment.

"Suck Sarah, suck" was what the consultant surgeon who was operating repeatedly instructed me to do with the suction device whilst I was assisting him as a medical student in theatre. After about the twentieth time he said this, the assisting registrar joked "I thought you'd be better at sucking than that Sarah". Everyone in the theatre laughed aloud and despite feeling increasingly uncomfortable, I joined in. I was trying my best to please my superiors and laughing at their jokes was part of this attempt. It wasn't until the casual discussion with my colleagues that evening that I realised how degrading and inappropriate these comments were. My uncomfortable feelings weren't just part of being a medical student surrounded by intimidating seniors, but rather, were the result of sexual harassment. The very fact that I assumed what occurred was normal is testament to the fact that bullying and harassment is entrenched in the culture of medicine and its hierarchy. I never reported the incident, and none of my colleagues ever encouraged me to do so.

My story raises the issue of commonplace occurrences in medicine. Sydney surgeon, Dr Gabrielle McMullin, publically said Dr Caroline Tan's career was ruined by a sexual harassment case that she won against her fellow neurosurgeon in 2008, and that she would have been better off giving him 'a blow job' [4]. Dr McMullin's controversial comments attracted unprecedented media attention and were successful in exposing a silent epidemic of bullying and harassment in medicine.

Bullying is defined as repeated unreasonable behaviour that creates a risk to health and safety. Harassment is unwanted, unwelcome, or uninvited behaviour that makes a person feel humiliated, intimidated, or offended [5]. According to the AMA, medical students, doctors in training, female colleagues, and international medical graduates are the most common victims of bullying and harassment in the medical profession [2]. Up to 50% of doctors, doctors in training, and international medical graduates have been bullied or harassed, and the most common perpetrators are senior doctors [5-7]. This problem has persisted for many years because hospitals and professional associations have failed to act, discouraged change, and have thereby fostered a culture of bullying [8].

The sequelae of workplace bullying and harassment in medicine are serious. The continued erosion of confidence, skills, and initiative creates negative attitudes among medical staff. It directly leads to reduced employee physical and psychological health that manifests as anxiety and depression. This leads to diminishing performance, reduced quality of patient care, and subsequently deteriorating patient safety [9].

Most large medical organisations including the AMA and RACS have responded to the issue and identified bullying and harassment in medicine as a priority area for change. The AMA, on 9th March 2016, released 'Setting the standard', a strategy to overcome bullying, discrimination, and harassment in the medical profession [2]. The RACS Expert Advisory Group (EAG) has published its final report on the extent of discrimination, bullying, and sexual harassment in the practice of surgery [5]. However, despite these efforts and the extensive coverage in the media, bullying and harassment still occur and victims such as myself are still afraid to speak up. Barriers to victims making claims include the perception that nothing would change, not wanting to be seen as a trouble-maker, the seniority of the bully, fear of impact on future job prospects, and uncertainty over how cases would be managed and future policies implemented [5].

Efforts need to focus on ground-level interventions. Importantly, new policies from the AMA, RACS, and other leading organisations need to work towards creating safer and more effective complaints processes that people such as myself are more willing to use. A system that ensures we will not be punished as Dr Caroline Tan was. All members of the medical workforce need to normalise a zero-tolerance attitude to bullying and harassment so that it can be cultivated and adopted into the culture of medicine. Only then may the change be organic and not just another unread policy used by medical associations as medicolegal protection.



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### On the importance of regular reporting from governmental public health bodies

#### **Jackson Blythe**

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Despite the increasing importance of transparency and accountability in government, and the demonstrated efficacy of consultation, communication, and response to criticism in policy development, the last decade has seen a backwards step in the effective output of Australia's governmental public health bodies.

The National Public Health Partnership (NPHP), a federal government organisation formed in 1996, was, and continues to be, widely celebrated by public health practitioners for its enduring contributions to Australian public health. The NPHP published quarterly newsletters and produced close to 100 publicly accessible reports in their relatively short tenure [1,2] covering a very broad set of issues. In 2006, the NPHP was dissolved and replaced by two advisory committees: the Australian Health Protection Principal Committee and the Australian Public Health Development Principal Committee (APHDPC). The former group exists in order to formulate strategies for response to public health emergencies and other largescale heath threats, while the APHDPC was intended to "coordinate a national effort towards an integrated health development strategy" [3]. To rename, rebrand, divide, and unite government entities is a common process undertaken for a variety of reasons. Indeed, the APHDPC appears to have since been divided into five separate principal committees, all advising the Australian Health Ministers' Advisory Council (AHMAC) [4]. However, these newer committees do not publicly report on their work, which is problematic in a number of dimensions.

Most governmental organisations communicate their work as a matter of principle (even ASIO releases yearly reports [5], and secrecy is their business). Accountability of governmental institutions is becoming an ever-more important factor in modern societies [6], and it is imperative that the public have some sense of the function of government departments. This is important for ensuring that public expenditure is well-targeted and produces meaningful results. In an ideal system, underperforming government entities will be subject to Jackson is a medical science/medicine student currently undertaking an Honours project investigating glucose metabolism at the Garvan Institute of Medical Research. He is also interested in mental health and health promotion, and intends to forge a career in rural general practice.

public pressure calling for internal change to either increase the efficacy of the entity in question, or remove it entirely. This is one of the key arguments for the importance of governmental transparency [6].

More importantly, the infrequency and inconsistency of publicly available reports emerging from the new principal committees are counterproductive to their stated aims. It is clear that consultation with the public is crucial to maximising the efficacy of emerging public health practices and policies [7]. As the peak groups responsible for advising governments on health policy, their work should be open to criticism, and therefore improvement, through as many avenues as possible.

Stifling the process of wider input into policy development restricts scrutiny to after-thefact analysis. Australia has clear mechanisms to evaluate the progress of certain health outcomes and effectiveness of new policies the Australian Institute of Health and Welfare and the Bureau of Statistics are responsible for this - so why is it that the evaluation of developing policies is not as open? Delaying consultation with academics and calls for public submissions on proposed policies until the implementation stage is not ideal; as with public health issues themselves, suboptimal policy decisions are best addressed upstream. It is critical for academics, non-government organisations, and the general public to have access to plans for developing public health programs, reports on current strengths and weaknesses, and other procedural documents. Helpful scrutiny can arise from such publicity and accelerate Australia's advances towards a healthier society.

After the immensely public legacy of the NPHP, the sudden absence of regular reporting in the sphere of public health policy development is somewhat disarming, but the reasons underlying this sudden disappearance are unclear. The central issue here appears to be primarily one of communication. A small suite of reports is available for download on the Council of Australian Governments (COAG) Health Council website, which represents the recent work of the principal committees which comprise the AHMAC [8]. These are, however, poorly advertised, difficult to find, and infrequently accessed. In short, a number of issues conspire to ensure that the work that does emerge from the COAG Health Council goes relatively unnoticed.

Consultation is a cornerstone of policy development in any sector, and all government bodies should seek to interact with the public in order to promote their work and receive feedback. Australians have a right to know what ideas our governmental public health groups are proposing and developing, and the optimisation and implementation of these ideas depends on communication with clinicians, public health practitioners, and the wider community. If the COAG Health Council and its subsidiaries more regularly presented work for public criticism, our formulation and implementation of federal public health initiatives would inarguably be more successful. A strong collective public health partnership is vital for the effective dissemination of information, as well as discussion and improvement of developing public policy. The current widespread radio silence from our peak intergovernmental public health bodies is damaging to the future of Australian health, and these organisations should be expected to more frequently demonstrate interest in communicating with the community through both consultation and the release of public reports.

Acknowledgements None.

**Conflict of interest** None declared.



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# Appraisal of the significant considerations associated with oral pre-exposure prophylaxis (PrEP) within the Australian context: existing challenges and future opportunities

#### **Obert Xu**

BSN (Bachelor of Science in Nursing) James Cook University MBBS Year 3 Obert Xu is currently a third year medical student at James Cook University in Townsville, Queensland. He holds a Bachelor's of Science in Nursing degree from Washington State University and has clinical practice experience in emergency nursing. His interests are in emergency medicine and he is committed to delivering quality care to patients, families, and communities.

Abstract: This review critically appraises the major considerations associated with oral pre-exposure prophylaxis (PrEP) for men who have sex with men (MSM) within the Australian context, and suggests implications for future research. Daily oral PrEP, tenofovir disoproxil fumarate (TDF)/emtricitabine (FTC) has demonstrated efficacy in preventing human immunodeficiency virus (HIV) transmission in MSM with an estimated risk reduction between 44.0 - 86.7% and even up to 99%, with consistent daily adherence. However, uptake has been slow, driven by high costs, limited availability, poor acceptance, and low concept awareness. Implementation of PrEP will rely heavily on primary care providers, who are at the forefront of health care services, in identifying high-risk patients, providing education, assessing readiness, and prescribing antiretroviral medication. Clinician scepticism and reluctance to prescribe PrEP can significantly impair access to this effective preventative strategy. Future research is essential to inform the best strategies in developing programs to support PrEP uptake, utilisation, and adherence in Australia. This will require collaboration and coordination between community health organisations, the health sector, and the general public. Open label and implementation research modelling real world effects, is urgently needed to respond to this gap in knowledge and is pivotal in driving the introduction of this effective primary prevention modality in Australia.

#### Background

Despite biotechnical and pharmaceutical advancements in primary, secondary, and tertiary prevention, human immunodeficiency virus (HIV) notifications have been on the rise in Australia since 1999 [1]. In Australia, 27,150 persons were living with HIV at the end of 2014 and 1,081 new cases are diagnosed annually, of which 80% are attributed to men who have sex with men (MSM) [1,2]. Furthermore, undiagnosed infections in MSM account for 31% of newly acquired HIV cases in Australia [3]. This urgently calls for original and unprecedented approaches in prevention and treatment to reduce the unrelenting high rates of infection.

A promising new strategy, combining both treatment and prevention, is pre-exposure prophylaxis (PrEP). A single pill taken daily, tenofovir disoproxil fumarate (TDF)/emtricitabine (FTC) (200 mg/300 mg) has been shown to dramatically reduce HIV acquisition in uninfected, high-risk individuals [4-8]. TDF and FTC are nucleoside and nucleotide reverse transcriptase inhibitors and synergistically stop viral replication by interfering with viral DNA polymerase [2]. These agents have classically been used to treat HIV infection and are now recommended as pre-exposure prophylaxis. Several trials have indicated that PrEP is safe and effective in preventing HIV amongst MSM [4,5], serodiscordant couples [6], and injecting drug users [8]. This prompted the United States Center for Disease Control and Prevention (CDC) to recommend immediate utilisation in 2012 [9]. Although PrEP was recently approved



by the Therapeutic Goods Administration (May 2016), this costly drug is yet to be funded through the Australian Pharmaceutical Benefits Scheme (PBS).

This paper focuses on critically appraising the significant considerations associated with introducing oral PrEP in the Australian MSM population, and suggests implications for future research. This review discusses the efficacy of HIV chemoprophylaxis, evaluates current awareness, accessibility and acceptance of PrEP in Australia, and finally, examines the considerations for future drug implementation within the Australian context.

## Establishing efficacy of oral HIV pre-exposure chemoprophylaxis

#### Clinical trials investigating PrEP efficacy and safety in MSM

Research investigating the efficacy of HIV chemoprophylaxis in MSM commenced in 2005 and evidence of success was first demonstrated in the Gates Foundation-funded Phase III multinational Preexposure Prophylaxis Initiative (iPrEx) study (Table 1) [4]. Daily oral TDF/FTC was evaluated in 2499 MSM participants from the United States, South America, Thailand, and Africa [4]. Subjects were randomised into either a placebo or a daily oral TDF/FTC cohort [4]. Follow up was conducted every 4 weeks and included provision of study medications, compliance counselling, and comprehensive prevention services. In total, adjusting for modified intention-to-treat, there was a higher seroconversion rate in the placebo arm (64/1248 subjects) compared to the TDF/FTC arm (36/1251 subjects), corresponding with an overall relative reduction in HIV risk by 44% (95% confidence interval [CI] 15-63%; p = 0.005) [4]. Adherence across participants was 50% based on pill counting and self-reported data, and estimated at 51% based on plasma detection of tenofovir [4]. Longer follow up did not reveal improvements in antiretroviral efficacy (p = 0.44). Of importance, the independent contribution of access to standard preventative services (HIV/STI testing, provision of condoms, risk reduction counselling, etc.) in the final outcome analysis is unknown. However, it is likely to have contributed positively to efficacy rates.

#### Table 1. Major studies on oral pre-exposure prophylaxis

Trial and location	Population and number of participants	Overall Efficacy	Estimated adherence level based on detectable plasma tenofovir levels
iPrEx [4] Brazil, Ecuador Peru, South Africa, Thailand, US	2499 HIV negative MSM	TDF/FTC 44%	TDF/FTC 50%
Partners PrEP [6] Uganda, Kenya	4747 HIV negative heterosexual men and women with	TDF/FTC 75%	TDF/FTC 80.6%
• 5 a	serodiscordant partners	TDF 67%	TDF 83.1%
FEM-PrEP [10] Kenya, South Africa, Tanzania	202 HIV negative women	No efficacy observed	TDF/FTC 37%
TDF2 [7] Botswana	1219 HIV negative heterosexual men and women	TDF/FTC 62.2%	TDF/FTC 80%
VOICE [11]	5029 HIV negative women	No efficacy observed	TDF/FTC 29%
South Anica, Oganua, Zimbabwe			TDF 30%
PROUD [5] England	544 HIV negative MSM	TDF/FTC 86%	Unreported

The open-label trial sponsored by the UK Medical Research Council, Pre-exposure Prophylaxis to Prevent the Acquisition of HIV-1 Infection (PROUD) study, evaluated the efficacy of TDF/FTC (245 mg/ 200 mg) in 544 HIV negative MSM reporting recent high-risk sexual activity (receptive anal intercourse without a condom) [5]. Subjects recruited from 13 British sexual health clinics were randomised into two cohorts - an immediate group, which received daily oral TDF/FTC at the time of enrolment, or into a deferred group, receiving the study medication one year later [5]. High levels of post-exposure prophylaxis (PEP) was utilised in both the deferred (n = 85) and immediate (n = 12) groups, acting as a confounding variable, thus altering final outcomes [5]. Despite this, rates of HIV were lower in the immediate group, 3/243 person-years of follow up (1.2 cases per 100 person-years) (90% CI 0.4-2.9) compared to the deferred group, 20/222 person-years (9.0 per 100 person-years) (90% CI 6.1-12.8; p = 0.0001) producing an 86.7% (90% CI 64-96%; p = 0.0001) relative risk reduction [5]. The demonstrated efficacy of PrEP was higher in this trial, compared to the iPrEx study. PROUD participants knew they were taking PrEP whereas iPrEx subjects were blinded to their treatment groups. This open label design gave participants the knowledge that they were taking PrEP that would prevent HIV, thereby improving motivation to adhere to study medication and generating overall better efficacy rates. Further non-blinded research should be conducted within the context of a real life, implementation based framework. Non-blinded study design can improve access of non-subsidized TDF/FTC to at-risk populations and heighten participant confidence and motivation while taking study medication.

## Clinical trials investigating PrEP efficacy and safety in heterosexual couples and women

Two other trials reproduced similar results in serodiscordant heterosexual couples (Table 1). The Partners PrEP study indicated a 75% (95% CI 55–87%; p < 0.001) risk reduction with daily oral TDF/FTC in Kenyan and Ugandan serodiscordant couples [6]. The TDF 2 trial investigated TDF/FTC in 1219 high-risk heterosexual men and women in Botswana and demonstrated an overall 62.2% (95% CI 21.5-83.4%; p = 0.03) reduction in HIV acquisition compared to placebo [7].

In contrast, the FEM PrEP (Pre-exposure Prophylaxis Trial for HIV Prevention among African Women) and VOICE (Vaginal and Oral Interventions to Control the Epidemic) trials did not observe any therapeutic benefit with TDF/FTC in uninfected, high-risk women (Table 1) [10,11]. In addition to investigating oral TDF/FTC, the VOICE study

also evaluated oral TDF alone and tenofovir (TFV) as an antiretroviral vaginal gel [11]. Research arms in both studies were prematurely terminated following a rise in HIV infections and due to a lack of evidence to support efficacy of oral [10,11] and vaginal preparations [11]. The vastly differing outcomes between these studies and previous studies are currently the focus of investigation.

#### Factors influencing PrEP efficacy

#### Adherence and quality of drug protection

The varying rates of PrEP efficacy across the aforementioned studies can be attributed to suboptimal medication adherence rates [4-11]. Adherence was measured by pill counting and participant self-reporting. Both methods are unreliable indicators, given the potential for misreporting and the assumption that subjects had actually taken the number of pills counted [4,6,7,10,11]. Pharmacokinetic measurements of plasma tenofovir in seronegative subjects are more reliable [12].

In the iPrEx study, overall reduction in HIV risk was 44%, with a higher rate of protection of 92% (95% Cl 1.7 -99.3; p < 0.001) in those with detectable plasma tenofovir levels compared to those with undetectable plasma drug levels [4].

A quantitative study analysed the impact of varying doses against antiretroviral efficacy, based on plasma tenofovir data obtained from an iPrEx substudy and a separate trial involving monitored oral TDF dosing [12]. This study found a 99% (95% CI 96 to > 99%; p = 0.016) risk reduction when PrEP was taken 7 days a week [12]. Adherence based on detectable levels of plasma tenofovir was suggested to be a key predictor of TDF/FTC efficacy in HIV prevention [4-7,12]. However, cautious interpretation of plasma drug concentrations as a sole measure of adherence should be maintained. Factors that could alter plasma levels include individual pharmacokinetic variability, pharmacogenetic responses, dosing regimens, and co-administration of other drugs [13].

Perhaps of greater clinical importance is to appreciate the factors associated with low adherence rates. In a qualitative New York study, MSM participants rated concerns about short- and long-term side effects of chronic PrEP exposure as the greatest barrier to PrEP adherence [15]. Across clinical trials, no serious events were documented, however, long-term consequences are unknown [4,5]. Self-limiting and short-term side effects, including mild nausea and

headaches, were reported [4,5] along with mild elevations in serum alanine aminotransferase [10] and serum creatinine [10,11]. Future educational programs should directly address these concerns by presenting the available evidence to suitable candidates to support their informed decision to take PrEP.

Comparatively, research participants in the VOICE trial based in South Africa, Uganda, and Zimbabwe emphasised poor cultural and social acceptance as reasons underpinning poor adherence [14]. Specifically, these barriers were the cultural stigmata of being perceived as HIV positive, fear of scrutiny, and lack of partner support [14]. Furthermore, there was a prevailing view among research participants (70%) of being at low risk for HIV acquisition, which could have undermined the motivation to take the study's drugs [10]. In Africa, cultural, societal, and perceptual influences appeared to be the strongest barriers to adherence, while North American attitudinal studies suggested primary concerns revolved around health consequences and medication safety. Meanwhile, future research should investigate the unique Australian factors that would predispose to poor adherence, as this information is lacking in the literature.

#### Access to preventative health services

Adherence alone cannot fully explain the substantial variability observed in drug efficacy rates. Experimental design in these trials included comprehensive HIV/STI prevention services [4,6,7]. The exact impact of these services in contributing to medication efficacy in the final analysis is unknown, however, prevention services alongside PrEP are likely to be important for reducing HIV infection.

Although PrEP has been demonstrated to be an effective tool in HIV prevention, use of this drug is complicated by concerns over increased risky sexual behaviour and higher rates of sexually transmitted infections [15]. There is conflicting data outside of clinical trials concerning risk compensation, emphasising a need for open label implementation research to better inform these associations in Australia. Meanwhile, applications of PrEP within the Australian context should involve a synergistic, multimodal approach, which includes expansion of prevention services providing intense and frequent HIV/STI testing, behavioural counselling, and provision of condoms [16-19].

#### **Current status of PrEP in Australia**

Outcomes from the aforementioned clinical trials will shape the future landscape of HIV prevention in Australia. These studies establish PrEP as an effective tool in preventing HIV transmission in MSM [4,5]. The current status of PrEP in Australia and the likelihood of successful implementation will be led by discussion of three key factors – awareness, accessibility, and acceptance.

#### Awareness

Advocacy organisations, HIV foundations, and research groups have recently made strong messages supporting PrEP utilisation in Australia. These messages seem to have garnered considerable awareness of PrEP, evidenced by a 2015 Australian study reporting 76.2% of homosexual and bisexual respondents had previously heard of PrEP [20]. Despite these efforts, few Australian MSM, 38/1251 (3.0%), have ever used PrEP, [20] with utilisation more likely to be associated with high-risk sexual practices (unprotected anal sex with casual partners rather than with regular partners) (adjusted odds ratio [AOR] 2.36, 95% Cl 1.24-4.48; p < 0.10) [21]. Public health campaigns targeted at high-risk populations at sexual health clinics, at social venues, and through gay community media should continue raising awareness with the goal of improving PrEP uptake. Despite high levels of awareness, the actual utilisation of PrEP in Australia is complicated by several factors that are subsequently discussed.

#### Accessibility

Oral TDF/FTC was recently approved for the indication of pre-exposure prophylaxis in Australia. However, funding to subsidise this medication remains unavailable through the Australian PBS. TDF/FTC can be acquired through participation in clinical trials, from overseas vendors at a cost of AU\$1,300/year, as a prescription costing AU\$13,500/year or obtained from another person prescribed TDF/FTC for HIV infection [22]. Undoubtedly, improved uptake of PrEP will require financial subsidisation and support through the PBS. From a population viewpoint, PrEP is expensive and extending coverage to all MSM would not be cost effective in the Australian context [23]. However, one study suggested PrEP would be cost effective if one dose cost less than \$15/ day and had > 75% efficacy rate [24]. Conflicting research demands further investigation to ascertain the specific groups best suited for this drug, taking into consideration the individual biopsychosocial benefits and cost to society.

#### Acceptance and attitudes

Willingness to take PrEP among uninfected or sero-status unknown Australian MSM fell from 327/1161 (28.2%) in 2011 to 285/1223 (23.3%) in 2013 (AOR = 0.83, 95% CI 0.68-1.00, p = 0.05) [25]. Another Australian study suggested that less than half of MSM (43.2%) were willing to participate in research trials evaluating antiretroviral prophylaxis [26]. These studies demonstrate negative attitudes and lack of acceptance towards PrEP. Encouragingly, however, very highrisk MSM in serodiscordant partnerships were more interested in PrEP (AOR = 3.23, 95% CI 1.48-7.05, p = 0.003), representing a group likely to derive the greatest benefit from this drug [25]. Future Australian research should be conducted to inform of the best strategies aimed at improving understanding and developing greater acceptance of PrEP amongst other MSM groups with hesitations towards antiretroviral prevention.

#### Future agenda for PrEP in Australia

#### Clinician aspects

Primary care clinics are often the first point of health care contact for many consumers in Australia, including MSM who would be suitable candidates for PrEP. A survey of 1175 physicians in the US and Canada revealed that only 9% had ever prescribed PrEP and 26% were unsure or would not prescribe PrEP to high-risk persons [27]. Multiple studies analysing physician attitudes towards PrEP describe concerns regarding real world effectiveness, non-adherence, drug resistance, toxicity, and risk compensation as reasons against PrEP [25,28-30].

Drug resistance is rare, however, can develop when PrEP is taken in acute seronegative HIV infection [31]. Management of drug resistance is challenging given that exclusion of acute infection is practically difficult in persons engaging in frequent sexual activity and delaying treatment can increase the risk of HIV infection. Close monitoring and intensive HIV surveillance after initiation of PrEP is vital in minimising the risk of HIV drug resistance [31].

Risk compensation associated with PrEP is another concern amongst clinicians. Behavioural disinhibition and risky sexual practices can increase STI incidence [32,33]. Early detection and management of STIs through frequent and routine screening every three months can reduce transmission and reduce infection incidence [32,33]. Longitudinal and real world data analysing drug resistance and risk compensation are limited. Further inquiry is needed to inform the safest and most effective therapeutic application of PrEP within the Australian context.

The surmounting evidence supporting PrEP in MSM is compelling and with recent approval in Australia, there has been general acceptance of this effective measure across public sexual health centres and



Figure 1. Factors involved in maximizing positive impact of PrEP in Australia.

general practice clinics. Future frameworks should embody programs supporting physician awareness of PrEP, improving comfort in discussing sexual health topics, assessing HIV risk, prescribing TDF/ FTC, supporting frequent screening for STIs, managing adherence, and monitoring for resistance and toxicity (Figure 1). Primary care providers will be instrumental in improving the delivery of PrEP and monitoring for drug safety as PrEP becomes more available in Australia.

#### Facilitating PrEP in Australia

In order to implement PrEP in Australia, facilitators for uptake and adherence will need to be considered. Respondents in US studies have named affordability of PrEP, availability of free HIV testing centres, accessibility to sexual health services, individualised counselling programs to assist with antiretroviral therapy, and a coherent understanding of what pre-exposure prophylaxis entails, as important factors facilitating uptake [15,34]. Future Australian policy development will need to account for these same issues to maximise PrEP impact.

This can only be achieved with more research to fill a major gap in the current understanding of PrEP in Australia. Future research could run as an Australian nationwide, implementation-based, open label study and assess the impact of TDF/FTC in high-risk MSM with three-monthly consultations. Outcomes would ideally inform on real world effectiveness, adherence, long-term safety considerations, risk compensation and issues surrounding utilisation. Successful PrEP rollout in Australia will require a systematic, multi-sectoral approach involving clinician training, expansion of preventative services, support from community health organisations, and increased community engagement (Figure 1). These partnerships will improve understanding, broaden acceptance, and maximise the positive impacts of PrEP in Australia.

#### Conclusion

This review aimed to evaluate the factors influencing PrEP implementation in Australia and to suggest an immediate research agenda. Implementation trials would bridge the gap between clinical studies and real world application through examination of PrEP within the Australian environment. Outcome variables would address adherence, awareness, accessibility, acceptance, clinician factors, cost/benefit analysis, patient motivations, and patient experiences with PrEP. Analysis of these findings will produce strategies to improve delivery of services, programs, and policies. In doing so, we optimise the successful impact of PrEP in a new primary prevention model and work towards a stronger and healthier future.

#### Acknowledgements

None.

#### **Conflict of interest**

None declared.

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## Evidence-based approach for the management of persistent occiput posterior position in labour: a review of the current literature

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#### Abstract

**Purpose of review**: To determine the maternal and neonatal outcomes after operative vaginal delivery of foetuses in the persistent occiput posterior position, and examine the efficacy and outcomes of techniques to rotate the foetus into an occiput anterior position prior to vaginal delivery.

**Summary of findings**: A literature search of the MEDLINE/ PubMed databases was conducted to identify all study types examining the management of persistent occiput posterior position during labour and subsequent maternal and neonatal outcomes.

Maternal posturing in the last four weeks of preg-nancy or during labour has no benefit in reducing the incidence of occiput posterior position at delivery. Rotational operative vaginal deliveries tend to have a low failure rate, however may be associated with anal sphincter injury, despite the overall risk being low. The most current evidence supports the use of rotational forceps in achieving a successful vaginal delivery. Manual rotation followed by direct traction forceps is a commonly performed method of delivery for the occiput posterior positioned foetus, however has only been directly compared to rotational forceps or vacuum in one study, with no demonstrable statistical difference in maternal or neonatal outcomes. Further evidence from the POP-OUT study currently in progress may further support an increasing role for manual rotation in the management of occiput posterior position at delivery.

#### Introduction

Occiput posterior (OP) describes the foetal head position where the base of the skull abuts the mother's sacrum, and the forehead abuts the mother's symphysis pubis. It is the most common foetal malpresentation and is of clinical important due to its associations with increased maternal and neonatal adverse outcomes. The management of the persistent OP position in labour continues to be an area of debate among obstetricians. Historically there has been conflicting opinion on the morbidity and mortality associated with the OP position. A number of early studies highlighted the increased incidence of operative deliveries and adverse maternal and neonatal outcomes [1, 2]. Interestingly, the basic principles for management of the OP position in labour remain largely unchanged into the modern era of obstetrics - conservative management in the first stage, and conflicting opinions in the second.

Recent studies suggest OP is the most common foetal malpresentation, with reported prevalence of 15-32% at the onset of labour and 5-8% at delivery [3, 4]. Approximately 90% of foetuses in the OP position at the onset of labour rotate into an anterior position without significant prolongation of labour [5]. Therefore the majority of OP positions at delivery arise through failure of rotation to the occiput anterior (OA) position during labour.

Maternal age greater than 35, nulliparity, or gestational age greater than 41 weeks at delivery have a higher incidence of OP position at delivery [4]. Studies have also shown an association between the use of epidural anaesthetic or oxytocin augmentation during labour, and increased rates of OP position at delivery [3]. Although not an established cause, studies have suggested inefficient uterine contractility during labour may account for a proportion of OP positions and may not always be correctible with oxytocin [6].

The OP position is associated with a number of adverse maternal outcomes including increased length of labour, augmentation of labour, chorioamnionitis, anal sphincter injury, and post-partum haemorrhage. Adverse outcomes to the neonate include lower 5-minute Apgar scores, cord blood acidosis, birth trauma, admission to neonatal intensive care units (NICU), and longer duration of stay in hospital [3, 4].

The increased rate of operative deliveries in the persistent OP position is similarly well documented. Studies suggest less than half the number of spontaneous vaginal deliveries occur in OP compared to OA. Furthermore, OP accounts for a disproportionate amount of assisted vaginal deliveries and caesarean sections [6].

Foetal head position has traditionally been determined by digital vaginal examination, by palpating the fontanelles and suture of the foetal skull. However, this has become problematic, as recent evidence suggests that vaginal examination fails to correctly determine the position of the foetal head in 72% of cases in the first stage, and 64% in the second [7]. This finding directly impacts the principles of management, as the exact position of the foetal head should be determined prior to any operative vaginal delivery to ensure safe and correct positioning of the instrument and a successful outcome. Furthermore, this brings into question the reliability of a number of studies in which the diagnosis of OP position was made with digital vaginal examination alone, as there is likely to be a large margin of error. Intrapartum ultrasonography continues to be an operator-dependent method that does not establish the exact position of the foetal head, however a recent study has shown promising results using an algorithm for quantitatively evaluating the position of the foetal head in the maternal pelvis [8]. Advances in ultrasonography techniques will likely continue to improve the utility of this technique, aiding clinicians in deciding whether or not to allow a vaginal delivery. More recent studies, such as the POP-OUT study, are implementing the routine use of transabdominal ultrasound early in the second stage of labour to reliably establish the diagnosis of OP position [9].

A number of large retrospective population based studies have examined the maternal and neonatal outcomes of instrumental vaginal deliveries, however there is limited data comparing the use of forceps and vacuum in the persistent OP position [10]. Furthermore, evidence is lacking for the effectiveness of these techniques in rotating the foetal head to an anterior position to improve outcomes during vaginal delivery. This review aims to examine the current literature on maternal and neonatal outcomes after instrumental vaginal delivery of foetuses in the persistent OP position, as well as to examine the efficacy and outcomes of techniques to rotate the foetus into the OA position prior to vaginal delivery.

#### Methods

The criteria outlined below were used for consideration of studies to be included in this review.

#### Types of studies

All published studies of any type including randomised controlled trials, retrospective and prospective cohort studies, retrospective and prospective case-control studies, case series and systematic reviews, examining the management of persistent OP position during labour and subsequent maternal and neonatal outcomes were included.

#### Types of interventions

The interventions of interest were maternal posturing, operative vaginal delivery including forceps and vacuum, and manual rotation.

#### Types of outcomes

The primary maternal outcomes to be assessed were the occurrence of anal sphincter injury and postpartum haemorrhage.

The primary neonatal outcomes to be assessed were the occurrence of birth trauma, shoulder dystocia, 5-minute Apgar scores <7, and NICU admission.

For the purposes of this review, only the above short-term outcomes were assessed. However, it should be noted that there are a number of important longer-term outcomes that can be used to assess maternal morbidity. These include bowel and bladder dysfunction and haemorrhoids, which tend to occur more commonly in operative vaginal deliveries, as well as an increased risk of pelvic organ prolapse [11-13]. Recent evidence in this area suggests vacuum extraction shares a comparable risk of pelvic organ prolapse to spontaneous vaginal deliveries, however further discussion is outside the scope of this review [14]. Long-term sequelae of neonatal injury during operative vaginal deliveries appear to be uncommon [15].

#### Search strategy

An electronic keyword search of the MEDLINE/PubMed databases was conducted to identify studies according to the criteria above. The keywords labor, labour, and occiput posterior were used initially and combined as appropriate with rotation, rotational, operative, instrumental, forceps, vacuum, vaginal delivery using the Boolean operators AND and OR. The reference lists of review articles and other retrieved articles were also searched for relevant studies. The language was restricted to English. All studies up to the 1st of November 2015 were included in the search strategy.

#### Selection of studies

The author assessed all potential studies identified as a result of the search strategy for inclusion. Only articles with full electronic text available were included in the analysis. To be in-cluded in the analysis studies needed to examine at least one maternal or neonatal outcome for an intervention of interest.

#### Results

#### Maternal posturing

A number of studies have examined the effect of maternal posturing and pelvic rocking exer-cises as an intervention for malposition of the foetus, however substantive evidence has been lacking. One study investigated the effect of ten minutes of hands and knees positioning with slow pelvic rocking beginning in the 37th week of gestation and continuing to the time of labour, as a prophylactic intervention to reduce the incidence of foetal malposition [16]. This large, multi-centre randomised controlled trial showed no difference in the incidence of persistent OP position at delivery. In this study foetal position was determined through ultrasonography at the onset of labour. Persistent OP accounted for 32% of all OP neonates at delivery, with the remaining likely to have come about through malrotation, consistent with the literature. This suggests maternal posturing before the start of labour would be of no benefit.

This was further explored in another randomised controlled trial where the intervention group were randomised at the onset of labour after ultrasonography confirmation of the foetal head in the OP position [17]. This study found that intervention with three different maternal postures corresponding to various stages of descent of the foetal head into the maternal pelvis had no significant effect on the foetal head rotation to the anterior position.

#### Non-rotational operative vaginal delivery

Several studies were identified examining maternal and neonatal outcomes in operative vaginal deliveries, however in two of these the data was not separated for OP position and will therefore not be discussed in detail. Briefly, Demissie and colleagues [18] found vacuum deliveries resulted in a lower risk of birth injuries, neonatal seizures, and anal sphincter injury. However in this study, rates of shoulder dystocia and postpartum haemorrhage were higher for vacuum deliveries. This study was limited by the data being sourced from birth certificates and administrative data, however the large sample size provided sufficient power to detect important differences in outcomes. In a smaller retrospective cohort study, the investigators showed vacuum deliveries resulted in less episiotomies (81.8% vs. 90.5%, p = 0.01), and a lower incidence of anal sphincter injury (27.9% vs. 44.4%, p < 0.001) [19]. Interestingly, more periurethral tears were seen in the vacuumassisted group. Similar Apgar scores and NICU admissions were seen in both groups.

This data suggests vacuum-assistance is superior to forceps in operative vaginal deliveries, however neither of these studies were specific to deliveries in the OP position. A retrospective case study by Damron and Capeless [20] obtained data from 364 operative deliveries in the OP position. The authors found vacuum-assistance had a higher risk of primary instrument failure (33.1% vs. 13.6%, p < 0.0001), but a lower risk of anal sphincter injury (33.1% vs. 71.6%, p < 0.0001). The overall increase in the risk of anal sphincter injury with the use of forceps compared to vacuum has been shown in previous studies [21]. Interestingly this study showed the risk of anal sphincter injury was further increased in the OP position compared to OA (OR 3.25 vs OR 5.25). There was no evaluation of neonatal outcomes measured in this study. The authors' exclusion of operative rotational procedures limited this study for the purposes of comparing the techniques.

Two further retrospective cohort studies examined the risk of anal sphincter injury in the OP vs. OA position with forceps-assisted or vacuum-assisted vaginal deliveries. Benavides and colleagues [22] showed that anal sphincter injury in forceps-assisted vaginal delivery was significantly more common in the OP position (51.5% vs. 32.9%, p = 0.003). In this study the absolute risk was shown to be lower than previously described [20]. The authors also excluded rotational forceps in the initial analysis, however a subsequent analysis showed that in 39 foetuses rotated from the OP to OA position with forceps, 31% resulted in anal sphincter injury, a rate comparable to the absolute risk for the OA position. A concurrent study examining vacuum-assisted vaginal deliveries also showed anal sphincter injury was more common in the OP position (41.7% vs 22.0%, p = 0.003) [23]. In comparison to the absolute risk shown previously [22], vacuum-assisted vaginal deliveries in the OP position appear to be associated with a reduced risk of anal

sphincter injury. None of the above-mentioned studies were designed to show superiority, and further comparative studies would aid clinicians in deciding which instrument to choose.

#### Rotational operative delivery

Survey suggest that rotational forceps (RF) are being much less frequently used when malposition delays delivery, attributed to a rise in use of rotational vacuum (RV) or caesarean section [24]. In a comparative retrospective study, women were eight times more likely to undergo caesarean section if RV was selected to assist birth rather than RF [25]. The low numbers in the RV group compared to RF in this study (107 vs. 1038) did not allow statistical comparison of maternal outcomes. Of the results obtained however, the absolute incidence of anal sphincter injury with RF remained low (2.4%), and no cases of anal sphincter injury were observed with the use of RV. The incidence of maternal haemorrhage was similar in both groups (1.8% RF vs. 1.9% RV). No significant differences were seen in neonatal outcomes such as lower 5-minute Apgar scores, admission to NICU, or cord blood acidosis, however there was a non-significant increase in shoulder dystocia in RF deliveries (6.2% vs. 3.7%). While this data suggests that RF is associated with the highest chance of achieving a vaginal birth without significant increase in maternal or neonatal morbidity, further studies are required for a definitive conclusion. Furthermore, delivery of the malpositioned foetus was either conducted or directly supervised by experienced obstetrician with at least 6-7 years of specialist training. This may have introduced bias as the skill level of the clinician may have impacted the outcomes of the chosen technique. This is further highlighted by the overall risk of anal sphincter injury being much lower than previous studies [20].

In a similar study, Stock and colleagues [26] also examined the maternal and neonatal outcomes of RF deliveries. This study was primarily designed for descriptive purposes and included a comparison with other types of deliveries in a secondary analysis. Thus, caution should be taken when interpreting this data. The initial analysis of 873 rotational forceps deliveries found a rate of anal sphincter injury of 6.1%. The secondary comparative analysis was limited by the inclusion of only successful RF deliveries in a single year (2008) and the lower number of cases in the RF group (n = 150). No comparison was made to RV, nor did the study include data on patients undergoing manual rotation prior to instrumental delivery. The rate of anal sphincter injury after RF delivery was 9.3% and comparable with non-rotational forceps (8.5%, p = 0.64), but higher than vacuum (1.9%, p = 0.005) or spontaneous delivery (2.9%, p < 0.001). No statistically significant differences in postpartum haemorrhage were observed between RF and non-rotational forceps (5.3% vs. 7.2%, p = 0.49) or ventouse delivery (5.3% vs. 2.5%, p = 0.25), however lower rates were observed for spontaneous delivery (5.3% vs. 2.3%, p = 0.027). It should be noted that the comparison groups are not specific for the OP position. There were no statistical differences in NICU admissions or neonatal encephalopathy between the modes of vaginal delivery. Interestingly, delivery by emergency caesarean showed an increase in NICU admission compared to RF (3.3% vs 11.2%, p = 0.002). Despite the limitations, this study showed RF deliveries overall had a low incidence of neonatal and maternal morbidity.

A recent meta-analysis compared the safety and efficacy of RF and RV [27]. Data was obtained for 5870 rotational vaginal deliveries performed with forceps. Most of this data came from retrospective cohort studies, with only one prospective study included. In direct comparison to RF, RV showed a significantly higher risk of failure in achieving vaginal delivery. There were no significant differences in maternal outcomes such as anal sphincter injury, haemorrhage, or extended tears. Furthermore, there was a significantly lower risk of neonatal trauma with RF, and no significant difference in NICU admission, neonatal jaundice, or shoulder dystocia. This study currently provides the most robust evidence in this area. However, it is important to note that no

randomised controlled trials have been performed and the authors state the quality of included studies was generally poor with significant sources of bias such as moderate selection bias and a high risk of comparability and outcome assessment bias.

#### Manual rotation

Manual rotation (MR) of the foetal head from OP to OA position during the second stage of labour is a relatively simple intervention that may increase the chance of normal vaginal delivery. In one study, investigators showed that MR was a successful intervention in 90.3% of cases, with 69.6% successful on the first attempt [28]. Interestingly, none of the fourth or fifth attempts were successful, suggesting that more than three attempts may have no benefit. Rotation failure was more common in nulliparity and a maternal age >35 years. The authors showed the risk of anal sphincter injury was minimal in both successful and unsuccessful rotations, and that although manual rotation may induce foetal heart rate abnormalities, there is no association between foetal heart rate abnormalities after manual rotation and caesarean delivery.

Overall, this study suggests that MR may be an effective technique for reducing the caesarean delivery rate in patients with an OP position during labour. Although this opinion is shared by 97% of obstetricians in Australia and New Zealand, only a minority regularly perform MR [29]. Furthermore, it has been suggested that more obstetricians would be willing to perform the procedure if more robust evidence showed a reduction in the operative delivery rate [29].

Bahl and colleagues [30] conducted a prospective cohort study of 381 nulliparous women who had rotational operative vaginal deliveries, comparing MR with RV and RF. It is important to note that in this study, direct traction forceps followed MR. In this study MR was the most commonly performed method of rotation accounting for 42.8% of deliveries (followed by RF 38.1% and RV 19.1%). There were no significant differences in anal sphincter injury or postpartum haemorrhage between the three interventions. Additionally, there were no significant differences between the groups when comparing neonatal outcomes including 5-minute Apgar scores <7, cord blood acidosis, birth trauma, NICU admissions or shoulder dystocia. Compared with RV, MR was significantly less likely to result in sequential use of instruments (OR 0.01; 95% CI 0.002-0.09 p<0.05). This data showed rotational operative vaginal deliveries including MR, RV and RF had a low failure rate (6.8%) and are associated with few adverse maternal and neonatal outcomes. This study was limited by its cohort design and low number of cases. Additionally, the authors presented no significance levels for their findings.

A recent systematic review investigating the efficacy of prophylactic MR to reduce operative delivery found only one small pilot study, which showed no clear difference in the operative delivery rate [31, 32]. Thus, there remains insufficient evidence to determine the efficacy of MR. However the POP-OUT study, a randomised controlled trial currently in progress, will determine the effect of MR at full dilatation in reducing the operative delivery rate, as well as a number of secondary maternal and neonatal outcomes [9]. The results of this trial may provide the robust evidence needed to inform future practice amongst obstetricians.

#### Recommendations

Based on the current available evidence, this review has demonstrated the following. Maternal posturing in the last four weeks of pregnancy or during labour has no benefit in reducing the incidence of OP position at or before delivery. Therefore, no posture should be imposed on women with OP position during labour. Rotational operative vaginal deliveries tend to have a low failure rate when performed by experienced clinicians, however may be associated with anal sphincter injury, despite the overall risk being low. Despite current trends favouring the use of rotational vacuum, the most current evidence supports the use of rotational forceps in achieving a successful vaginal delivery with no increase in maternal morbidity, and a lower rate of neonatal trauma. Manual rotation followed by direct traction forceps is a commonly performed method of delivery for the OP positioned foetus, however has only been directly compared to rotational forceps or vacuum in one study, with no demonstrable statistical dif-ference in maternal or neonatal outcomes. At the completion of the POP-OUT study, new ev-idence may support an increasing role for manual rotation in the management of OP position at delivery.

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#### Acknowledgements

The author would like to acknowledge Associate Professor Andrew Bisits from the Royal Hospital for Women for his mentorship and continuing passion for teaching medical students..

#### Conflict of interest

None declared.

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### Addressing primary risk factors for strongyloidiasis in rural and remote Australian Indigenous communities through health promotion: a review of the literature

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Abstract: Strongyloidiasis is a disease caused by infection with the soil-transmitted helminth Strongyloides stercoralis. The infection can become life threatening if it progresses to complicated strongyloidiasis. S. stercoralis infection is a concern primarily in developing countries with tropical or subtropical climates. In Australia, the disease is significant for Indigenous people in rural and remote communities in these climates. Conditions that facilitate infection with S. stercoralis overlap considerably with the conditions found in rural and remote Australian Indigenous communities. These conditions include the physical and social context of the people living in these communities. Of particular emphasis in this review are their hygiene beliefs and behaviours. These beliefs and behaviours, which include beliefs surrounding defecation and general hygiene, as well as behaviours such as toilet use versus open-defecation, and use of footwear in areas with fecally contaminated soil, provide a focal point for intervention. Addressing harmful hygiene beliefs and behaviours through health education as a means of primary prevention of strongyloidiasis is considered, and a framework for implementing an educative programme is provided. There are considerable gaps in the research relating to the risk factors for and prevention of strongyloidiasis, as well as the role of the social determinants of health in facilitating infection with S. stercoralis. Furthermore, more research is required to consider the value of educative strategies versus anthelminthic chemotherapy in combatting this disease. The significance of strongyloidiasis in rural and remote Australian Indigenous communities must be recognized, and culturally safe, evidence-based means of preventing it need to be investigated.

#### Introduction

"We know that this parasite kills; we know that the infection can be lifelong in the absence of effective treatment; we know that the prevalence is probably much higher than previously estimated...we know enough to call for action now [1]."

Strongyloidiasis is a soil-transmitted helminthiasis caused by infection with the intestinal parasite *Strongyloides stercoralis*, a nematode that is endemic to tropical and subtropical regions [2–4]. Though underrecognised and poorly represented in the literature, strongyloidiasis is an important health issue in Australia.

Estimates have suggested that up to 100 million people are infected worldwide [5]. Poor disease surveillance has made it challenging to determine the prevalence of strongyloidiasis however, and the number of infected people is thought to be much higher [1]. In Australia, the infection is of particular significance for Indigenous people living in rural and remote communities (RRCs) in the northern parts of the country [6] who are by far the most affected population group [7,8]. Recent research indicates that the prevalence of the disease in these communities is as high as 60% [9,10]. With a prevalence rivaling that of the world's most destitute countries, and an estimated fatality rate of over 80% in complicated cases [11], it is time for strongyloidiasis in Australia to be given due attention. This article addresses the underlying factors that have permitted and perpetuated the success of



*S. stercoralis* in rural and remote Australian Indigenous communities. Additionally, it discusses existing and potential approaches to manage or eliminate these factors.

#### Clinical presentation of S. stercoralis infection

Infection with S. stercoralis has manifestations of varying severity. It has the potential to become a life threatening illness if it progresses to complicated strongyloidiasis [11,12]. Uncomplicated cases can present asymptomatically or with mild, non-specific gastrointestinal, respiratory, and dermatologic symptoms. The ambiguous and subdued clinical presentation can make it difficult to diagnose the disease. The exception is when the patient presents with larva currens, a unique rash that is pathognomonic to S. stercoralis infection [6,12,13]. Complicated strongyloidiasis, which refers to either hyperinfective syndrome or disseminated strongyloidiasis, manifests less obscurely and more severely [5]. Occurring in 2.5% of cases, most often due to a compromise in the patient's immune status, complicated strongyloidiasis may present with potentially life-threatening complications. These complications include shock, disseminated intravascular coagulation, meningitis, renal or respiratory failure, and septicemia, all of which contribute to its 50-86% case fatality rate [6,11,12,14].

#### **Risk factors for strongyloidiasis infection**

Understanding of the risk factors for developing strongyloidiasis is important for developing effective interventions in rural and remote Australian Indigenous communities (RRAICs). These risk factors stem from the interaction between factors pertaining to the individual (the host), the pathogen (*S. stercoralis*), and the sociocultural and physical environment. Many of these individual and contextual factors are present in RRAICs, explaining the high prevalence of the disease in this population.

Pathogen factors refer to the characteristics of *S. stercoralis* that allow it to infect humans. These include its mode of transmission, life cycle, and reservoir of infection. *S. stercoralis* may be transmitted through penetration of exposed skin (through contact with the faeces of an infected individual) or via the faecal-oral route. The parasite also has a unique ability to propagate itself via an auto-infective lifecycle [14]. Infected humans are the primary reservoir of infection, however the environment may also act as a reservoir in the case of continual habitation and contamination by infected humans [10,15].

Individual determinants of infection risk include the person's health behaviours and beliefs, while environmental determinants refer to the individual's social context and physical environment [16]. Individual and environmental risk factors that are particularly relevant to RRAICs include: contact of bare skin with infectious faeces and transport of faeces to the mouth via contaminated hands or food [14]; close living quarters; living in a warm climate [8,17]; and being socioeconomically disadvantaged [15]. Individual conditions seen in RRAICs that facilitate either skin or oral contact with infectious faeces are: limited use of appropriate footwear [18,19], the practice of open-defecation among children, the belief that open-defecation and the faeces of young children pose no health risk, not appreciating the health risks associated with faecally contaminated soil, poor general hygiene, and the unsafe disposal of nappies and faecal material [20]. Further contributing to the risk of contact with faeces is the lack of adequate sanitation hardware, as there is a high level of non-functional sanitation facilities in RRAICs [20-22]. Overcrowding is a significant issue in RRAICs, with 20% of remote and 53% of very remote Indigenous households thought to be overcrowded, exacerbated by the marked socioeconomic disadvantage faced by Indigenous people living in RRCs [23].

Clearly, the risk factors for *S. stercoralis* infection overlap significantly with the determinants of health of Indigenous Australians in RRCs. It is this overlap that has ensured that the insidious presence of strongyloidiasis in these communities has endured for so long

#### Barriers to effective strongyloidiasis management in Australia

A number of barriers to effective management of strongyloidiasis in Australia have been identified. Firstly, there is sparse literature on the topic: among the soil-transmitted helminthiases (STHs), strongyloidiasis is the least well-researched [24]. Secondly, clinicians in RRAICs often lack adequate knowledge about the disease and its presentation, which may result in a delayed or missed diagnosis. Thirdly, there is poor knowledge surrounding appropriate treatment, as well as a lack of follow-up on unconfirmed cases [6]. Fourthly, the cost of screening and treatment has also been an obstacle to control, as has the lack of a coordinated public health strategy [4,7]. To aid in the management of *S. stercoralis*, effective primary prevention of should be employed to prevent infection.

#### Primary prevention of strongyloidiasis

The interplay of the risk factors for infection, determinants of health of Indigenous Australians in RRCs, barriers to control, and characteristics of RRAICs is reflected in the variety of strategies suggested. Here strategies are presented in isolation, but it should be emphasised that a homogenous approach would be ineffective in controlling a disease that has such a multifaceted foundation. Furthermore due to the scarcity of research on controlling strongyloidiasis in Australia, evidence must be drawn from studies undertaken in other countries, as well as those relating to hygiene-associated diarrhoeal diseases (HADDs) and STHs other than strongyloidiasis.

Strategies to break the transmission of S. stercoralis have the most published evidence, including reducing skin contact with faecallycontaminated soil and preventing faecal-oral transmission. These include wearing appropriate footwear, possessing and utilising adequate sanitation facilities, and improving hygiene beliefs and behaviours (HBBs). A systematic review found that wearing shoes was found to strongly lower the odds of infection with hookworm (OR 0.29, 95% CI 0.18-0.47), a soil-transmitted helminth that also penetrates exposed skin [24]. The results of a study conducted in Cambodia are also supportive of this intervention, as the authors found a negative association with possession of shoes and S. stercoralis infection (OR 0.4, 95% CI 0.2-0.9, P = 0.031) [25]. Possession and use of adequate sanitation facilities to be negatively linked to S. stercoralis infection (OR 0.3, 95% CI 0.1-0.5, P < 0.001) [25,26]. The possession and use of functional sanitation hardware also reduced the number of cases of soil-transmitted helminthiases (OR 0.46-0.58) [27,28]. Contrary to this however, a study conducted in Zanzibar, found no significant

association between new strongyloidiasis cases and having access to a latrine at home (OR 0.97, 95% CI 0.51-1.86, P = 0.987) [29]. It is worth mentioning that, though not very well represented in the literature, there is yet another possible avenue for primary prevention of the disease through environmental control strategies. Unfortunately, limited research on such strategies precludes meaningful evaluation of this approach [15].

Studies evaluating the effect of improving HBBs on the incidence of strongyloidiasis, other STHs, or HADDs have validated the use of HBBs as a target for strongyloidiasis prevention programs. A review evaluating the effectiveness of hygiene interventions for improving general health outcomes in RRAICs found that encouraging hand washing with soap was effective in reducing STHs and HADDs in children [30]. Though the review did not pertain to strongyloidiasis, its supportive findings encourage the utilisation of hygiene interventions as a possible strategy for controlling the disease. One study evaluated in this review specifically addressed STHs, supporting the validity of improving HBBs as a control measure for strongyloidiasis [31].. The usefulness of a strategy targeting HBBs is dependent not only on the degree of protection from infection that it would afford, but also on the practicality of implementation. Previous methods used to promote healthy hygiene behaviours in RRAICs have, unfortunately, been neither comprehensive nor long lasting, confirming the need for alternative, evidence-based approaches [30].

#### Approaching strongyloidiasis through health promotion

Health promotion to improve HBBs surrounding defecation may represent a viable strategy in the primary prevention of S. stercoralis infection. There are numerous avenues through which HBBs in RRAICs could be improved, though the suggested strategy discussed in this review focuses on improvement through health promotion. Health education is an essential component of any program to control STHs. The World Health Organization (WHO) recommends that health education be the starting point for preventing STHs because it ensures an environment in which the success of other methods of prevention will be facilitated [32,33]. The foundational nature of health education and the absence of current programs in Australia that utilise health promotion bespeak the urgency with which such an approach should be evaluated [4]. Strategies employing chemotherapeutic deworming strategies provide only short term benefit, and cannot prevent reinfection [27]. Addressing the disease through the lens of health promotion provides a long-term strategy to eradicate S. stercoralis infection through behavior change [27].

Here we propose a strategy focused on health education and based on two of the five tenets of the Ottawa Charter for Health Promotion: creating supportive environments and developing personal skills [34].

The primary focus of the strategy is to achieve the following objectives through health education. The first objective of this approach is to educate community members about S. stercoralis, and to ensure that they understand how it causes disease. When educating about S. stercoralis, it would be necessary to establish microscopic literacy, so as to create awareness of the microscopic world, and to facilitate an understanding of the concept that microorganisms can cause disease [35]. This would contextualise and give meaning to the remaining objectives [36]. The second objective is to encourage the use of toilets, if available, and to educate about alternative means of hygienic waste management. The third objective is to make community members aware of the health risks associated with faeces, with an emphasis on the importance of ensuring appropriate disposal of the faeces of S. stercoralis-infected individuals. The fourth objective is to educate community members about the importance of discouraging opendefecation by young children, and to enable caretakers to potty-train young children. The final objective is to educate individuals about the rationale behind hand washing, particularly after defecating, disposing of children's faeces, or contact with soil. The components of this approach have been synthesised based on strategies for preventing



strongyloidiasis, STHs, or other HADDs that have been suggested or evaluated in the existing literature. Additionally, the evidence from which this strategy was synthesised was derived primarily from studies in communities with similar socioeconomic contexts and sanitation infrastructure to RRAICs.

A suitable framework would be required in order to implement a program focusing on improving HBBs. The WHO has outlined one such framework that could be modified to increase its relevance to strongyloidiasis in RRAICs [32,33]. The action plan they have developed relates to hygiene behaviours beyond those surrounding defecation, but the principles are still applicable. Briefly, the framework details the need to: ascertain and understand local hygiene beliefs and traditional defecation behaviours, learn about the dynamics and the perceived needs of the target community, involve community members and build on or establish community organisations, direct the hygiene education at children and their caretakers, utilise a variety of participatory learning activities, and capitalise on human resources by involving community elders and other respected members of the community, as well as health professionals. It is emphasised that the educational strategies should be used alongside the provision of functional handwashing and defecation facilities [32,33]. In order for the hygiene education framework to be applied to RRAICs, the principles of effective Aboriginal health promotion, as outlined in the 2002 Sydney Consensus Statement on Principles for Better Practice in Aboriginal Health Promotion, would need to be considered [37]. These principles include: acknowledging the social, economic, and cultural contexts of the target communities, ensuring continued community participation and evaluation, and maintaining transparency when designing and implementing any interventions [37]. Ensuring that the education program is culturally appropriate and acceptable by involving community members in its design and application is paramount to the efficacy of the intervention [20].

There are a number of limitations and barriers to this strategy. The scarcity of evidence for the effectiveness of health promotion and educative strategies to control strongyloidiasis is striking. Additionally, the cost of implementing a comprehensive behavioural intervention strategy could prove to be prohibitive. Research on the control of hookworm has suggested that the influence of health education would be negligible without first improving the economic status of the people living in these communities [38]. Additionally relevant is the sensitive nature of the topic of hygiene: indicating that there is a need for 'better' HBBs implies that the current practices are 'bad' or 'wrong'[30]. This is a damaging sentiment that could hinder the implementation of this strategy. Another limitation of this strategy is the dependence on adequate sanitation infrastructure - a significant limitation when considering the previously discussed low levels of functioning sanitation hardware in RRAICs. Lastly, hygiene interventions for the control of strongyloidiasis have not been unanimously supported in the literature, as at least one study reported that there was no significant link between hand washing and S. stercoralis infection [24].

The strengths of this strategy lie in its capacity to lay the foundation for long-lasting control of the disease. As mentioned previously, health education is needed to set a facilitative stage for further control measures. This strategy also addresses the underlying factors that contribute to the hyperendemicity of strongyloidiasis in RRAICs. Most promising is the potential for long-lasting prevention that can come from educating children and their caretakers or elders about healthy hygiene behaviours. Improving the HBBs of caretakers and elders establishes a home environment in which said HBBs will be taught to children. Without this education and reinforcement in the home environment, it would be unlikely for the children to adopt these new behaviours [35]. Thus, by educating elders, the education of children is ensured. The effective education of children is critical, as children can apply the learnt behaviours in their adult lives and pass them on to the next generation [32,33]. This multigenerational education could ensure that the improved HBBs become ingrained in the norms of the community. Additionally, although the initial cost of implementing

such a comprehensive intervention may be significant, there is the potential for a greater cost-effectiveness in the long run. This long-term reduction in cost could arise if the more permanent educative solution negates the need for regular use of screening and anti-helminthic chemotherapy in the future. The strategy's final strength is its potential to empower target communities. By focusing on educating community members about *S. stercoralis*, the strategy would enable them to take the initiative to reduce their risk of infection, as opposed to cultivating a paternalistic situation in which they are exclusively reliant on the instructions of external parties.

Regular evaluation of outcomes of the strategy is essential to ensure its effectiveness.

This could be achieved by: regularly screening for infection, frequently discussing the perceived efficacy of the strategy with community members, and continually reassessing the hygiene needs of the community. However, it has been reported that measuring the success of hygiene interventions can be a complex and difficult undertaking [30].

#### Conclusions

The enduring presence of strongyloidiasis in RRAICs is appalling: a disease that is otherwise almost entirely restricted to impoverished countries thrives in the wealthy nation of Australia. Without addressing the social, cultural, and economic factors that underlie the health disparity seen in RRAICs, effectively controlling this disease will prove to be challenging. Health promotion and health education as a means of controlling strongyloidiasis should be further investigated, as the role of such strategies has, for the most part, only been incidentally discussed to date. There are a considerable number of gaps in the research relating to strongyloidiasis and health promotion strategies for improving hygiene in RRAICs. Areas that require more research include: culturally acceptable, non-confrontational methods of hygiene education, the short- and long-term cost-effectiveness of anthelminthic chemotherapy and screening, with or without health promotion programs, the role of the social determinants of health in strongyloidiasis in RRAICs, the role of overcrowding in the transmission of strongyloidiasis, strategies to reduce overcrowding in RRAICs; the influence of rurality on the prevalence of the disease, the role of the faecal-oral route of transmission and its significance to preventative strategies, and the potential role of the environmental stages of S. stercoralis as a target for control strategies.

The medical community of Australia must recognise the significance of strongyloidiasis in rural and remote Australian Indigenous populations. Furthermore, the need for comprehensive, coordinated control strategies – that prevent not only initial infection but also the potentially fatal complications of existing infection – must be made a priority when the health of Indigenous Australians is discussed.

#### **Glossary of abbreviations**

HBBs	Hygiene beliefs and behaviours
HADDs	Hygiene-associated diarrhoeal diseases
RRAICs	Rural and remote Australian Indigenous communities
RRC	Rural and remote communities
STHs	Soil-transmitted helminthiases
WHO	World Health Organization

#### Acknowledgements

None.

#### **Conflicts of interest** None declared.

None declared.

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## Meniscal repairs: a review of past, current, and future options

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**Abstract**: Meniscal tears are amongst the most common knee injuries. The purpose of the current article is to identify the most common meniscal tears, current treatment options, and potential future treatment methods. The traditional approach to meniscal tears was total meniscectomy. However, this approach has been largely abandoned due to the emergent relationship between even partial meniscectomy and the early onset and development of osteoarthritis. Complete meniscectomy is indicated only if the meniscus is torn beyond repair, however, preservation of the meniscal rim is always a priority. Tears in the peripheral onethird region are well suited for repair and these have high success rates. When irreparable damage is encountered, removal and replacement of the meniscus with natural or synthetic scaffolds presents a promising option if its efficacy can be definitively demonstrated in future trials.

#### Introduction

The menisci are a pair of semilunar, wedge-shaped fibrocartilaginous structures sitting between the femur and the tibia within the tibiofemoral joint of each knee. They are involved in load transmission and produce significant load-spreading across the articular surfaces in normal knees [1,2], as well as shock-absorption, which is reduced in painful knees [3]. Other meniscal functions include joint lubrication [4], structural stability [5], and proprioception [6].

Meniscal tears are among the most common knee injuries and can be secondary to trauma or degenerative changes [7]. The former occurs when excessive force is applied to a normal meniscus while the latter occurs from normal forces acting on a degenerative structure [8]. Acute tears are usually caused by a traumatic, twisting motion of the knee, frequently during sports [7]. Sports-related meniscal tears are often associated with anterior cruciate ligament (ACL) rupture [7,9].

In addition to the two aetiological categories mentioned, meniscal tears can be classified according to the pattern of rupture seen at arthroscopy [8]. The most commonly described patterns of meniscal injury are as follows:

 Horizontal (cleavage) tears: These tears result from shear stresses generated by inferior and superior sections of the meniscus, causing the meniscus to cleave into two layers [7,8]. Horizontal tears are difficult to manage and are not usually amenable to repair.

- Vertical (longitudinal/circumferential) tears (Figure 1): These are the most common type of meniscal tear to be repaired. They can vary in size between ~1mm to the full length of the meniscus [8]. The Bucket-handle tear (Figure 2) is a type of vertical longitudinal tear in which the inner margin is displaced from the remainder of the meniscus. Depending on the extent of injury, it can be unstable and cause mechanical symptoms such as the classical "lock knee" [8]. Owing to its more secure attachment to the tibial plateau, the medial meniscus is more prone to shear forces and is more commonly affected [8].
- Oblique (flap/parrot-beak) tears (Figure 3): These are tears that
  proceed towards the periphery at an acute angle to the meniscal
  margin. Oblique tears can occur at any point along the meniscus
  but most often between the posterior- and middle-thirds of the
  meniscus. Propagation of the tear or mechanical symptoms can
  be elicited by a free flap catching in the articular interface [8].
  Along with vertical tears, they make up 81% of all tears [8].
- *Radial (transverse) tears:* These are tears that occur across the circumferential fibers of the meniscus (Figure 4). They are commonly seen following ACL disruption. Radial tears may extend to the periphery if not treated, at which point they disrupt the natural hoop stresses of the meniscus and interfere with its natural load-spreading and shock-absorptive functions [8].
- *Complex tears:* These are degenerative in nature, composed of several different tears in multiple planes resulting from persistent hoop and sheer stresses, and are often associated with degeneration of articular cartilage [10]. Together, they feature in the pathology of degenerative arthritis, which is positively associated with older age [8,11]. The healing potential of chronic degenerative menisci remains poor and conservative treatment is recommended except in refractory cases [10].

#### Methods

A literature search of publications relating to meniscal repairs was undertaken. The databases PubMed, CINAHL, and Ovid were searched. The search terms "Meniscus OR Meniscal", "Tear", "Treatment OR Repair OR Surgery", "Knee", "Options" and "Outcome" were used. This search yielded 453 publications. Additional articles were obtained from bibliographic screening. After the search, articles that were not relevant to meniscal tears of the knee and treatment options were excluded. In the final analysis, 37 articles were included in the current review.

#### Meniscectomy

The traditional approach to meniscal tears, until the 1970s, was total meniscectomy [11]. However, this approach has been largely abandoned due to the emergent relationship between even partial meniscectomy and the early onset and development of osteoarthritis (OA) [7,12-15]. Meniscectomies have been shown to cause joint-space narrowing, lowering the rate of regeneration, leading to an increase in the degenerative changes in the surrounding cartilage, and hence a higher incidence of OA [16-20]. In a normal knee, the menisci transmit 50% of joint-compressive forces in full extension and 85% of the load at 90° of flexion [21]. However, following a total meniscectomy, the tibiofemoral contact area is reduced by approximately 75%, while contact forces increase by 235% [1,2]. Today, repair and preservation of the menisci is the universally-accepted approach to meniscal tears.

Untreated meniscal damage is a potent risk factor for the development of OA [22]. When meniscal repair is not possible, partial meniscal resection is preferred to total meniscectomy, and is associated with less radiographic OA over time [22,23]. A systematic review of clinical outcomes found lateral meniscectomy to be associated with significantly greater frequency of radiographic OA, reduced knee function and future instability than medial meniscectomy [24]. The lateral meniscus has been reported to carry a higher load in the knee compared with the medial meniscus, and its loss may result in increased cartilage contact stress [22]. Furthermore, degenerative meniscal tear and cartilage changes at the time of surgery were associated with radiographic OA more frequently than were longitudinal tear and absence of cartilage changes, respectively [22].

#### **Current Treatment Methods**

Meniscus surgery procedures have rapidly developed from open procedures to arthroscopic surgery over the past two decades [25]. Reparability of the meniscus depends on several factors, such as vascularity, type of tear, chronicity, and size [15,26]. Complete meniscectomy is indicated only if the meniscus is torn beyond repair, however, preservation of the meniscal rim is always a priority [15,26,27].

The indications for meniscus repair include: active patients with tibiofemoral joint line pain, patients younger than 50, or patients between 50 and 60 who are athletically active. Repair may also be undertaken with concurrent knee-ligament reconstruction, a reducible meniscus tear, and good tissue integrity [28].



Figure 1. Peripheral longitudinal tear. Source: Dr Andrew Stuart



Figure 2. Bucket-handle tear. Source: Dr Andrew Stuart



Figure 3. Oblique (flap) tear. Source: Dr Andrew Stuart



Figure 4. Types of meniscal tears. Source: Hope Orthopaedics



Tears in the peripheral one-third region (zone 1, also known as the red-red zone due to its high vascularity; Figure 5) are well suited for repair, and these have high success rates. Tears in the middle-third region (zone 2, also known as the *red-white* zone) are often reparable with reasonable success rates. Longitudinal, radial, and horizontal tears confined to zones 1 and 2 are patterns that are usually amenable to repair [28-30]. The vascularity of the menisci is important, as it is critical to the success of a healing response. Meniscal vascularity has been described by Arnoczky and Warren [31]. The degree of vascular penetration was found to be 10-30% of the width of the medial meniscus, and 10-25% of the width of the lateral meniscus. Therefore, tears in the vascular zone have the highest chance of healing. Cannon and Vittori [32] reported a decline in healing rates as tear location moved from peripheral to central: 90% for tears within 2 mm of the periphery, 74% for tears within 3 mm of the periphery and 50% for tears within 4-5 mm of the periphery. The length of the tear has also been suggested to affect repair outcome. Cannon and Vittori [32] reported 90% and 50% healing rates for tears less than 2 cm and greater than 4 cm, respectively. Bach et al. [33] documented significantly earlier failure in larger tears. However, other data has been unable to demonstrate a significant difference in repair outcomes based on tear length [33].

The identification of meniscal tears suitable for repair is usually made at the time of arthroscopy. The three general meniscal repair techniques are as follows:

- Inside-out repair technique: This technique uses sutures placed in the menisci from within the joint cavity and tied over the capsule through a limited open approach. This technique is the gold standard with which other repair techniques are compared [34,35]. However, comparable results are reported with other techniques that are less technically demanding [35].
- Outside-in repair technique: Sutures are introduced into the knee through the lumen of a standard spinal needle, where they are visualised by the arthroscope. The suture is then drawn through a portal and interference knot tied. The knot is pulled back into the knee where it tamps down the torn meniscal fragments. This technique is mostly suited to tears in the anterior and adjacent middle segments of the meniscus [36].
- All-inside repair technique: This is a more recent technique, favoured by most clinicians due to its lower complication rate and lower morbidity [37,38]. It can be divided into two types: one that uses resorbable, rigid arrows (darts and staples), which provide rigid fixation, and one that employs flexible, suture-based repair devices, which deploy anchors for stability [39]. These arrows and sutures are designed to hold the meniscal fragments together while healing occurs. They are popular, as they do not necessitate an additional skin incision. However, some of the rigid devices have demonstrated inferior mechanical properties compared with sutures [39-41]. Suture-based devices were developed in an attempt to avoid the complications associated with rigid devices and to allow a more flexible fixation of the meniscal fragments [42]. Success rates of 83-88% have been reported for this technique [43,44].

Arthroscopic trephination of vascular channels at the free meniscal edges has also shown improved meniscal healing. Trephination is a safe and easy procedure that involves the creation of a channel through the meniscus from the vascularised zone to the tear. Fox *et al.* [45] reported good results in 90% of cases and Zhang *et al.* [46,47] showed trephination led to healing of all tears, either partially or fully [47], with an improved healing rate and lower re-tear rate compared with suturing alone [46].

Not all meniscal tears can or should be repaired, particularly if considerable damage has been sustained. Contraindications include:



Figure 5. Vascularity of meniscus. Source: Hope Orthopaedics

tears located in the inner-third region (zone 3, also known as the white-white zone, where the tissue is entirely devoid of a vascular supply), and tears with major degeneration. Longitudinal tears measuring less than 10 mm in length and incomplete radial tears that do not extend into the outer one-third of the meniscus should also not be repaired. Older patients (above 60 years of age) and those unwilling to follow post-operative rehabilitation programs would also be unsuitable candidates [28].

Degenerative (complex) tears in older patients are among those tears historically treated by unnecessarily invasive means. Sihvonen et al. [48] conducted a randomised sham-controlled trial in patients with a degenerative meniscal tear and no knee OA. Patient outcomes after arthroscopic surgery were no better than those after a sham operation. A subsequent meta-analysis showed a small, clinically insignificant benefit from surgical intervention that is entirely absent within two years [49]. Current evidence does not support a role for arthroscopic debridement, washout, or partial meniscectomy for middle-aged and older patients with knee pain with or without signs of OA [49,50]. First-line treatment comprises non-operative modalities, such as education; self-management; exercise; weight loss, if overweight or obese; walking aids, if indicated, paracetamol; nonsteroidal anti-inflammatory drugs; and intra-articular glucocorticoids [50]. Knee pain refractory to conservative therapy may respond to partial meniscectomy in the absence of OA when combined with a physiotherapy program, however, relief does not persist in the longterm [10].

#### **Meniscus Replacement**

Potential future treatments have expanded their focus beyond the conventional methods. In some cases, there may be an indication to resect and replace the entire meniscus. Meniscal replacement has a greater capacity to protect the joint surfaces and is a suitable option in cases where patients have suffered degenerative changes due to prior meniscectomy or when an irreparable tear is encountered [16]. Meniscal replacement surgery uses natural or synthetic scaffolds to guide tissue repair or regeneration in three dimensions while providing a temporary construct for mechanical function [51]. Clinical application of both allograft transplantation and synthetic replacement scaffolds show promising results [52], however, their superiority to partial meniscectomy still needs to be demonstrated [53].

#### Conclusion

Meniscal tears are a common orthopaedic pathology that may have an acute traumatic or chronic degenerative cause. Due to the likely complication of OA, alternatives are now preferred to total meniscectomy. There are several surgical approaches suited to treating different patterns of meniscal tear. Where indicated, meniscal repair is the preferred method of treatment, with evidence supporting very good long-term results. When irreparable damage is encountered, removal and replacement of the meniscus with natural or synthetic scaffolds presents a promising option, provided its efficacy can be definitively demonstrated in future trials.

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#### Aknowledgements

The authors wish to acknowledge Hope Orthopaedics for supplying Figure 4 and Figure 5.

#### **Conflicts of interest**

None declared.

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## Focal segmental glomerulosclerosis – Treatment beyond corticosteroids

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Erin is a final year medical student at Monash University with an interest in general medicine, as well as women's and children's health.

Abstract: This case report describes a fourteen year-old male who presented with a relapse of steroid-dependent focal segmental glomerulosclerosis (FSGS). FSGS is responsible for 10-15% of cases of idiopathic nephrotic syndrome (INS) in children, with the majority of cases attributed to minimal change disease. Prednisolone is first line for the induction of remission, with the majority of INS cases responding to initial therapy. Those who fail to achieve remission within four weeks of corticosteroid therapy are labeled "steroidresistant". Of those who do remit with corticosteroids, 80% have a relapse, with 50% of these patients having "frequently relapsing disease". Those patients who relapse while on corticosteroids, or within two weeks of cessation of corticosteroids, are labeled "steroid-dependent". The aim of this article is to review the literature available on the management of FSGS, particularly steroid-resistant, steroid-dependent, and frequently relapsing disease.



ML, a fourteen year-old male, presented to a rural paediatric department with a one-month history of increasing oedema of his face, sacrum, and lower limbs; lethargy; and oliguria on a background of known steroid-dependent focal segmental glomerulosclerosis (FSGS).

ML first presented with nephrotic syndrome in late 2014, which was initially responsive to corticosteroids, but relapsed following steroid cessation. A renal biopsy was performed in early 2015 and ML was diagnosed with FSGS. At this time, he was started on cyclosporin 125 mg OD and was managed by a general paediatrician and nephrologist.

Approximately one month prior to his admission, ML commenced 50 mg doxycycline at night for acne and the cyclosporin was consequently reduced to 100 mg daily due to concerns that doxycycline may increase the cyclosporin concentration. Soon after, his symptoms of nephrotic syndrome began to return and the cyclosporin was increased to 110 mg daily. ML had also started ramipril 1.25 mg at night prior to his admission.

ML had a history of partial seizures, diagnosed in 2008, which were well controlled by valproate 400 mg twice daily. Developmental history was unremarkable. He had no known allergies and had received his routine childhood vaccinations. Due to the immunosuppressive nature of relapsing nephrotic syndrome, he also received the pneumococcal vaccine and an annual influenza vaccine. There was a family history of epilepsy in his grandmother, but no family history of renal disease. ML was an only child, a non-smoker, and a non-drinker, who lived with his mother in a major regional centre.

On examination, ML was pale and lethargic, with marked periorbital oedema. His vital signs were within normal limits. He had cold peripheries, indicating intravascular depletion but central capillary refill was normal. His jugular venous pressure (JVP) was not elevated, but he had pitting oedema extending to the upper legs, as well as sacral, periorbital, and scalp oedema. His abdomen was distended and ascites was demonstrated by shifting dullness. The abdomen was otherwise non-tender and bowel sounds were present. Heart



\* Image for illustration purposes only and is unrelated to the patient discussed in this case report.

sounds were dual with no murmurs. His chest was clear with resonant percussion, excluding pulmonary oedema.

Investigations included urine dipstick; urine microscopy, culture, and sensitivity (MCS); spot protein-creatinine ratio; full blood examination (FBE); urea, electrolytes, and creatinine (UEC); liver function tests (LFTs); and a cyclosporin level. Urinary investigations revealed heavy proteinuria, but no haematuria, and all other investigations were unremarkable.

ML was admitted for management of his acute relapse, which included fluid and salt restriction, daily weighs, and daily urine dipstick. The ramipril was ceased. He was administered 75 mg of intravenous 20% albumin over six hours, with 40 mg of intravenous frusemide given at mid-infusion and post-infusion.

ML lost four kilograms overnight and was discharged on a five-day course of oral frusemide, with a 40 mg dose on the first day, then 20 mg for four days.

#### Discussion

#### Background

FSGS is a histopathological pattern of glomerular injury seen under light microscopy, in which sclerosis occurs in segments of only some of the glomeruli [1]. This pattern of injury can occur in all age groups and is the most common cause of adult nephrotic syndrome [2]. FSGS is also identified in 10-15% of cases of idiopathic nephrotic syndrome in children, with the majority of cases attributed to minimal change disease [3].

In most cases of FSGS, the underlying cause is unknown – termed "primary FSGS" [4]. However, secondary FSGS may develop as a response to previous renal injury. Underlying causes of secondary FSGS include reflux nephropathy, infections (for example, HIV), obesity, medications (for example, interferon), genetic mutations, surgical resection of renal tumours, congenital renal dysplasia, and intrauterine growth restriction [5].
Primary FSGS presents with a typical nephrotic syndrome, including foamy urine and extensive oedema [6], particularly periorbital oedema. Nephrotic syndrome is confirmed with a spot urine protein creatinine ratio >0.2 g/mmol [3]. Secondary FSGS is more variable in its presentation, with proteinuria often below nephrotic levels and patients being less likely to present with overt oedema [5].

In children who present with overt nephrotic syndrome, a renal biopsy is not appropriate, because the majority of these cases will be due to minimal change disease. Only when they are unresponsive to corticosteroids, or develop a frequently relapsing or steroid-dependent pattern of disease, is a renal biopsy justified [6]. For indistinct presentations (for example, proteinuria below nephrotic levels), a renal biopsy may be considered on the initial presentation [7]. The risks and benefits of the renal biopsy must be evaluated, with post-biopsy bleeding being a major risk to consider [6].

The following discussion will focus on the treatment of primary FSGS. Secondary FSGS is best treated with angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers to lower the intraglomerular pressure and treatment of the underlying cause, when possible [2].

#### Immunosuppressive treatment: corticosteroid

Corticosteroids are first-line in treatment of idiopathic nephrotic syndrome (INS) for the induction of remission. Between 80-90% of cases of INS are responsive to initial corticosteroid therapy [3]. Those patients who fail to achieve remission within four weeks of corticosteroid therapy are labeled "steroid-resistant". Of those patients who respond initially, there is an 80% chance of relapse, with 50% of those having frequently relapsing disease, defined as two or more relapses in the first six months or four or more relapses in any twelvemonth period [3,8]. Those who relapse while on corticosteroids or within two weeks of cessation of corticosteroids are labeled "steroid-dependent" [3].

#### Immunosuppressive treatment: non-corticosteroid

In steroid-resistant, steroid-dependent, and frequently relapsing disease, non-corticosteroid immunosuppressive agents are utilised. The available evidence for each of the commonly used non-corticosteroid immunosuppressive agents will be explored to determine if cyclosporin is the best treatment to prevent relapse in a patient like ML, who has steroid-dependent FSGS.

Calcineurin inhibitors, with or without low dose prednisolone, are first line [1]. The majority of evidence is with cyclosporin. Cochrane Reviews have demonstrated that cyclosporin increases the rate of remission in children with steroid-resistant disease [9] and reduces relapses in steroid-dependent disease, compared with prednisolone alone [8]. Cyclosporin was superior to intravenous cyclophosphamide in steroid-resistant disease [9]. However, in steroid-dependent disease, relapse was reduced with an eight-week course of alkylating agents, cyclophosphamide, or chlorambucil, while cyclosporin required a prolonged course and its effects were not always sustained following treatment cessation [8]. Therefore, cyclophosphamide plays no role in steroid-resistant disease, but may be used in the treatment of steroiddependent FSGS when cyclosporin has failed or in patients with higher risk of calcineurin nephrotoxicity due to extensive interstitial fibrosis or vascular disease [1].

Mycophenolate motefil may be useful as an alternative medication for relapsing disease, however, the evidence is limited to a few smaller trials [8]. It may be used in combination with corticosteroids when calcineurin inhibitors have been unsuccessful or are contraindicated. Rituximab is another alternative, which has had some success in steroid-dependent disease, but the evidence does not support its use in steroid-resistant

disease [8,10,11]. Subcutaneous natural adrenocorticotropic hormone (ACTH) therapy has also had some success in pilot studies, however, the treatment is expensive and further randomised trials are required to confirm the results [12,13].

#### Non-immunosuppresive treatment

The evidence clearly supports the use of ACE inhibitors or angiotensin receptor blockers in children with steroid-resistant nephrotic syndrome and secondary FSGS [7]. The use of these agents in steroid-dependent or frequently relapsing disease has not been specifically studied. However, guidelines on the use of anti-hypertensive agents in children with chronic kidney disease from any cause suggest that children should be started on an ACE inhibitor or angiotensin receptor blocker when their blood pressure is consistently above the 90<sup>th</sup> percentile for their age, sex, and height [14]. Treatment should aim to reduce blood pressure to at or below the 50<sup>th</sup> percentile, unless limited by symptomatic hypotension [14]. Blood pressure-lowering drugs should be used when indicated, irrespective of the level of proteinuria [14]. In primary FSGS, blood pressure-lowering therapy may slow progression to end-stage renal disease, however, it rarely results in remission without concurrent immunosuppressive treatment [15].

Hyperlipidaemia is a common complication of nephrotic syndrome. Combined with the higher cardiovascular risk of patients with chronic kidney disease, this calls for lipid-lowering therapy with a statin [1,16]. While lipid-lowering agents have been successful in lowering lipids in adults with nephrotic syndrome, no studies have looked at the mortality and morbidity benefits of a statin [16]. The use of statins in children with nephrotic syndrome is controversial, with small studies showing that statins reduce lipid levels and are well tolerated, however, there is a lack of evidence regarding long-term safety of statins in paediatric patients [17].

#### Renal transplantation

Over ten years, 60% of cases of FSGS progress to end-stage renal failure [18]. These patients will need dialysis or renal transplantation. However, there is a high rate of graft failure, with recurrence of FSGS in 30% of allografts [19,20]. The graft survival is lower in children than in adults [19].

Therapeutic plasmapheresis, used for a number of antibody-mediated conditions, is a process that removes the antibody-containing plasma from the patient's blood and replaces it with unaffected plasma or a plasma substitute [21]. Therapeutic plasmapheresis may be used in FSGS prophylactically before transplantation or in the treatment of established recurrence in an allograft [19]. Studies show that 49-70% of children with recurrent FSGS who receive plasmapheresis enter complete or partial remission of proteinuria [19]. A small study demonstrated that early and intensive daily plasmapheresis in patients with recurrence was beneficial in obtaining complete remission [20].

#### Future novel therapies

Adalimumab and galactose versus conservative therapy with lisinopril, losartan, and atorvastatin is currently being studied in the "Novel therapies for resistant focal segmental glomerulosclerosis (FONT)" trial. [22] If successful, these treatments may form part of the treatment of FSGS in those patients who have failed other immunosuppressive therapies.

#### Conclusion

This case report describes a patient with steroid-dependent nephrotic syndrome, diagnosed on renal biopsy as FSGS. The patient was commenced on cyclosporin, which is first-line in steroid-dependent disease. Alternative immunosuppressive agents, rituximab and

mycophenolate motefil, require larger-scale trials to confirm their efficacy. Current guidelines suggest that patients' ramipril should be restarted if their blood pressure is above the 90th percentile for their age, sex and height. However, further research is needed to create specific guidelines for the use of anti-hypertensive agents in children with steroid-dependent nephrotic syndrome. The evidence for the safety of statins in children is insufficient, therefore these drugs should be avoided.

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#### Acknowledgements

None

#### **Conflicts of interest**

en None declared.

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### A stroke in a young man with a murmur

#### **Dr Rhys Gray**

Intern BAppSc (Physiotherapy), MBBS Rhys is an intern at the Wollongong hospital. He previously studied physiotherapy at the University of Sydney and worked as a physiotherapist throughout medical school. He completed his medical degree at the University of Wollongong. Rhys is interested in general medicine and critical care. He is passionate about rural and regional medicine and also enjoys surfing and hockey.

**Abstract**: A fit 40-year-old man presented to hospital with signs and symptoms consistent with a large anterior stroke. He underwent intravenous thrombolysis and later developed cerebral oedema, which was managed with a decompressive hemicraniectomy. Investigation findings revealed the patient had tight mitral stenosis most likely due to rheumatic heart disease. The report discusses the pathogenesis of stroke due to rheumatic heart disease and compares the use of intravenous thrombolysis and mechanical thrombectomy in the treatment of ischaemic stroke.

#### Introduction

Cerebrovascular disease is the second leading cause of death and the leading cause of disability in Australia [1]. This case report describes a 40-year-old who presented with symptoms consistent with a large anterior stroke. The report illustrates the causes of stroke in a young person, and outlines the pathogenesis of stroke due to rheumatic heart disease. It also highlights the serious complication of cytotoxic and ionic cerebral oedema that can occur after a large stroke, and the use of hemicranectomy in its management. The case report also discusses and compares the use of intravenous thrombolysis and mechanical thrombectomy in the treatment of ischaemic stroke.

#### **Case description**

A 40-year-old man collapsed at home and was transported by ambulance to the emergency department (ED) of a regional hospital. En route to the hospital he was confused and was noted to have left sided weakness and facial droop. He emigrated from India at age 13, had no known medical conditions, and was on no regular medications. There was no family history of stroke or any prothrombotic conditions. He reportedly did not smoke or drink alcohol, he exercised regularly, and was not overweight.

On examination in the ED, he had a Glasgow Coma Score (GCS) of 13, left-sided facial droop, dysarthria, complete flaccid paralysis of the left upper limb, and left lower limb weakness (unable to resist gravity). He was assessed as having a National Institute of Health Stroke Score (NIHSS) of 14. On auscultation, his chest was clear and heart sounds were reported as being dual with no murmurs. An ECG was performed, which showed he was in sinus rhythm. A computerised tomography (CT) brain scan showed an area of hypodense brain tissue corresponding to the right middle cerebral artery (MCA) territory and a dense right MCA sign, representing increased attenuation of the proximal portion of the MCA (Figure 1). There were no signs of acute haemorrhage on the CT scan. A CT angiogram was not performed. These findings were consistent with a large right MCA ischaemic stroke. Since all inclusion criteria were met with no contraindications to therapy, the patient was treated with alteplase within four hours of symptom onset. The patient was observed for signs of bleeding; and vital signs, cardiac rhythm, blood glucose, and neurological function were checked regularly following alteplase administration. Approximately three hours later, the patient's GCS dropped to 11. A CT brain scan was repeated, which showed further development of cerebral oedema and effacement of the sylvian fissure, but no acute haemorrhage. Due to his neurological deterioration and worsening cerebral oedema, he was transferred to a tertiary hospital to undergo a decompressive hemicraniectomy.

On examination in the intensive care unit, post-hemicraniectomy, the patient's neurological function had improved to a GCS of 14. He still had a dense left hemiparesis, reduced left sided sensation, facial droop, dysarthria, and left-sided neglect. The intensivist identified a diastolic murmur with an opening snap that had not been picked up on previous examinations. The patient was extensively investigated to find the cause of the stroke. This included a full blood count (FBC); urea, electrolytes, and creatinine (UEC); coagulation studies; fasting lipids and glucose; ESR and CRP; syphilis serology; vasculitis screen; prothrombotic screen; chest x-ray; ECG; and carotid artery doppler scan. These results were all normal. An echocardiogram showed tight mitral stenosis (MS) with a mitral valve area of 1.8 cm<sup>2</sup>, thickened and restricted valve leaflets, and a large dilated left atrium measuring 49 mm. The systolic pulmonary artery pressure was also measured during echocardiogram which demonstrated no significant pulmonary hypertension.

It was hypothesised by the intensivist that the stroke resulted from a thrombus forming in the large, dilated, left atrium due to paroxysmal atrial fibrillation (AF) caused by the MS. Even though no significant childhood illness was reported by the patient or his family, the MS was believed to be the result of rheumatic heart disease (RHD) based on his echocardiogram findings and the patient's emigration history.

The patient was reviewed by cardiology and was commenced on warfarin with a target INR of between two to three. It was also recommended that he receive intramuscular penicillin injections of 900 mg monthly for the secondary prevention of RHD. A follow-up echocardiogram and cardiology appointment was booked for six weeks' time to determine whether a percutaneous balloon mitral valvuloplasty would be indicated to treat his MS. A follow up neurosurgery appointment was also planned for discussion of a future cranioplasty. Once stable, the patient was transferred to a rehabilitation facility to undergo an intensive multi-disciplinary program consisting of physiotherapy, speech therapy, and occupational therapy with the aim of maximising his physical, psychological, social, and financial independence.



**Figure 1.** A non-contrast CT scan of the brain showing a dense right middle cerebral artery sign [32].



#### Discussion

Young patients with minimal risk factors who have suffered a stroke require more extensive investigations in order to find an underlying cause. Conditions associated with ischaemic stroke in young adults include cardiac abnormalities, premature atherosclerosis, hypertension, vasculopathy including arterial dissection, recent pregnancy, other hypercoagulable states, smoking, illicit drug use, metabolic disorders, and migraine with aura [2]. A meta-analysis by Schurks et al. [3] found migraine with aura to be an independent risk factor for developing ischaemic stroke, but the absolute increase in the risk of stroke was found to be small. The pathophysiology underlying migraine as a possible cause of stroke is not yet clear [3]. Several metabolic conditions are also associated with acute ischaemic stroke in young adults. Cerebral autosomal-dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) is a metabolic condition which leads to progressive degeneration of smooth muscle cells in the vessel wall [4]. Patients with CADASIL may present with migraine, transient ischaemic attack, or ischaemic stroke in late childhood or early adulthood [4]. Mitochondrial encephalomyopathy with lactic acidosis and stroke-like episodes (MELAS) is another metabolic condition that causes stroke-like episodes in young adults, leading to progressive neurologic dysfunction and dementia. The hallmarks of this syndrome are episodes of hemiparesis, hemianopia, or cortical blindness [5]. Cardiac defects such as patent foramen ovale (PFO) and atrial septal defect (ASD) have also been implicated in the pathogenesis of stroke in younger adults [6]. The mechanism is via an embolus that originates in the systemic venous circulation and enters the systemic arterial circulation through the cardiac defect. Emboli can originate from the lower extremity or pelvic veins, tricuspid vegetations, or right atrial thrombi [6]. Many of these conditions only account for a very small percentage of stroke in young adults. A large cohort study by Putaaya et al. [7] looked at patients aged 15-49 with their first ever ischaemic stroke. They found the most common aetiologies were cardioembolism and cervicocephalic atrial dissection.

Atrial fibrillation is a common causes of cardioembolic stroke, with around 25% of ischaemic stroke patients in Australia having AF [8]. Coronary artery disease, hypertension, heart failure, and valvular heart disease are the most common causes of AF [9]. In this case report the patient's thrombus was hypothesised to have been caused by paroxysmal AF due to rheumatic MS. Rheumatic heart disease is a result of cardiac inflammation and scarring triggered by an autoimmune reaction to infection with group A streptococci [10]. This can result in thickened and restricted valve leaflets, leading to valve stenosis and/or regurgitation [10]. Rheumatic heart disease is the most common cause of MS [11]. One of the most common complications of rheumatic MS is AF [12]. In rheumatic MS, AF may initially be paroxysmal, but eventually it becomes chronic as the MS and left atrial dilatation progress [11]. AF may cause systemic embolism from mural thrombus development in the left atrium leading to stroke. Patients with MS and AF should therefore receive long-term prophylactic anticoagulation. Left atrial thrombus can occur in MS, even when sinus rhythm is present. This is due to left atrial dilatation, low blood velocity, and disorganised blood flow. Therefore, prophylactic anticoagulation should also be considered for patients with MS and a dilated left atrium even if in sinus rhythm [12]. The 2014 American Heart Association (AHA) guidelines on management of valvular heart disease recommends the use of warfarin in patients with MS and at least one of the following conditions: paroxysmal AF, permanent AF, prior embolic event, or proven left atrial thrombus [13]. Newer oral anticoagulants are now approved for the prevention of systemic embolism in adults with nonvalvular AF. However, they are not approved for use in patients with MS, as this patient group was excluded in clinical trials [13].

Another treatment option for MS is percutaneous balloon mitral valvuloplasty. This procedure involves a balloon catheter being inserted via the femoral vein and placed in the left atrium. The balloon is positioned across the stenotic mitral valve and inflated, thereby

separating the stenotic leaflets along the commissures. The criteria for percutaneous balloon mitral valvuloplasty in an asymptomatic patient with MS is a mitral valve area  $\leq 1.0 \text{ cm}^2$ , favorable valve morphology, absence of moderate to severe mitral regurgitation, and no left atrial thrombus [13]. The patient in this case report did not meet the AHA criteria and therefore is unlikely to undergo valvuloplasty. In asymptomatic patients with MS, follow-up echocardiography is recommended every three to five years, if the mitral valve area is >1.5 cm<sup>2</sup> [13]. The patient in this case report should therefore undergo regular echocardiograms to monitor the progression of his MS.

One of the serious complications of a large MCA stroke is the development of cytotoxic and ionic cerebral oedema. Cerebral oedema is the result of cells being unable to maintain ATP-dependent Na<sup>+</sup>/K<sup>+</sup> membrane pumps which are responsible for a high extracellular and low intracellular Na<sup>+</sup> concentration [14]. When energy falls due to cerebral ischaemia, these pumps cease to operate and Na+ accumulates in the cell, drawing with it Cl<sup>-</sup> and water along an osmotic gradient [14]. Spaceoccupying cerebral oedema can elevate intracranial pressure and lead to brain herniation [15]. The development of space-occupying cerebral oedema due to a large infarction leads to neurologic deterioration with signs that typically include decreased arousal, pupillary changes, and worsening of motor responses [16]. These neurological signs are indicators of the need to intervene urgently. Decompressive hemicraniectomy and durotomy is a surgical technique used to relieve the increased intracranial pressure and brain tissue shifts that occur in the setting of large cerebral hemisphere space-occupying lesions. The technique involves removal of bone tissue and incision of the restrictive dura mater covering the brain, allowing swollen brain tissue to herniate upwards through the surgical defect rather than downwards to compress the brainstem [16]. In patients with malignant MCA infarction, decompressive surgery undertaken within 48 hours of stroke onset reduces mortality and increases the number of patients with a favorable functional outcome [17].

The immediate aim in the management of acute ischaemic stroke is to recanalise the occluded vessel as quickly, safely, and effectively as possible to restore blood supply to the ischaemic brain region [18]. Thrombolytic therapy is an effective strategy for salvaging ischaemic brain tissue that is not already infarcted following ischaemic stroke [19]. However, there is a risk of haemorrhage, a narrow window during which it can be administered, and multiple contraindications to its use [18]. The indications for administering thrombolysis include the onset of ischaemic stroke within the preceding four-and-a-half hours in Australia and Europe, and within three hours in the United States. There must also be no signs of haemorrhage on the brain CT scan [18]. Where available, assessment of ischaemic brain injury with either diffusion and perfusion MRI or with perfusion CT should be performed if the findings are likely to influence treatment decisions. However, this should be used rather than CT only if it does not delay treatment with intravenous alteplase [20]. A 2014 meta-analysis by Emberson et al. [21] evaluated individual patient data from 6756 subjects who were allocated to intravenous alteplase or control within three to six hours of acute ischaemic stroke onset. The primary outcome measure was the proportion of patients achieving a good stroke outcome at three or six months as defined by a modified Rankin scale score. The modified Rankin scale measures the degree of disability or dependence in the patient's daily activities [21]. The results of Emberson's analysis showed that the sooner intravenous alteplase treatment is initiated, the more likely it is to be beneficial, and that the benefit extends to treatment started within four-and-a-half hours of stroke onset [21]. It was found that beyond five hours, harm may exceed benefit as alteplase increased the risk of symptomatic intracranial haemorrhage (6.8% vs 1.3% control) and fatal intracranial haemorrhage within seven days (2.7% vs 0.4% control) [21]. A recent systematic review by Wardlaw et al. [22] found similar results, that treatment with intravenous alteplase within three hours of stroke was substantially more effective in reducing death or dependency than therapy given up to six hours after stroke onset.

Intra-arterial mechanical thrombectomy is another treatment option for patients with ischaemic stroke. Five large randomised control trials [23-27] demonstrated that early intra-arterial treatment using mechanical thrombectomy devices is superior to standard treatment with intravenous thrombolysis alone for large proximal vessel ischaemic stroke in the anterior circulation. The inclusion criteria for mechanical thrombectomy include a CT brain scan ruling out intracranial haemorrhage, angiography demonstrating a proximal large artery occlusion in the anterior circulation, and thrombectomy initiated within six hours of stroke onset [23]. One problem that limits the widespread clinical use of mechanical thrombectomy is that only an estimated ten percent of patients with acute ischaemic stroke have a proximal large artery occlusion in the anterior circulation and present early enough to qualify for mechanical thrombectomy [18]. Another issue that limits its widespread use is that it is restricted to major stroke centres that have specialist interventional radiology resources and expertise able to perform the procedure [18]. The Queensland Health Policy Advisory Committee on Technology published a report in December 2015 that looked at mechanical thrombolysis for ischaemic stroke [29]. They found that mechanical thrombectomy can only be safely performed in experienced centres with appropriate support in terms of imaging and multidisciplinary care, and that only large tertiary centres with stroke units are able to provide this service. They noted that this may have implications for patients who are not near to these services, especially given the time frame within which the procedure can be performed. This has implications for accessibility for rural and remote patients, and associated costs if transferring patients to tertiary centers is required [29]. Another issue is that transferring patients to

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tertiary centres can delay the onset of stroke treatment. However, eligible patients can receive standard treatment with intravenous alteplase if they present to hospitals where thrombectomy is not an option. Those patients with qualifying anterior circulation strokes can then be transferred to tertiary stroke centers where intra-arterial thrombectomy is available [30].

In this case report, the patient was discussed at an interventional radiology meeting at the tertiary hospital. The radiologist commented that if this patient had initially presented to the tertiary hospital rather than the regional hospital, the patient would have undergone a mechanical thrombectomy instead of, or as well as, the intravenous thrombolysis. Similar views are expressed in a 2015 editorial by neuroradiologists Pierot and Derdeyn [31]. They conclude that endovascular treatment has now been proven effective for a well-defined subset of patients with acute stroke, provided there is careful patient selection, time to reperfuse, and reperfusion rate is optimised. This illustrates that mechanical thrombectomy is now the treatment of choice for proximal, anterior, ischamic stroke if the resources and personnel are available.

#### **Consent declaration**

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

#### **Conflicts of interest**

None declared.

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### An unusual aetiology in a patient with increasing abdominal girth

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**Abstract:** Pseudomyxoma peritonei (PMP) is a rare, slow growing mucinous ascites, typically associated with primary appendiceal or ovarian neoplasm [1]. Mucinous material fills the peritoneal cavity, causing enlargement of the abdomen and has been described as "jelly belly", due to its appearance at laparotomy [2]. The symptoms of PMP are often non-specific and vague, causing difficulties in diagnosis. Further, diagnostic imaging is not always able to detect the disease prior to surgery. The clinical implications of this are that PMP is not commonly considered a differential diagnosis being made. This causes a potential delay in treatment, which has been shown to worsen the morbidity and mortality associated with PMP [3,4].

#### Introduction

Pseudomyxoma peritonei (PMP) is an uncommon condition, with diagnosis primarily occurring incidentally at laparotomy, at a rate of approximately 2 in 10,000. Most cases (75%) occur in females, with an average patient age of 53 years [5]. PMP often masquerades as other intra-abdominal pathologies, such as appendicitis, ovarian cancer, and irritable bowel syndrome, and can be difficult to diagnose pre-operatively due to the vague and non-specific nature of symptoms reported. This case report describes a 48-year-old female with a suspected diagnosis of ovarian cancer, who was found to have PMP at the time of laparotomy. The natural history of the disease creates a poor prognosis for patients, and therefore requires timely diagnosis to allow for appropriate management. A summary of the pathology of this unusual disease is included, and its pre-operative diagnostic difficulty and subsequent consequences in clinical practice are discussed.

#### Case

A 47-year-old fmale presented to her general practitioner with a twomonth history of increasing abdominal girth and a feeling of pelvic "fullness". Importantly, she had not been unwell, did not have any infective symptoms, no loss of weight or appetite, and no nausea or vomiting. Her bladder and bowel function was normal, her periods were regular, and her Pap smears were up to date and normal.

The patient had a past medical history of primary hypothyroidism and depression, both of which were clinically stable. She had no known allergies. Her regular medications were Fluoxetine (20 mg daily) and thyroxine sodium (100 🗵 g daily). She lived with her 16-year-old daughter, and worked full time in a delicatessen. Her family history included bowel, prostate, and breast cancer.

Her GP ordered various investigations (Table 1). Her borderline high CA-125 level (38 kU/L, reference range < 36 kU/L) and the imaging findings suggested a possible gynaecological malignancy.

She was referred to an outpatient gynaecological oncology clinic for further evaluation and formulation of a management plan. On examination in the clinic, the patient looked well and was afebrile. Her abdomen was distended, with a palpable, non-tender mass in the right iliac fossa. Mild ascites was present. She was also obese (BMI 37). Per



\* Image for illustration purposes only and is unrelated to the patient discussed in this case report.

vaginal examination revealed a palpable mass, with noted fixation of the right adnexa. Her uterus was mobile, non-tender, and of normal size and morphology.

The patient was discussed at the multidisciplinary team meeting where it was recommended that she undergo a laparotomy for total abdominal hysterectomy, bilateral salpingo-oophrectomy, and omentectomy. At the time of the surgery, she was noted to have extensive mucinous material throughout her peritoneum, and within her uterus and cervix. The mass seen on imaging was found to be an enlarged appendix, which required concurrent general surgical consultation for removal. The specimens were sent to pathology for analysis (Table 2).

The subsequent histopathological diagnosis was of a primary appendiceal malignancy, with rupture and extensive mucin extrusion into the peritoneal cavity.

She had an unremarkable post-operative course, and was discharged home on day 4. She was to be followed up with the pathology results for relevant discussion regarding her ongoing treatment, management, and prognosis.

#### Discussion

#### Pathology

The underlying pathology in PMP has been a controversial area for some time [6]. The pathological process was originally thought to be due to a foreign body reaction after mucus containing cysts ruptured into the peritoneum [7]. However, it has now been re-defined to embrace a spectrum of cells from benign to malignant that produce abundant mucinous fluid. Within the ascitic fluid, there may be a few, if any, neoplastic cells seen, as the mucinous exudate is believed to spread further than any potential malignant cells within the peritoneum [8]. Malignant cells that produce PMP are often described as histologically borderline, as they do not show invasion of surrounding structures since they adhere rather than invade. Haematogenous or lymphatic metastasis is unusual, and most cases are found to originate from the appendix, with the most common being primary appendiceal mucinous neoplasia [6]. Rarely, however, the origin may be from the ovary, stomach, gallbladder, pancreas, urinary bladder, uterus, or fallopian tubes [1]. The mucinous tumour cells form cysts that increase Table 1. Initial investigation results (pathology and imaging).

Full blood examination	Normal
UEC	Normal
Ca125^	38 (RR* < 36 kU/L)
CEA^	7.2 (RR* < 2.5 μg/L in non-smokers)
Ca19.9^	12 (RR* < 31 kU/L)
Trans-abdominal ultrasound	Normal-sized, anteverted uterus. Right adnexa: large complex-appearing mass lesion associated with ascites. Right ovary not able to be visualised. Left adnexa: left ovary slightly bulky but unremarkable.
CT chest/ abdomen/ pelvis	Relevant features: Multiloculated cystic lesion noted within the right side of the pelvis that measures 9 cm in maximum diameter. Thin septa with associated calcifications are noted. Ascites is present in the peritoneal cavity and there is streaking of the omentum. Some of this streaking is suspicious for omental seeding. There is no retroperitoneal lymphadenopathy seen Conclusion: right-sided pelvic lesion consistent with ovarian mucinous cystadenomatous-type lesion. The presence of ascites and possible omental caking suggests adenocarcinoma.

\*RR – reference range

^Ca125: cancer antigen 125, CEA: carcinoembryonic antigen, Ca19.9: cancer antigen 19.9. These are common tumour markers used in conjunction with clinical examination and other investigations to aid cancer diagnosis.

intraluminal pressure within the organ of origin, and eventually cause the luminal wall to rupture [8]. The cells are then able to leak into the peritoneum. They are transported passively by peritoneal fluid flow and absorption, and by gravity to adhere to both abdominal and pelvic structures. Even if PMP is of a benign cell origin, the slow but relentless increase of gelatinous fluid in the peritoneal cavity causes compression of intra-abdominal organs, and mechanical and functional gastrointestinal obstruction [8].

#### Clinical presentation

Symptoms of PMP vary and will depend on the extent of the disease. Most commonly, patients report increasing abdominal girth or enlarging incisional, umbilical, or inguinal hernias [2]. Women may be diagnosed incidentally during routine pelvic examination or may present with infertility [2]. Patients may also report early satiety, as the space within the peritoneal cavity for the stomach to expand decreases, or with a clinical picture of acute appendicitis [9]. However, PMP is still often diagnosed incidentally at laparotomy, with symptoms sometimes inaccurately labeled as irritable bowel syndrome for years prior to diagnosis [1,2].

#### Utility of diagnostic imaging in PMP

Multiple imaging modalities have been reviewed with regard to PMP. Plain abdominal x-rays have been found to be of little diagnostic use, however, it may help to diagnose intestinal obstruction, a late complication of PMP [10]. Ultrasound may be utilised, with reported findings including homogenous tumour deposits, separated ascites, scalloping of the liver edges, and echogenic masses [11]. CT scans are the most widely used imaging technique for intra-abdominal pathology. Findings suggestive of PMP include scalloping of organs, ascitic septations and loculi, curvilinear calcifications, and omental thickening [10].

A review of CT scan use in 17 cases of PMP reported that early disease is easier to diagnose than more advanced disease. The authors urged radiologists to look for a pattern of mucinous ascites accumulation, rather than the appearance of individual deposits of disease on the image [12]. These authors were based at a surgical hospital and had experience with PMP. It may be difficult to expect a radiologist to detect this diagnosis without having had that same level of experience. Ultrasound requires similar expertise, where it has been reported that familiarity with the features of PMP are required for accurate diagnosis [13].

#### Clinical implications

Despite being uncommon, PMP is a possible diagnosis that may occur in patients. It is worth keeping this disease as a differential diagnosis for patients that present with abdominal fullness. Imaging may help with the diagnosis but is not definitive. Without treatment, the prognosis for this condition is poor, with a ten-year survival rate of approximately 32% [14]. Treatments such as peritonectomy, intra-peritoneal chemotherapy at the time of surgery, and radical de-bulking of tumour deposits have been shown to improve the recurrence free survival time in these patients and decrease overall mortality [3,4]. Further, surgery that does not definitively de-bulk the condition contributes to increased difficulty in managing PMP effectively later on, through the creation of adhesions that can facilitate spread of PMP to the small bowel [3]. Early diagnosis is therefore important to help expedite care, allow for appropriate surgical and oncology management to occur, and improve outcomes in patients with PMP.

This case highlights that although it is most commonly horses when you hear hooves, very occasionally, it may actually be a zebra.

#### **Consent declaration**

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

#### **Conflicts of interest**

None declared.

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## Evaluating women's knowledge of the combined oral contraceptive pill in an Australian rural general practice setting

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#### Abstract

**Background**: In addition to the contraceptive action of the combined oral contraceptive pill (COCP), there are a number of other benefits to its use such as menstrual cycle regulation. However, COCP use is also associated with a higher risk of thromboembolism. Despite the prevalence of COCP use, studies have indicated that overall women have poor knowledge of the COCP.

**Aim**: To evaluate women's knowledge of the COCP in a rural general practice setting. The extent of knowledge was assessed in several domains including: COCP use and effectiveness, mechanism of action, and the risks and benefits of COCP use.

**Methods**: An observational study design was utilised. Women aged 18-50 years self-selected to complete an anonymous survey at a general practice in rural NSW. Women who were currently using, had previously used, or had never used the COCP were invited to participate. Women using a progesterone-only contraceptive were excluded. A total knowledge score on the usage and effects of the COCP was calculated for each participant by assessing responses to 34 questions for an overall score out of 34.

**Results**: A total of 80 surveys were completed revealing that 98% of respondents used the COCP at some time in their lives with almost 29% being current users. The mean total knowledge score for all participants was 14.4 (SD = 4.9) out of a possible 34 (range: 5 - 26). There was no significant difference in total knowledge score between current and previous users (p = 0.56).

**Conclusion**: The women surveyed in this study appear to have substantial gaps in their knowledge of the COCP. This study provides insight into specific knowledge areas that require further education and clarification during COCP counselling sessions (especially those conducted by a GP) to encourage improved knowledge of the COCP by women in this particular setting.

#### Introduction

The combined oral contraceptive pill (COCP) is an oral hormonal contraceptive that contains synthetic oestrogen and progesterone. Since it was first made available in Australia in 1961, the COCP has become the principal contraceptive method of choice among Australian women [1]. Contraceptive management is a common reason for GP consultation, with the COCP being the most frequently prescribed contraceptive [1].

Though it is well known for its contraceptive action, there are a number of additional benefits associated with COCP use [2-11]. There is decreased risk of ovarian and endometrial cancers [2,3,5,6] and reduced risk of benign breast disease, functional ovarian cysts, ectopic pregnancies, and pelvic inflammatory disease [2-4,7]. The COCP is also beneficial in that it helps to regulate the menstrual cycle, and reduces dysmenorrhoea, menorrhagia, and endometriosis-associated pain [2,3,8,9]. Acne and the effects of hyperandrogenism may also be minimised with COCP use [2-4,10].



Despite these many benefits, there are several risks associated with COCP use. The introduction of low-dose COCPs saw a significant improvement in its safety profile, particularly in the reduction of thromboembolism [2,3]. Nonetheless, COCP use does increase the risk of thromboembolism, stroke, and myocardial infarction [2,3,12,13]. This is a rare complication in otherwise healthy women [2]. Women over the age of 35, smokers, and women who are obese have a higher risk of thromboembolism with COCP use [11,14]. The evidence is mixed as to whether the COCP increases the risk of breast cancer [2,15]. The current consensus is that the COCP does increase risk, but this risk is considered to be very small (equal to approximately one extra case per year for every 100,000 women) and becomes negligible ten years after cessation of use [15,16], however, research is still ongoing.

The COCP has been shown to be a very effective contraceptive with perfect use (the failure rate is 0.3%), however, its typical-use failure rate is as high as 9% [17,18]. These figures were generated by an American study by Trussell [18] and are frequently utilised in Australian literature. The typical-use rate is most commonly attributed to incorrect or inconsistent use [2]. Thus, unplanned pregnancy is an important risk for women taking the COCP to consider. There is little data to suggest that sound knowledge of the COCP correlates to improved behavioural changes and related outcomes such as unintended pregnancies [19,20]. Nevertheless, a better understanding of this common medication is likely to be a significant contributing factor in the reduction of the current failure rate which is why studies assessing women's knowledge of the COCP are important.

Research conducted in a diverse range of settings has indicated that women's knowledge of the COCP is generally poor [11,19,21-24]. A comprehensive search of the current literature, however, revealed a paucity of studies focusing on such knowledge amongst rural Australian women, with only one Australian study focusing on women's knowledge of the COCP from a national perspective [11]. Furthermore, there were no international studies focusing on a rural perspective in their study populations. As such, this study aimed to evaluate the level of knowledge women attending an Australian rural general practice have regarding the COCP. The extent of knowledge was assessed through several domains including: COCP use and effectiveness, mechanism of action, and the potential risks and benefits of COCP use.

#### Methods

#### Participants

Participants eligible for inclusion were women of reproductive age, between 18 and 50 years, who were patients of a New South Wales rural general practice, and who attended the practice during the study period. Women who were currently using or had previously used the COCP were invited to participate, as were women who had never taken the COCP. Male patients and women taking a progesterone-only oral contraceptive were excluded from this study due to the nature of the research question. A total of 80 responses were collected and all were used in data analysis.

#### Study design and survey

This study utilised an observational study design through the provision of a survey to participants. The survey included two basic demographic questions (age and level of education) and five questions assessing personal COCP usage patterns. The questions assessing knowledge covered several domains including: COCP use and effectiveness, mechanism of action, and the potential risks and benefits of COCP use. Additionally, participants were asked about their information sources regarding the COCP.

#### Recruitment and data collection

Women attending the medical practice self-selected to complete the survey. Participant information sheets were attached to each survey and were made available at the reception desk of the practice. Posters advertising the survey were also displayed in the waiting room area. Participation was entirely voluntary and anonymous, with consent being implied from completion of the survey. Completed surveys were returned to a secure box at the reception desk, with access to returned surveys and subsequent generated data being limited exclusively to the lead researcher. Data collection occurred between October and December 2014.

Ethics approval was granted by the University of Wollongong (UoW) Human Research Ethics Committee in collaboration with the UoW Graduate School of Medicine.

#### Statistical analysis

Survey data was processed using Microsoft Excel<sup>TM</sup>. *P*-values were calculated for correct scores between current and previous COCP users using z-scores with a significance level of  $\leq 0.05$ .

A "total knowledge score" was also calculated for each participant by combining the total marks for questions 8, 10, and 11 of the survey, where one mark was awarded to each correct response. Question 8 comprised a total of 6 sub-questions, question 10 comprised 13 and question 11 had 15. As such, the maximum possible score for these questions was 34. The mean total knowledge score was subsequently calculated by averaging the values amongst all the participants. The total knowledge scores of current COCP users versus previous users were analysed using the Mann-Whitney "U test" with a significance level of  $\leq 0.05$ .

For the purpose of this study, a score of 80% or above for each individual response item was designated as an adequate level of knowledge.

#### Results

#### Sample characteristics

In total, 80 responses were received during the study period. Table 1 shows basic demographic information of the study participants. The mean age of the sample was 32.1 years (standard deviation = 8.8).

#### Personal COCP usage information

Of the respondents, 98% (n = 78) had taken the COCP at some point in their lives (question 3 of the survey). Further information regarding usage for women who had previously or were currently taking the COCP is listed in Table 2. Women who had never taken the COCP were not required to complete these questions (questions 4 to 7).

#### Knowledge domains

#### 1. COCP use and effectiveness

Participants were asked to complete questions that assessed their general knowledge of the COCP and of what factors may reduce the COCPs contraceptive effect.

In terms of general knowledge (question 8 of the survey), 96% of participants correctly identified that the COCP needs to be taken every day to serve as effective contraceptive, with 94% correctly identifying that it should be taken at the same time every day. Only 28% of women were aware that the COCP is not the most effective contraceptive currently available with 13% of current COCP users selecting the correct answer (compared to 35% of previous users).

Of the factors that may reduce the contraceptive effect of the COCP (question 10), missing one active pill by more than 12 hours and missing more than one active pill was correctly identified by 84% and 94% of women respectively. Other factors that potentially reduce contraceptive effect (with percentage of participants selecting the correct response in brackets) are as follows: St John's wort (20%), epilepsy medications (14%), vomiting (79%), and severe diarrhoea (61%). Two-thirds of women incorrectly identified that antibiotics (other than rifampicin and rifabutin) may be a factor that reduces contraceptive benefit. There was no significant difference in the number of participants selecting the correct response between current and previous COCP users for each of the factors investigated. Participant responses are further detailed in Table 3.

#### 2. Mechanism of action

Only 58% of women surveyed correctly identified that the COCP acts to prevent ovulation; this represented 44% of current COCP users and 64% of previous COCP users. Furthermore, only 3% of the study sample correctly identified all three mechanisms of action (preventing ovulation, thickening of cervical mucus, and helping to prevent adherence of the embryo to the endometrium).

#### 3. Risks and benefits of COCP use

Frequencies of responses to questions assessing knowledge of the potential risks and benefits of the COCP are shown in Table 4. The conditions in which COCP use may be beneficial (with the percentages of participants selecting the correct responses listed in brackets) were as follows: menstrual disturbances (60%), acne (56%), endometriosis-associated pain (28%), ectopic pregnancy (9%), and ovarian and endometrial cancer (6%). Fifty-nine percent of women correctly identified that the COCP has no effect on the risk of contracting a sexually transmitted infection (STI). Furthermore, weight gain was incorrectly identified as a risk associated with taking the COCP by 75% of women with only 5% of participants selecting the correct answer of "no effect". COCP use increases the risk of cardiovascular disease which 39% of women correctly identified. For the majority of these questions, "don't know" was the response selected by a large proportion of participants.

 Table 1. Demographic information of sample (n = 80).
 Parameters
 Parameters

Variable n (%) Q1. Age (years) 18-20 8 (10%) 21-24 17 (21%) 25-30 10 (13%) 31-34 17 (21%) 35-40 11 (14%) 40-50 17 (21%) Q2. Education level Year 10 18 (23%) Year 12 24 (30%) Undergraduate degree 16 (20%) Postgraduate degree 6 (8%) TAFE qualification 12 (15%) Other 4 (5%)

**Table 2.** Usage information for women who are currently using or have previously used the COCP.

Variable	n (%*)
Q4. Current COCP usage (n = 78)	
Yes	23 (29%)
No	55 (69%)
Q5. Duration of COCP usage (n = 77)	
< 1 year	5 (6%)
1 – 5 years	29 (36%)
5 – 10 years	17 (21%)
> 10 years	26 (33%)
Q6. Has an active tablet ever been	
missed? (n = 78)	
Yes	64 (80%)
No	13 (16%)
Don't Know	1 (1%)
Q7. Frequency of missing an active	
tablet (n = 77)	
Never	12 (15%)
Only one time	4 (5%)
Once a year	11 (14%)
Once every few months	30 (38%)
Once a month	16 (20%)
Once a week	4 (5%)
	20)

\* Percentages calculated using the total sample (n = 80)

Table 3. Participant responses to general knowledge questions relating to the COCP and factors that may reduce its contraceptive action.

	Yes	No	Don't know	No response	Number of current COCP users correct (n = 23)	Number of previous COCP users correct (n = 55)	P-value (significance ≤ 0.05)
Q8. General knowledge (* indicates the correct	answer)						
The pill needs to be taken every day to be an effective contraceptive	*77 (96%)	1 (1%)	-	2 (3%)	22 (96%)	53 (96%)	0.88
The pill should be taken at approximately the same time every day	*75 (94%)	3 (4%)	2 (3%)	-	23 (100%)	51 (93%)	0.18
It is acceptable to continue taking active tablets without taking the inactive tablets in between	*43 (54%)	16 (20%)	21 (26%)	-	12 (52%)	31 (56%)	0.73
The pill is the most effective form of contraception currently available when used correctly	44 (55%)	*22 (28%)	14 (18%)	-	3 (13%)	19 (35%)	0.054
It is possible to fall pregnant while taking the pill even with perfect use	*63 (79%)	10 (13%)	6 (8%)	1 (1%)	16 (70%)	45 (82%)	0.23
It is important to take a break from using the pill	26 (33%)	*20 (25%)	34 (43%)	-	6 (26%)	14 (25%)	0.95

Q10. Factors that may reduce the contraceptive benefit of the COCP (\* indicates the correct answer)

· · ·		•					
Missing one active pill by less than 12 hours	25 (31%)	*34 (43%)	17 (21%)	4 (5%)	11 (48%)	23 (42%)	0.62
Missing one active pill by more than 12 hours	*67 (84%)	6 (8%)	7 (9%)	-	19 (83%)	48 (87%)	0.58
Missing more than one active pill	*75 (94%)	1 (1%)	3 (4%)	1 (1%)	23 (100%)	51 (93%)	0.18
Missing one or more inactive pill/s	22 (28%)	*43 (54%)	14 (18%)	1 (1%)	14 (61%)	28 (51%)	0.42
St John's Wort herbal preparation	*16 (20%)	9 (11%)	55 (69%)	-	5 (22%)	11 (20%)	0.86
Epilepsy medications such as phenytoin or carbamazepine	*11 (14%)	3 (4%)	66 (83%)	-	3 (13%)	8 (15%)	0.86
Vomiting	*63 (79%)	5 (6%)	12 (15%)	-	19 (83%)	44 (80%)	0.79
Severe diarrhoea	*49 (61%)	10 (13%)	21 (27%)	-	15 (65%)	34 (62%)	0.78
Smoking	6 (8%)	*36 (45%)	38 (48%)	-	9 (39%)	26 (47%)	0.51
Antibiotics such as rifampicin and rifabutin	*53 (66%)	3 (4%)	24 (30%)	-	14 (61%)	38 (69%)	0.48
Other antibiotics (When taken without side-effects like vomiting/diarrhoea)	53 (66%)	*2 (3%)	25 (31%)	-	0 (0%)	2 (4%)	0.35
Minor alcohol consumption (e.g. an occasional alcoholic drink/s not on a regular basis)	6 (8%)	*52 (65%)	22 (28%)	-	17 (74%)	35 (64%)	0.38
Excessive alcohol consumption (e.g. drinking amounts that cause vomiting, diarrhoea, poor concentration or memory, or significant liver damage)	*43 (54%)	13 (16%)	24 (30%)	-	10 (43%)	32 (58%)	0.23

Table 4. Participant responses regarding effects of the COCP on level of risk for various conditions.

Q11.	Decreases	No effect	Increases	Don't know	No response	Number of current COCP users correct (n=23)	Number of previous COCP users correct (n=55)	P-value (significance ≤ 0.05)
Ectopic pregnancy	*7 (9%)	18 (23%)	11 (14%)	44 (55%)	-	2 (9%)	4 (7%)	0.83
Birth defects	2 (3%)	*33 (41%)	8 (10%)	37 (46%)	-	4 (17%)	29 (53%)	0.004
Infertility	3 (4%)	*30 (38%)	14 (18%)	33 (41%)	-	9 (39%)	21 (38%)	0.94
Cardiovascular disease (stroke, hypertension, clots)	2 (3%)	14 (18%)	*31 (39%)	33 (41%)	-	10 (43%)	21 (38%)	0.66
Benign breast disease	*4 (5%)	17 (21%)	16 (20%)	42 (53%)	1 (1%)	0 (0%)	4 (7%)	0.18
Functional ovarian cysts	*9 (11%)	12 (15%)	11 (14%)	47 (59%)	1 (1%)	4 (17%)	5 (9%)	0.29
Endometriosis-associated pain	*22 (28%)	9 (11%)	3 (4%)	45 (56%)	1 (1%)	8 (35%)	14 (25%)	0.41
Breast cancer	4 (5%)	17 (21%)	*18 (23%)	41 (51%)	-	6 (26%)	13 (22%)	0.82
Ovarian cancer	*5 (6%)	18 (23%)	11 (14%)	46 (58%)	-	2 (9%)	3 (5%)	0.59
Endometrial cancer	*5 (6%)	18 (23%)	7 (9%)	50 (63%)	-	1 (4%)	4 (7%)	0.63
Menstrual disturbances	*48 (60%)	6 (8%)	9 (11%)	13 (16%)	4 (5%)	12 (52%)	35 (64%)	0.35
Acne	*45 (56%)	4 (5%)	14 (18%)	16 (20%)	1 (1%)	11 (48%)	33 (60%)	0.32
Weight gain	1 (1%)	*4 (5%)	60 (75%)	13 (16%)	2 (3%)	1 (4%)	3 (5%)	0.84
Pelvic inflammatory disease	*6 (8%)	14 (18%)	9 (11%)	50 (63%)	1 (1%)	2 (9%)	4 (7%)	0.83
Sexually transmitted infections	4 (5%)	*47 (59%)	7 (9%)	20 (25%)	2 (3%)	11 (48%)	36 (65%)	0.12

\* Indicates the correct answer

Question 12 of the survey asked women to identify factors that can potentially increase a women's risk of thromboembolism while taking the COCP. The most frequently identified risk factors were smoking and obesity (selected by 74% and 69% of participants, respectively). Only 38% correctly identified all three risk factors, which also includes age greater than 35 years [11,14].

#### Information sources

Participants were asked where they source information regarding the COCP for question 13 of the survey. "General practitioner" was the most frequently selected option at 90% (n = 72). Further response details are shown in Figure 1.

#### Total knowledge score

The mean total knowledge score for all participants was 14.4 (SD = 4.86) out of a possible 34 (range = 5 to 26). The mean total knowledge score for current COCP users was 14.0 (SD = 4.81), with previous COCP users achieving a mean score of 14.8 (SD = 4.75). Women who had never used the COCP achieved a mean total knowledge score of 6.5. There was no significant difference in total knowledge score between current and previous users of the COCP (p = 0.56).



Figure 1. Survey participants' information sources regarding the COCP.

#### Discussion

This study has found deficiencies in women's knowledge of the COCP in all domains that were assessed. This finding is consistent with the available literature [11,19,21-24]. For the purpose of this study, a score of 80% or above for each individual response item was designated as an adequate level of knowledge. The rationale for stating an arbitrary value such as this was influenced by a recent systematic review by Hall et al. [19]. Though many studies concluded women have a poor level of knowledge regarding oral contraceptives, Hall et al. stated that of the studies they included for review, "what constituted deficient or adequate knowledge was not clearly defined". The majority of women did not score above the required 80% correct responses to be considered adequate knowledge. No significant differences were found in the number of correct responses per question between current COCP users and previous users except for one question regarding whether the COCP has an effect on the risk of birth defects occurring (p = 0.004). Furthermore, the total knowledge score for both current and previous COCP users was less than 50% of the possible maximum score.

Several key findings discussed below stand out as being important focus areas for improved contraceptive counselling.

#### COCP use and effectiveness

This study revealed that 55% of women believe the COCP is the most effective form of contraception currently available when used correctly, with only 13% of current COCP users correctly identifying that it is not. Examples of contraception that have a better failure rate profile than the COCP include long-acting reversible contraceptives (LARC) such as the implantable rod (typical and perfect-use failure rate 0.05%), and intrauterine devices such as the Mirena (typical and perfect-use failure rate 0.2%) [17].

Women were not aware that antibiotics (other than rifampicin and rifabutin) were no longer considered to have a negative impact on the contraceptive effect of the COCP [25], with 66% of women indicating that taking antibiotics (without side effects such as vomiting and diarrhoea) would reduce the contraceptive effect of the COCP.

There were mixed results regarding whether it is important to take a break from the COCP with 25% of women correctly identifying there is no requirement for a break. Interestingly, Philipson, Wakefield, and Kasparian [11] found that 25.6% of their participants thought that it was healthy to stop COCP use for a while (length of time was not stipulated in the question).

#### Mechanism of action

Only 58% of women correctly identified the main mechanism by which the COCP works, with 3% correctly identifying all three mechanisms. A systematic review by Hall *et al.* [19] found that understanding of the mechanism of action is infrequently assessed in similar studies. A study by Rajasekar and Bigrigg [23] not included in the aforementioned review found that 81.5% of women understood that the oral contraceptive prevented ovulation every month, but that 32% also thought that it killed sperm.

#### Risks of COCP use

Of the study participants, 39% correctly identified that the COCP increases the risk for cardiovascular disease (hypertension, stroke, and other thromboembolic events). Similarly, Philipson, Wakefield, and Kasparian [11] found that 46.5% women identified an increase in blood clots. Although 74% of women in our study identified smoking as a factor that when combined with the COCP increases thromboembolism risk further, only 38% of women correctly identified all three risk factors (obesity, age over 35 years, and smoking).

Women appear to erroneously believe that the COCP causes weight gain (75% of respondents). A causal relationship has never been established. A Cochrane Review has found there is no significant difference in weight change between placebo and those taking combined contraceptives, though further research was indicated [26]. Previous studies suggest similar results. Fletcher, Bryden, and Bonin [27] found that 30.6% of respondents were concerned about weight gain on the pill, with 23.4% of respondents reporting weight gain as an experienced side effect. Gaudet *et al.* [28] found that 51.5% of respondents thought weight would increase on the pill.

Only 59% of women were aware that the COCP has no effect on contracting STIs, with 48% of current COCP users identifying the correct answer. This result is lower than that found by Philipson, Wakefield, and Kasparian [11] with 81.3% of their respondents identifying the correct answer.

#### Benefits of COCP use

There was a low level of understanding regarding decreased ovarian and endometrial cancer risk, but a better (though still low) understanding that COCP use can improve acne and menstrual disturbances. Poor understanding about COCP benefits appears consistent among studies with Philipson, Wakefield, and Kasparian [11] finding 13.7% correctly identified that COCP use decreases ovarian cancer risk, with 10% identifying decreased risk of endometrial cancer.

#### Study limitations

Noting that approximately 29% of this study sample is currently taking the COCP, one might consider that knowledge would be forgotten after having ceased the COCP or after changing contraceptive methods. Additionally, it cannot be expected that women will remember all details relating to the COCP, as with any medication. Significant limitations of this study include the small response rate, which is likely due to the self-selection of participants. A self-selection bias may also exist. We can see from the results that there were very few women who had never taken the pill completing the survey. We must consider whether this is a true representation, or whether this may reflect the fact that women who have previously taken or are currently taking the COCP are more likely to complete the survey (perhaps due to a perceived familiarity with the topic). As the study was conducted in a general practice, a bias may also exist towards women who are likely to attend such medical facilities. An additional limitation of this study is that data was generated out of a single general practice and therefore the results may reflect specific factors associated with the GPs working there. Due to how the study was implemented, it cannot be determined if the participants had ever received contraceptive counselling from the practitioners within this centre, or whether a single or multiple GPs from this practice may have been involved in the counselling and prescribing of the COCP. At the time the study was conducted, seven GPs were working within the practice and so participants are likely patients of a number of these GPs with no particular focus on an individual practitioner's patient list. Both the self-selection and single-centre nature of this study means that the results cannot be generalised. The survey was developed after a review of current literature and did not come from a validated source. Assessment of the reading level of the survey and a pilot study prior to data collection would improve the validity of the findings. Additionally, statistical analysis was limited to current and previous COCP users as the sample of participants who had never used the COCP was too small to allow reliable calculations.

#### Implication for clinical practice and future directions

A recent analysis of the Bettering the Evaluation and Care of Health (BEACH) data by Mazza *et al.* [1] found that COCP prescribing is a common focus of many GP consultations concerning contraceptive

management. Our study also indicated that GPs are the main source of information regarding the COCP. Given that the COCP is a prescription medication, routine medical consultations are required and offer ample opportunity for medical practitioners to ensure appropriate use and knowledge of the COCP. This is especially so since a total of 54% of participants in our study indicated they have been or were using the pill for more than five years. In their study assessing Australian women's knowledge of the COCP, Philipson, Wakefield, and Kasparian [11] found a positive correlation between duration of pill usage and level of knowledge.

Although our study suggested that GPs are the main source of information regarding the COCP, there were many other information sources identified and so we cannot assume the subsequent level of knowledge of the surveyed participants is the result of GP intervention alone. Therefore, other healthcare professionals that may provide COCP counselling have a role in helping to improve women's knowledge of the COCP. Given that the Internet, friends, and family members were also important information sources for women regarding the COCP, awareness and appropriate counselling is also necessary to identify and address any misinformation that women may have obtained from these sources.

This study provides a unique perspective in that it assesses rural Australian women's knowledge of the COCP. The aforementioned study by Philipson, Wakefield, and Kasparian [11], whose data collection was generated randomly from each state, was the only other Australian study identified after examination of the literature. As our study was limited to a rural general practice setting, future research may wish to expand on this data by investigating other rural practices or compare results to metropolitan practices.

Rural Australians experience poorer health outcomes compared to their metropolitan counterparts [29,30]. Health literacy is likely a contributing factor to such outcomes [30]. An analysis of the Adult Literacy and Life Skills Survey data from 2006 by the Australian Bureau of Statistics shows that health literacy levels are low across the board -42% of Australian urban populations were shown to have a literacy level of 3 (considered an adequate level) or greater; 38% and 39% of inner regional and remote populations, respectively also demonstrated a literacy level of 3 or greater. The outer regional populations possessed the lowest levels of people demonstrating a literacy level of 3 or greater at 36% [31]. In the context of the clinical environment, there is a paucity of literature available, but one recent study by Wong et al. [32] comparing health literacy of patients attending both a rural and an urban rheumatology practice found no significant difference between these groups. Despite research showing differences in health outcomes between rural and metropolitan populations of Australia [29,30], studies comparing the knowledge and health literacy of rural and metropolitan patients, particularly in relation to medications, proved difficult to find so we cannot extrapolate the findings of the current study to comment on whether a general knowledge deficit exists.

Since this study was designed only to assess women's level of knowledge about the COCP, and not factors associated with level of knowledge, further studies regarding what factors influence knowledge are also important. These may include factors relating to the primary care setting, such as: impact of consultation timing; exploring the discussions and resources used during COCP consultations and whether counselling deficiencies exist; assessing what information healthcare professionals deem clinically relevant or applicable on an individual patient basis, and whether this impacts upon what information is provided to patients and therefore what knowledge base they retain. Additional studies may wish to investigate the effectiveness of the product information sheet for the COCP, or whether women believe COCP information is easily accessible and where this can be obtained

(for example, what limits women's access to information from pharmacies or community health clinics). Future studies may also wish to explore whether rural specific issues (for example, more limited access to healthcare providers) play a role.

Furthermore, additional studies that evaluate practical strategies for improving knowledge and information retention should also be undertaken. In the systematic review by Hall *et al.* [19] only four studies assessed interventions and their impact on contraceptive pill knowledge. Three of the four studies noted improved knowledge in at least one domain, highlighting that an array of additional educational materials may be beneficial in improving counselling sessions [19].

As more Australian-specific data accumulates about women's knowledge of the COCP, better public health initiatives and education strategies can be implemented to improve outcomes. The results of this study may encourage healthcare professionals to better understand and review areas of their own counselling sessions. Improvements may be achieved through better addressing how to use the COCP, what will affect its contraceptive benefit, and common misconceptions. Additionally, healthcare professionals can be assured they have provided appropriate informed consent by discussing risks, benefits, and alternative options [33]. In the long term, this may eventually lead to improvements in the typical failure rate of the COCP and reduce the rate of unintended pregnancies.

#### Conclusion

The women surveyed in this study appear to have substantial gaps in their knowledge of the COCP despite a high prevalence and duration of usage. Although many other sources were also utilised for information on the COCP, GPs were the main source of information. As such, this study provides insight into specific knowledge areas that require further education and clarification during COCP counselling sessions to encourage improved knowledge of the COCP by women, particularly those in the rural Australian general practice setting.

#### Acknowledgements

The authors would like to thank the staff at the medical centre where this research was conducted for their support in facilitating this project.

#### **Conflicts of interest**

None declared.

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## Medicine you can depend on: opioids and benzodiazepines

A discussion of evidence-based guidance for long-term therapy

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Abstract: Opioids and benzodiazepines are frequently prescribed medications that carry a high risk of dependency and are commonly misused. Long-term use of these agents is associated with significant harm to the individual such as exacerbating the patient's original symptoms, increasing mortality, and negatively impacting the community by contributing to road trauma. This paper will begin by outlining the regulation of drugs of dependence in Australia and defining misuse, dependency, and associated harms. The evidence for use of these drug classes will then be presented, with reference to best practice guidelines. Finally, the discrepancy between guidelines and prescribing behaviours will be highlighted with reference to specific challenges associated with drugs of dependency. It will be emphasised that doctors, especially the newer generations, have a responsibility to own the problems of drug misuse, and to impact individuals and the community through advocacy and evidence-based clinical governance. It will be shown that whilst opioids and benzodiazepines are effective short-term medicines, there is little support for long-term prescribing. If we are to turn the tide on drug dependency and misuse, change is needed in modern prescribing behaviours to achieve the best longterm outcomes for patients.

#### The problem

The most commonly misused prescription drugs in Australia are opioids and benzodiazepines, including z-drugs (zolpidem, zopiclone, and zalephon), which are non-benzodiazepines that act on the same receptors [1-3]. Access to these drugs is restricted by the Australian Therapeutic Goods Association Drug Schedule, which determines availability for public consumption [4]. Drugs of dependency include all Schedule 8 drugs (controlled drugs, such as opioids) and some Schedule 4 drugs (prescription only medicines, such as benzodiazepines) [5]. Such restrictions are regularly reviewed and subject to change. For example, alprazolam, a potent benzodiazepine with high toxicity [6], was made Schedule 8 in early 2014 due to a rise in illicit use [7], and there is current debate about the appropriateness of Schedule 4 for codeine, because of increasing codeine-related deaths [8,9].

Drug misuse is an important umbrella term to define in relation to the problems associated with drugs of dependency. Five main categories, that are not mutually exclusive, emerge in the literature:

- Overuse: Higher dose or dose frequency than prescribed; often due to tolerance and self-adjusted dosing over longterm use [3].
- (ii) Abuse: Overuse with the goal of intoxication [3].
- (iii) Prolonged use: An emerging problem involving continued therapy to achieve a sense of normality. Such individuals have been termed the "hidden population" [2-3]. Similarly, the term "accidental addicts" has emerged in popular media, referring to individuals who become dependent on pharmaceuticals with continued use. Prescribers must be hypervigilant for these patients as they are often of high socioeconomic status and highly functional, in contrast to traditional drug-seeking stereotypes [10].



- (iv) Substance use disorder: This is a formal diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) based on eleven symptomatology criteria across four categories (impaired control, social impairment, risky use and pharmacology) [11]. For diagnosis, use must cause clinically significant distress or impairment and occur within a twelve-month period [11].
- (v) Dependency: A syndrome in which an individual has: (i) a strong drive to use a substance; (ii) difficulty regulating their use; (iii) tolerance; and (iv) withdrawal symptoms on cessation [12].

Opioids and benzodiazepines are included on the World Health Organization list of essential medicines [13], indicated primarily in pain or palliative care (opioids), and anxiety disorders, seizures, acute insomnia, and alcohol withdrawal (benzodiazepines) [3]. Availability of opioids and benzodiazepines has been steadily increasing in recent decades. The number of opioid-dispensing episodes increased from 500,000 to 7.5 million from 1992 to 2012 [14]. Harrison and colleagues evaluated 4666 encounters with general practitioners (GPs) between 2010 and 2011 in which opioids were prescribed or supplied [15]. They found that 3.5% of opioids were prescribed for cancer pain, 43.9% were prescribed for chronic non-cancer pain, with the remainder being prescribed for indications classified as non-chronic [15]. For benzodiazepines, approximately 7 million scripts are written annually [16]. The 2013 National Drug Strategy Household Survey found that 3.3% of people aged 14 or over had used analgesics and 1.6% had used tranquillisers or sleeping pills over the past year for non-medical purposes, with both increasing over each three-yearly iteration of the survey since 2001 [17]. With problematic usage and availability of these drugs in the community (through either personal prescription or diversion), the harm associated with misuse has become increasingly apparent. There is a great degree of harm caused by opioid and benzodiazepine misuse to the individual and community (Table 1).

Opioids and benzodiazepines are highly habit-forming and potentially destructive to the individual and society. Physiological side effects of long-term use of both drug classes significantly reduce quality of life and contribute to personal suffering through symptoms such as constipation and balance derangement contributing to falls. Further, opioids and benzodiazepines are both associated with increased mortality. This is through means such as deliberate overdose, accidental

overdose, and motor vehicle accidents secondary to impaired driving ability [2,42,43]. In Victoria, overdose deaths involving prescription drugs outnumber deaths from road trauma [44], and alcohol and drug helplines receive nearly threefold more calls regarding prescription opioids than heroin [45]. Importantly, an Australian study investigating 320 oxycodone related deaths reported that 52% were due to unintentional overdose, 20% were deliberate self-harm, and the remainder either awaiting coronial enquiry or with indeterminable intent [46]. Victorian coronial data indicate that benzodiazepines are at least contributory in 48.8% of all drug-related deaths [47]. As such, long-term opioid and benzodiazepine use is associated with a very real increase in mortality, not only in people with the intent to self-harm. Overall, opioids and benzodiazepines carry a high risk of dependence, cause a wide range of physiological harms including increased mortality, and they negatively affect the community through diversion and contributing to motor vehicle accidents.

#### The evidence

Current evidence supports short-term use of both opioids and benzodiazepines for appropriate indications (for example, less than 90 days and one month, respectively). These drugs are effective when used properly and should be available for people who need them. Longterm use, however, is not supported by evidence for the indications for short-term use. Both classes of medications are known to be highly addictive and associated with poor long-term outcomes if use is not time limited. Notably, recent studies suggest that psychobehavioural interventions are at least equivalent to, or more effective than, pharmacotherapy for pain, anxiety, and insomnia [48-50].

Opioids have convincing evidence supporting their use in acute pain [51], cancer pain [52], palliative care, [53] and addiction [54]. Most of the controversy in opioid prescribing relates to use in chronic noncancer pain, with reviews suggesting little short-term efficacy [55], and tolerance and opioid-induced hyperalgesia occurring with prolonged use [56]. Furthermore, a Cochrane Database review showed no clear gains in pain and functional outcomes when opioids were used longterm [57], and another study found no significant correlations between opioid dose adjustment and clinical pain scores over time [58]. In line with the biopsychosocial conceptualisation of chronic non-cancer pain, multimodal approaches using non-pharmacological strategies such as exercise and psychological interventions have been shown to be superior to monomodal regimens in terms of long-term impact [59]. Cognitive behavioural therapy (CBT) is recommended as first line psychosocial treatment for chronic, non-cancer pain [60]. A Cochrane review in 2012 found that CBT conferred significant improvement in pain, disability, mood, and catastrophising in comparison to waitlist controls [61]. Effect sizes were small to moderate and the only sustained impacts were seen on mood.

Short acting benzodiazepines and z-drugs are effective at managing acute insomnia [62], generalised anxiety disorder, social anxiety, and panic disorder [63]. Dependency can be rapid (for example, within 2 to 4 weeks) [64] and increased mortality has been associated with long-term use [39]. Unfortunately, randomised controlled trials for long-term use are of inadequate duration (approximately 3 months), and lack representative clinical samples [16]. Reassuringly, however, it has been shown that the majority of patients on benzodiazepine therapy for sleep and anxiety do not increase their doses over time [65]. Moreover, a recent three year follow-up study of users of benzodiazepines and z-drugs found less than 1% of patients developed problems with excessive use, which predominated in patients with a significant drug and alcohol history and increased with duration of therapy [66]. This suggests that careful evaluation of patients to identify those at risk of excessive use is important, and that monitoring and cessation plans at first prescription may be protective for this population. Of note, this paper did not assess experience of adverse effects or harms associated with long-term use of benzodiazepines. Instead, it focussed on excessive use only, defined as more than two daily doses over a three month period.

Insomnia treatment is generally recommended to proceed in a stepwise fashion, with initial management emphasising basic sleep hygiene education and stimulus control, with the latter supported by randomised controlled trial evidence for long-term efficacy [67]. If insomnia persists, more involved behavioural interventions, either with or without medications, should be offered. CBT combines sleep hygiene education, stimulus control, and progressive muscle relaxation into a cognitive therapy framework to address insomnia. A recent metaanalysis of randomised controlled trials has shown lasting benefits for establishing sleep, wake times, and sleep efficiency [68]. However, total sleep time was not significantly increased and the patient samples excluded those with medical and psychological comorbidities. As such, the magnitude of the effects needs to be interpreted with caution. CBT is recommended as first line treatment for insomnia by the Royal Australian College of General Practitioners (RACGP) and the British Association for Pharmacology [69] on the basis of previous systematic reviews, which have included randomised controlled trials and patients with medical and psychiatric comorbidities and shown reliable and sustained improvements on sleep parameters [70]. Similarly, in the treatment of anxiety disorders, CBT is supported by meta-analysis of randomised controlled trials [71] and is recommended as first line therapy, either as monotherapy or in combination with antidepressant medication [72].

Current guidelines are in line with the evidence base for long-term prescribing of opioids and benzodiazepines in Australia. The RACGP published two comprehensive documents in 2015 about prescribing drugs of dependency (with particular reference to benzodiazepines) that summarise best evidence, provide concrete guidance and examples of difficult consultations, and ways in which they can be safely and effectively negotiated [5,16]. For opioid prescribing in chronic, non-cancer pain, the Hunter Integrated Pain Service provides additional evidence-based guidelines [19]. An overview of the key prescribing guidelines can be extracted from these documents (Table 2).

#### The need for evidence-based prescribing behaviours

Evidence does not support long-term therapy with opioids and benzodiazepines. This has been known for some years, yet the problem has only grown. Future generations of practitioners need to engender practice in accordance with guidelines, enhance utilisation of alternative, non-pharmacological interventions, and strive for better patient outcomes.

Consultations that involve the consideration of drugs of dependence present significant challenges to the GP, and usually involve complex and vulnerable patients. GPs report complicating factors such as time pressure, concerns about patient autonomy, patient-centred care and preserving the doctor-patient relationship [73-75]. Studies have shown that GPs have some ambivalence towards prescribing benzodiazepines and may lack consistency in their approach [73]. There is also referral to the notion of the "deserving patient" in the literature, whereby doctors ask themselves whether the patient deserves a prescription rather than whether they should write one [76]. Indeed, it has been reported that some GPs will provide benzodiazepines even when they do not believe it will help, giving reasons such as: having no realistic alternatives; assumptions about the patients' expectations; problems in saying no; and succumbing to pressure [16]. Importantly, research indicates that many doctors assume that patients want prescriptions or would resist attempts at withdrawal whilst, in fact, patients report wanting explanations and discussion [73,77].



Inevitably, there is often a discrepancy between clinical guidelines and practice. There is some disagreement in the literature regarding the usefulness and clinical impact of best practice guidelines, with some findings demonstrating improved and more consistent management [78,79], whilst others show minimal impacts [80]. Recent studies are suggesting that GPs perceive clinical practice guidelines with a positive attitude [81], but that there are inconsistencies regarding which components are followed [82]. Research into the appropriate prescribing of antibiotics suggests that inappropriate prescribing is more likely to occur in high-volume practices and by those who have been in practice longer [83]. As such, to improve concordance with guidelines, it will be important for junior doctors to emerge into the workplace as proponents of evidence-based prescribing. They should take advantage of their training period, where case loads are lower, to ingrain safe prescribing habits and good clinical governance into their practice. Obviously, there is more to appropriate prescribing than simply following guidelines. There is an art to handling challenging consultations, conveying evidence in a meaningful way, inspiring trust in your patient, and establishing a collaborative management plan, which may or may not meet the patient's original expectations. In light of this, there are some additional consultation techniques that may facilitate safe prescribing for junior doctors (Table 3).

Junior doctors and emerging medical professionals have the power to be agents of change in the evidence-based management of conditions such as chronic, non-cancer pain; anxiety; and insomnia. Doctors in training are often the most up-to-date on evidence-based guidelines in these areas, with greater emphasis on non-pharmacological management and multidisciplinary collaboration in undergraduate and postgraduate programs than in generations past. In addition, medical school curriculums have been modified to promote highly developed communication skills in graduates that are crucial to the ability to inspire motivational change in patients. As highlighted in Table 3, doctors can up-skill by developing their professional knowledge and consulting skills, and engaging with the wealth of resources available to them. Continuing medical education is paramount and skills in cognitive behavioural strategies such as goal setting and structured problem solving, mindfulness strategies, and motivational interviewing are vital to being an effective clinician. In addition, the RACGP provides examples of consultations and scripted responses to common questions such as "I need something to help me sleep" or "I want medication", which are helpful for the emerging practitioner whilst they are still building clinical experience [16]. In the consulting room, the junior doctor can advocate evidence-based, non-pharmacological approaches; conduct appropriate risk assessment for dependence; and prescribe appropriately with reduction plans already in place. The 'five As' of pain medicine (Analgesia, Activity, Adverse effects, Aberrant behaviour, and Affect) provide a useful framework for assessing risk of dependence [5].

It is best practice to seek advice when there is suspicion of problematic use, and link patients in with specialist services. Managing patients who are substance dependent is highly challenging. Leveraging support organisations, specialist alcohol and drug services, community pharmacists, and prescription tracking services provides greater likelihood of positive patient outcomes. Furthermore, it will protect the primary medical professional from burnout.

Table 1. Harms to the individual and community associated with opioid and benzodiazepine misuse.

Harms	Opioids	Benzodiazepines
Individual	High risk of dependence [18] and misuse [2]	Extremely habit forming: tolerance and dependence can occur in 2-4 weeks [31-33]
	Physiological effects Constipation [19] Biliary dyskinesia [19] Cognitive impairment [19] Increased risk of death [20]/overdose (including inadvertent childhood ingestion) [2] Sleep apnoea [21] Sexual and endocrine dysfunction [22] Immunosuppression [23] Opioid-induced hyperalgesia [24] Osteoporosis/increased fracture risk [2] Dental caries and necrosis secondary to xerostomia [2] Impaired cognition [2]	Physiological effects Insomnia [7] Anxiety [7] Depression [34] Poor memory and concentration [35] Excessive / daytime sedation [36] Risk of ataxia and falls, disinhibition and amnestic effects [36] Cognitive impairment [37]/decline and dementia [38] Increased mortality with long term use [39]
	Codeine: gastric bleeding [25], severe metabolic imbalances [26-28], and risk of death [8]	Z-drugs: potentially dangerous complex sleep behaviours [16]
	Harms with intravenous abuse: blood clots, amputation, and serious soft tissue injuries [29,30]	Harms with intravenous abuse: blood clots, amputation, and serious soft tissue injuries [29,30]
Community	Diversion [40] Low levels of organised crime [41] Driving impairment and motor vehicle accidents [42,43] Doctor shopping affecting GPs [3]	Diversion [7] Low levels of organised crime [41] Driving impairment and motor vehicle accidents [42,43] Doctor shopping impacting GPs [3] Criminal activity through precipitating aggression and disinhibition [41]

 Table 2. Summary of guidance for opioid and benzodiazepine prescribing from Australian evidence-based guidelines.

Guideline	Authors	Summary of recommendations
Prescribing drugs of dependence in general practice, part A – clinical governance framework* [5]	RACGP	<ul> <li>Maintain and develop skills in chronic pain, mental health, drugs of dependency (DOD) and optimise non-pharmacological interventions</li> <li>Inform patients DOD should be prescribed from one practice, one GP and dispensed from one pharmacy</li> <li>In complex cases or if situations deteriorate, be prepared to utilise specialist support</li> <li>Prescribing for drug dependent patients must be based on comprehensive assessment and an authority must be sought when prescribing a Schedule 8 drug</li> <li>Patients have the right to respectful care that promotes their dignity, privacy, and safety</li> <li>Provide patients with information about the purpose, realistic expectations, options, and benefits and risks</li> <li>Develop respectful, non-judgemental, and clear responses to inappropriate requests for DOD</li> </ul>
Prescribing drugs of dependence, part B – Benzodiazepines[16]	RACGP	<ul> <li>Prescription of benzodiazepines (BZDs) should be with the lowest dose and shortest possible timeframe, continual monitoring, and careful consideration of risks and benefits</li> <li>Discuss with patients the potential for dependence, withdrawal, misuse, and known harmful effects such as falls, cognitive decline, and motor vehicle accidents</li> <li>Avoid prescribing to patients with comorbid alcohol or substance use disorders (these patients are more vulnerable to major harms)</li> <li>Use beyond four weeks should be uncommon, if no alternatives are available, long-term use must be supervised with regular attempts at reduction</li> <li>For insomnia, first line should be non-pharmacological (e.g. CBT) and BZDs/Z-drugs only given on an individual basis, with short-term, intermittent dosing</li> <li>For anxiety disorders, first line therapy should include CBT; SSRI/SNRI are suitable first line pharmacological treatments</li> <li>BZD use in anxiety disorders is mostly limited to severe or treatment resistant cases</li> <li>Short term BZD use as occasional adjunctive therapy may be effective at reducing symptoms in the first few days to weeks of SSRI/SNRI therapy</li> <li>BZD discontinuation can be achieved with minimal interventions (such as GP advice/advisory letters), strong therapeutic alliance and psychological therapies</li> </ul>
Reconsidering opioid therapy: a Hunter New England perspective [19]	Hunter Integrated Pain Service	<ul> <li>Opioid therapy is indicated for acute pain; cancer pain, palliative care; opioid dependency/ addiction – NOT chronic, non-cancer pain</li> <li>Multidimensional pain assessment is recommended for all types of pain</li> <li>A drug and alcohol history, use of the risk assessment tools to gauge the risk of opioid misuse and contact with the Australian Prescription Shopping Information service is recommended</li> <li>Opioid therapy for acute pain:</li> <li>Should be time limited and coordinated between hospital and primary care</li> <li>Can usually be ceased within one week of surgery or injury if possible, and weaned and ceased within 90 days in complex cases</li> <li>A daily oral morphine equivalent dose of 100 mg should not be exceeded in primary care</li> <li>A treatment agreement explaining potential benefits, adverse effects, and duration of therapy should be used, with pain and functional outcomes measured</li> <li>Review therapy regularly with the "four A's": Analgesia, Activity, Adverse effects, and Aberrant behaviour</li> <li>Should be prescribed with ongoing non-pharmacological supportive care and a focus on evidence-based self-management strategies</li> <li>Involvement of a pain medicine specialist and multidisciplinary pain management team may be helpful</li> <li>Opioid naïve patients prescribed opioids and patients on long term opioids and BZDs should not drive</li> </ul>

#### Table 3. Practical advice for managing patients and drugs of dependency.

Areas of Development	Strategies
Professional Knowledge	Engage in continuing medical education for drug dependence and safe prescribing Develop skills in cognitive behavioural strategies and structured problem solving [84,85] Familiarise with typical patient requests and responses from examples [5,16]
<b>Consultation Skills</b> <i>Time spent in early consultations will</i> <i>save time long-term</i>	Encourage non-pharmacological measures Assess risk/benefits of any drug prescribed Make collaborative decision making for prescribing and non-prescribing [5] Prescribe only for supported indications Prescribe with plan for reduction [5] Be honest and explore issues [5] Involve the patient's supports [5] Monitor use and look for signs of dependency (review 'five As') [5] Identify problem use and refer to specialist services [5] Provide written management plan and fact sheets [5] Seek advice if unsure
Resources	Withdrawal scales for alcohol [86], opioids [87], and benzodiazepines [88] Therapeutic Guidelines for withdrawal management Opioid risk tool [89] Specialist drug and alcohol services NPS MedicineWise Key Points for managing chronic pain [90] The patient's pharmacist [91] Local support groups Medicare Australia prescription shopping information service (ph. 1800 631 181) [2]

In order to improve patient outcomes, doctors need to begin raising patient awareness of the likelihood and seriousness of adverse effects of these medications, and enthusiastically advocate and facilitate evidence-based treatments. Moreover, the right treatments need to be provided for the right indications. This is, after all, at the heart of patient-centred care, rather than allowing motivated and vulnerable patients to choose their own treatment.

#### Conclusion

While current prescribing behaviours are understandable because of patient expectations and time pressure, particularly limiting the opportunity for patient education, this is an area that will need to be addressed in the current generation of training doctors. Guidelines to assist in this have been provided in this paper along with some practical strategies that can be implemented to drive the changes

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necessary to improve patients' long-term outcomes. Whilst opioids and benzodiazepines are drugs of dependency, neither the doctor nor the patient should depend on these drugs to treat a long-term problem that can be resolved, or at least managed, with other effective evidence-based treatments.

#### Acknowledgements

None.

#### **Conflict of interest**

None declared.

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### Assessing cardiac output in the perioperative patient

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Abstract: Cardiac output (CO) is an essential component in the evaluation of the critically unwell hospitalised patient's physiological state. As an estimated measure of cardiac function, CO is of high clinical importance to determine how well nutrients and oxygen are delivered to body tissue. Additionally, as its determinants are related to circulating volume and heart rate, it can be used as a surrogate measure for any homeostatic imbalances, which may require critical medical intervention. This article compares the available clinical measurements of CO. The Pulmonary Artery Catheter (PAC) remains the most accurate and reliable method, however is a highly invasive measure. Minimally invasive techniques reduce the risk of procedural complications, but do so at the expense of reliability. Of these methods, pulse contour analysis is the most extensively studied, with precision being similar, if not equivalent to, PAC. However, until definitive, outcome-based, comparison studies have been completed, the selection of the most appropriate CO measurement modality remains the decision of the treating clinician, the patient and relevant clinical guidelines.

When assessing critically unwell hospitalised patients, haemodynamic monitoring is an important indicator of the patient's condition. Cardiac output (CO) assessment is an essential component of the patient's physiological state during their perioperative period. CO is an estimated measure of cardiac function calculated by multiplying the heart rate (beats per minute) by stroke volume (volume of blood pumped out of the heart in mL) [1]. CO is of high clinical importance, as it is one of the determinants of how well nutrients and oxygen are delivered to body tissue, with a normal CO defined as 4-8 L/min in healthy individuals, varying with gender and body habitus [1,2]. Additionally, as its determinants are related to circulating volume and heart rate, it can be a surrogate measure for any homeostatic imbalances (such as haemorrhage and volume depletion or sympathetic activation in stress raising heart rate) that may indicate the need for critical medical intervention.

Importantly, CO is also a dynamic way to assess organ perfusion and cardiac function intraoperatively, in addition to providing an indication of likely expected outcomes and complications postoperatively [1]. Other important clinical aspects of care to assess and monitor include the assessment of end organ function. This includes conscious state, respiratory rate, blood pressure, peripheral perfusion (temperature and capillary refill time), urinary output, and markers of metabolic acidosis [1,3].

Multiple invasive, semi-invasive, and non-invasive methods of assessing CO in the clinical setting are available. Five common and emerging methods are summarised and compared below (Table 1).

#### Invasive methods: pulmonary artery catheter

The pulmonary artery catheter (PAC) was introduced in 1970 by Harold Swan and is often used as the gold standard for CO monitoring [1]. This technique involves the insertion of a catheter, preferably through the right internal jugular vein because of ease of insertion, proximity



to the heart's right atrium, and rarity in anatomical variation between patients in this vein, although other sites can be used, particularly the subclavian veins. The device has an inflatable balloon at its tip, which permits it to be floated through the right cardiac chambers and into the pulmonary artery. The PAC estimates CO using a technique called thermo-dilution. This involves administration of a bolus of 10 mL of saline (0.9% NaCl at room temperature) injected into the right atrium via a proximal catheter port. The difference in temperature is measured through the thermistor (thermally sensitive probe) on the PAC's tip [1]. From this, a CO value is calculated using the Stewart-Hamilton equation. This equation is based on the principle that the rate of blood flow is inversely proportional to the change in temperature over time (the concentration of the indicator solution divided by the "area under the curve" or integral created by the indicator solution concentration change over time) (Figure 1) [2]. Such a reading can either be continuous or not depending on both the requirement of the clinical setting and the form of PAC [4].

The use of the PAC method for CO monitoring has many advantages over other techniques. Conversely, due to it being an invasive device, it does carry inherent risks including an increased possibility of dysrhythmias such as complete heart block, perforation of heart chambers, cardiac tamponade, pneumothorax, valve damage, infection, and emboli [1]. Post hoc analyses of larger studies have also reported no benefit in using the PAC method, other than in elective surgical patients [5]. However, given that elective surgical patients are often healthier than non-elective intensive care patients, queries over confounding factors within the population have been raised [5]. This demonstrates that it can be used safely, but brings into question its patient-related value in situations arising from the critical care environment [6]. Despite the relatively high reliability of this device, debate still exists around whether it actually improves outcomes in various patient groups [6]. Regardless, its clinical benefit in monitoring both undifferentiated, multi-factorial shock states and cardiac cases is well documented [6].

## Minimally invasive methods: CO2 re-breather, Doppler ultrasound, and bio-impedance

#### Indirect Fick principle (CO2 re-breather)

The pulmonary circulation is the part of the cardiovascular system that involves deoxygenated blood flowing from the right heart, through the lungs, and back into the left side of the heart (now oxygenated Table 1. Summary of cardiac monitoring techniques.

	Method	Principle	Advantages	Disadvantages
Invasive	Pulmonary artery catheter (PAC)	Uses the Stewart-Hamilton equation: the rate of blood flow is inversely proportional to the change in temperature over time.	<ul> <li>Very accurate</li> <li>Clinical benefit in monitoring multi- factorial shock states and cardiac cases</li> </ul>	<ul> <li>Risk of:</li> <li>Dysrhythmias</li> <li>Cardiac perforation</li> <li>Tamponade</li> <li>Pneumothorax</li> <li>Valve damage</li> <li>Infection</li> <li>Emboli</li> </ul>
Non- invasive	CO2 rebreather	Uses the Fick principle: the conservation of mass, which allows the calculation of blood flow to an organ based on the uptake of a specific marker substance.	<ul> <li>Fewer complications</li> <li>Non-invasive</li> <li>Useful in intensive care unit setting</li> </ul>	<ul> <li>Requires patient intubation and mechanical ventilation</li> <li>Poorer accuracy than invasive methods</li> <li>Not reliable in perioperative cardiac cases</li> </ul>
	Aortic and echocardiography Doppler ultrasound	Doppler ultrasound operates on the principle that the shift in frequency of a wave between two points is directly proportional to the velocity of that wave.	<ul> <li>Non-invasive</li> <li>Suprasternal and oesophageal methods</li> <li>Simple to operate</li> <li>Very few complications</li> <li>Provides data on heart structure</li> </ul>	<ul> <li>Reliability depends on operator skill/ consistency</li> <li>Requires nomogram which may miss individual variation</li> <li>Individual physiological variables may alter reading (such as expansion of the aorta during systole)</li> </ul>
	Bio-impedance	Measures electrical impedance of the thoracic cavity generated during systole and left ventricular outflow into the aorta. The ratio of applied current and measured voltage equals the bio- impedence, which is measured over time.	<ul> <li>Easy to use</li> <li>No risk of infection or vascular complications (such as emboli)</li> </ul>	<ul> <li>Sensitive to movement</li> <li>Unsuitable in hemodynamically unstable and arrhythmic patients</li> <li>Limited use in septic shock and aortic regurgitation</li> <li>Limited in pathology with thoracic fluid (such as pulmonary effusion)</li> </ul>
Semi- invasive	Pulse contour analysis	Based on the hydraulic principle between flow, pressure, and time; measures pulse pressure (the difference between diastolic and systolic pressure) as proxy to volume, in order to create a picture or "wave form" that can be analysed mathematically to find stroke volume	<ul> <li>Invasive and non- invasive models available</li> <li>Accuracy similar to pulse contour analysis</li> </ul>	<ul> <li>Requires individual patient calibration</li> <li>Limited in patients with arrhythmias, aortic regurgitation, and intra-aortic balloons</li> <li>Invasive methods have risk of infection and bleeding</li> </ul>



Figure 1. Modified Stewart-Hamilton equation applied in PAC Thermal dilution during CO monitoring [2].



blood). This circulation can be used to estimate CO via the use of a mathematical equation called the "Fick" principle [7]. The Fick principle is a mathematical interpretation of gasses, based on the conservation of mass, which allows the calculation of blood flow to an organ based on the uptake of a specific marker substance [2]. In more clinical terms, it grants the ability to observe the amount of gas release, classically oxygen (O2) or carbon dioxide (CO2), that occurs in the pulmonary circuit, via the alveolar blood flow, and the difference in gas concentration in the arterial and venous circulation (by collecting venous and arterial blood samples) [7]. By measuring alveolar blood flow via the rate of carbon dioxide volume (VCO2) produced from the lungs and body over the arterio-venous carbon dioxide gradient of arterial carbon dioxide partial pressure (PaCO2) and venous carbon dioxide partial pressure (PvCO2), one can extrapolate CO from the difference between these CO2 gradients [8]. Mathematically, with Q representing CO and VO2 being volume of oxygen consumed, the generic formula is as follows:

#### VO2 = Q (PaCO2 - PvCO2) [8]

For example, if the concentration of CO2 being delivered to an organ is known, and the amount this concentration increases after perfusing the organ (venous and arterial difference) is also known, it is possible to divide the two in order to determine the "flow" of gas, and therefore blood, to that organ [7]. In CO monitoring, the use of the pulmonary circuit to represent "the body", with a sample taken before (venous) and after (arterial) allows us to determine the change in CO2 concentration as the blood flows to the heart. Concurrently, the patient in which CO is being measured must be intubated and under mechanical ventilation in order to control this gas exchange and its volume parameters [8].

The advantages of using the Fick technique are largely associated with it being a minimally invasive technique (such as relatively fewer contraindications and adverse outcomes than comparable methods) [7]. However, this method has limitations in that it has a lower level of accuracy than invasive methods, and requires the patient to undergo intubation [7]. Additionally, it was found that in the determination of CO for patients undergoing cardiac surgery, an underestimation preoperatively and an overestimation postoperatively commonly occurred [9]. This brings into question its clinical reliability in the vital perioperative setting [9]. Thus, although it has clinical advantages in patients who cannot tolerate more invasive methods, its reliance clinically is not as consistent as that of PAC.

#### Doppler ultrasound: aortic and echocardiography

Doppler ultrasound operates on the principle that the shift in frequency of a wave is directly proportional to the velocity of the moving plasma [10]. By measuring plasma velocity, Doppler ultrasound can be used to estimate CO. Typically, Doppler ultrasound calculates CO by measuring the velocity of blood plasma at the level of the thoracic aorta, generating an estimation of blood flow (stroke volume) by measuring plasma flow across the cross-sectional area of the aortic vessel or valve. This velocity can then be multiplied by the heart rate to provide an estimation of CO [7]. This technique is commonly combined with echocardiography, which measures left-side cardiac filling pressures via a two-dimensional ultrasound, and Doppler measurement of the aortic annulus diameter [11]. Additional benefits derived from this method include the provision of clinically relevant information on the global structure of the heart, in addition to valvular anatomy and presence of pericardium pathology (including tamponade or constrictive pericarditis) [11]. This allows for accurate, non-invasive measurement of left ventricular diastolic dysfunction, which is predictive of mortality in hospitalised patients [10]. Furthermore, echocardiography can also measure the response of stroke volume to both fluid bolus and diuretic therapy, while monitoring left (trans-mitral) and right (vena cava) arterial pressure [12]. This may be critical in patients at risk of both systolic and diastolic heart failure [12]. Importantly, these changes can be monitored serially after interventions have been performed.

Significant drawbacks of this method include its inability to provide continuous monitoring and difficulty in measuring sample volume placement; probe placement and beat-to-beat variation in stroke volume both impact accuracy [11]. Additionally, in the setting of decompensated systolic heart failure, tissue Doppler imaging can be inaccurate for monitoring filling pressures [11]. Since this technique also requires particular placement of the probe, as this is an important variable for reproducible results, significant operator training and skill is required [12]. Therefore, while this method is both reliable and has multiple reasons for use in the clinical setting, consideration needs to be given to operator skill and reproducible monitoring. An additional limitation is that echocardiography requires considerable skill to perform well.

Finally, while not commonly used in Australia, oesophageal and transthoracic Doppler methods also exist. As with Doppler echocardiography, monitoring has a similar level of reliability as more invasive methods, but is predicated upon three factors: the aortic cross-section accuracy, the parallel placement of the transducer, and the maintenance of constant beam direction between measurements [7]. Even controlling for these variables, inherent factors limit this technique, including physiological expansion of the aorta during systole, noted to be approximately 12% [10]. Furthermore, the use of a nomogram (a pre-determined graph using three or more logarithmic scales to show a relation between them, such as occurs in weight and height charts to calculate body mass index) introduces potential measurement error secondary to variation with vascular tone and volume status that needs to be considered for all measurements [10].

#### **Bio-impedance**

CO can also be estimated via bio-impedance in a technique known as impedance cardiography. This technique measures the electrical impedance of the thoracic cavity generated during systole and left ventricular outflow into the aorta through the conductive properties of blood via four electrodes placed around the thorax; two placed on the left neck and another two upon the lower thorax, focus alternating current toward the ascending and descending aorta, within which blood is the most conductive material [13]. Put simply, the electrodes emit a small electrical current that is then "bounced" off conductive tissue, of which blood produces the strongest "bounce". This current is then received by the electrode, wherein the change of impedance (current "bounced" from the blood tissue and received by the electrode) correlates to stroke volume [1].

Similar to all minimally invasive techniques, impedance cardiography nullifies the risk of infection and haemorrhage, however, it remains particularly sensitive to movement and is unsuitable for use in patients with arrhythmias or who are haemodynamically unstable [7]. This limits its use in Australian medical settings and so it is not commonly seen in practice [7,13].

#### Semi-invasive: pulse contour analysis

The final, commonly used method of estimating CO is pulse contour analysis. Pulse contour analysis utilises arterial waveforms, obtained either from an arterial catheter (invasive) or a peripheral finger probe (minimally invasive), in order to extrapolate stroke volume and systemic vascular resistance [2]. This technique relies on measuring pulse pressure, that is, the difference between diastolic and systolic pressure (as proxy to volume), in order to create a picture or "wave form" that can be analysed mathematically to find the area under the curve. Initially, this method assumed compliance of aortic wall to be uniform, regardless of patient demographics and co-morbidities (as the compliance of a vessel alters its distensibility). However, via the use of an algorithm developed by Wesseling et al. [14], it become possible to gauge stroke volume by integrating the area under the curve measured during systole to minimise this error. Concurrently, the estimated stroke volume can then be multiplied by heart rate to give CO [7,14,15]. Many devices rely on the principle of pulse contour analysis, such as Pulse Contour Cardiac Output Monitoring (Pulsion Medical Systems, Munich, Germany) and Lithium Chloride Dilution (LiDCO Ltd., Cambridge, UK), are invasive, needing arterial lines. However, the Vigileo<sup>™</sup>/FloTrac<sup>™</sup> system (Edwards Lifesciences, Irvine, CA, USA) and the Nexfin® system (BMEYE, Amsterdam, Netherlands), which uses a finger cuff to measure pulse pressure of the digital arteries, are noninvasive options. Currently, all of these devices are limited by the fact that they require inter-patient calibration [16].

As in the bio-impedance method, this technique is limited in patients with cardiac arrhythmias, aortic regurgitation and intra-aortic balloons as they alter measurement accuracy [4]. Equally, the use of arterial catheters introduces an additional risk of infection and haemorrhage. Despite this, a recent meta-analysis performed by Mayer et al. determined that a strong positive correlation exists between the contemporary pulse contour analysis devices (FloTrac/Vigileo) and the PAC method when measuring CO [16]. Concurrently, this method possesses a high clinical applicability with significant potential for future development.

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In conclusion, accurate CO assessment and monitoring in the perioperative patient remains critically important. While PAC remains the most accurate and reliable method, its invasiveness and the subsequent risk of complications makes it unsuitable for specific patient subsets. Conversely, while minimally invasive techniques reduce the risk of procedural complications, this is often at the expense of reliability. Of these methods, pulse contour analysis is the most extensively studied, with precision being similar, if not equivalent to, PAC. Until definitive, outcome-based comparison studies have been completed, the selection of the most appropriate CO measurement modality remains the decision of the treating clinician, the patient, and faculty clinical guidelines.

#### Acknowledgements

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#### **Conflicts of interest**

None declared.

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# Forget everything you thought you knew: how your assumptions are impacting the health outcomes of your patients

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Nahkita is a final year medical student at Monash University who is fascinated by the intersection of health and communications. Passionate about health access, equity, and inclusion, Nahkita is dedicated to amplifying the voices and celebrating the unique strengths of all individuals, to ensure that patients are valued, represented, and engaged in our health systems.

Abstract: Modern health professionals are well versed in the value of person-centred care for their patients. However, the way we are taught to view our patients through a problem-based lens is counterintuitive to this person-centred approach. Medical professionals have learned to consider the diverse sociocultural contexts of patients as a "risk" to their overall wellbeing, rather than acknowledging the unique strengths of all individuals and communities. This focus entrenches assumptions into the way we approach patients of diverse backgrounds. These assumptions and the subsequent expectations that we hold of our patients have been evidenced to serve as powerful self-fulfilling prophecies for an individual's overall health and wellbeing. Individuals will internalise negative health identities and have poorer health outcomes if health professionals hold low expectations of them based on their sociocultural "risks". Strengths-based practice recognises resilience and focuses on the strengths, abilities, knowledge, and capacities of all individuals, rather than on their deficits, limits, or weaknesses. It provides a framework for health professionals to better support their patients in achieving their best health outcomes. A strengthsbased approach has the ability to shift the broader deficits-based discourse that exists around the diverse sociocultural groups that exist in Australia. Changing this conversation is of immeasurable importance if we are to improve the health outcomes and agency of our patients and mitigate the persistent health inequities that exist within the Australian health system.

As modern health professionals in training, we have been well conditioned to consider all biological, psychological, and sociocultural factors that may contribute to poorer health outcomes in any given patient. We are familiar with the World Health Organisation's definition of health as "a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity [1]". But how does this translate into our practice? High patient caseloads and the sheer breadth of medicine compel us to streamline history-taking processes and problem formation through pattern recognition. We are taught to cluster "risk" factors - to make assumptions about disease, prognosis, compliance, and life expectancy, based upon sociocultural "risks". We tick boxes. "Now, this is a question that we have to ask everyone, but do you have a history of previous intravenous drug use?", "Do you identify as an Aboriginal or Torres Straight Islander?", "Are you from a refugee or migrant background?", and "Do you live in a rural or remote area?" We turn our attention to "vulnerabilities" and "high-risk groups" without much consideration of the impact of this focus and our subsequent assumptions on individual health identity.

The expectations we consciously or subconsciously hold of our patients, and the language we use toward or about them, inherently impact their health outcomes. In medical school, we are often taught to view our patients through a lens of deficit, by focusing on health problems rather than the opportunities that come from realising patients' individual strengths. Strengths-based practice can shift this problem-based approach, and is a means of acknowledging the importance of our patients' environments and diverse sociocultural



contexts in the trajectory of their health attainment [2]. Strengthsbased practice is an ecological approach to individuals, families, and communities that recognises resilience and focuses on the strengths, abilities, knowledge, and capacities of all individuals, rather than on their deficits, limits, or weaknesses [2]. A strengths-based approach is of immeasurable importance if we are to improve the health outcomes and agency of our patients, and mitigate the persistent health inequities that exist within the Australian health care system. This article will examine the impact of assumptions on patient health attainment and identity, the value and practicality of a strengths-based approach in the clinical setting, and the broader implications of our deficits discourse in the Australian public health arena.

#### **Expectations and health identity**

The expectations we hold of our patients can serve as powerful selffulfilling prophecies for their overall health outcomes and identity. More than once I have heard a doctor use the phrase, "We save smart solutions for smart people". This approach, however well intended, is damaging. Our clinical decision-making should not be influenced by expectations of noncompliance or assumptions of deficit. This is because health often exists at the nexus of societal expectations and our subsequent internalised perception of self. Essentially, if health professionals have high expectations of their patients, their patients are likely to have higher expectations of themselves, and subsequently experience better overall outcomes. This phenomenon is known in the behavioural psychology sphere as the Rosenthal effect, whereby our interpersonal expectations have been shown to significantly impact the learning, abilities, and health attainment of the subjects of our expectations [3,4]. We subconsciously facilitate "warmer" socioemotional environments for individuals of whom we have higher expectations [3]. We have also been shown to input more effort into maximising the outcomes of individuals we see as having greater potential [3]. These subtle changes in the behaviour of care providers are internalised by patients and shape the expectations an individual holds of themselves [3]. Negative internalised expectations have been shown to directly lead to poorer mental and physical health outcomes in patients [5]. Internalised expectations may also directly act to motivate or discourage patients in their personal attainment of better health

outcomes [5]. Essentially, negative health care provider assumptions and expectations demoralise an individual's health identity, and this in turn impacts the mental and physical health outcomes of patients [3,6].

Our clinical approach to Indigenous patients in Australia offers an obvious example of how health care provider expectations may demoralise an individual's health identity. At the beginning of any consultation, we are taught to ask all patients if they identify as Aboriginal or Torres Straight Islander. Identification of Aboriginal or Torres Straight Islander descent is essential in creating safety for our Indigenous patients. Too often however, doctors aren't asking about Indigenous identity in order to practice their (often limited) cultural competencies, but rather to unfold a new list of differential diagnoses, and to remember to ask about smoking, alcoholism, substance use, diet, and exercise. On examination of Indigenous patients, we are also taught to check specifically for signs of cardiovascular disease, hypertension, type-2 diabetes, and chronic renal disease. While such a comprehensive approach to all patient consultations is desirable, our underlying assumptions relating to our Indigenous patients' healthseeking behaviours, and our expectations for their health prognoses, is problematic. These assumptions are one of the means by which racism is maintained within our health system. As health professionals who work to support others in achieving their best possible health outcomes, we are terrified to talk about racism, or to consider that we might be contributing to its perpetuation in the Australian health system. However, it is important to define what racism in our health system actually means, in order to understand our role in it.

There are three levels of racism that contribute to poor health outcomes for Indigenous people: institutional, interpersonal, and internalised racism [7-12]. Institutional racism is often established in political systems and sustained by the policies of governments and health institutions that discriminate against Indigenous peoples [8]. Interpersonal racism in the health setting occurs when a health care provider makes assumptions about a patient on the basis of their Indigenous identity, or discounts Indigenous beliefs and practices [9]. These discriminatory interactions may be communicated to patients through non-verbal or verbal means, and often alter the course of care for an Indigenous patient [8,9]. Internalised racism occurs when an Indigenous patient accepts the stereotypes of interpersonal and institutional racism, and allows these stereotypes to shape their health identity. Institutional and interpersonal racism are often not intentional, but remain uninterrogated and largely invisible in our health system. Sometimes it is highly visible, but still unchallenged and unchanged. By not acknowledging or confronting the racism that exists within our health institutions, we are reinforcing negative internalisation among Indigenous individuals, leading to negative mental and physical health outcomes [6,8,9]. If a patient is conscious of interpersonal racism, this has been shown to influence their participation in unhealthy behaviours, and directly contribute to the long-term development of cardiovascular disease, hypertension, renal disease, and alter some of the neurochemical processes involved in diabetes [6,8]. The high prevalence of these chronic conditions within Indigenous populations is therefore something that is perpetuated, rather than mitigated, through our current approach to Indigenous health. As health professionals, we must challenge our conventional health paradigms and disrupt the processes that blame such systemic problems on the "unhealthy behaviours" of an entire culture [9].

By utilising reductionist techniques to simplify care provision for our patients, we are limiting our patients' ability to attain their highest standard of health, as well as restricting their agency and self-aspiration [13]. An individual's health is more than the sum of their medical issues – it is also determined by their personal resources. In medical school, we are not taught to identify the inherent strengths of all individuals, but rather to focus on health risks, problems, and limitations. That is, instead of seeing the potential that exists in

celebrating the diverse sociocultural contexts of our patients, we regularly view sociocultural identity as a "risk" to overall wellbeing. This deficits-based understanding of health identity and our subsequent interpersonal communication is internalised by our patients, shaping their health behaviour and outcomes. We have the opportunity to change the conversation.

#### The strengths-based approach

Strengths-based practice is a well-evidenced approach in ensuring people have agency in their own health outcomes and identity. Strengths-based practice appreciates the centrality of people's environments and sociocultural contexts in the attainment of their optimal health outcomes, and builds upon these strengths to reinforce health identity [2]. A strengths-based practice framework involves six core principles [2]:

- 1. All individuals, families, groups, and communities have strengths, and the emphasis is on these strengths rather than on pathologies
- 2. Communities are an abundant source of resources
- Interventions are built on the self-determination of the patient
   Collaboration is key, and a positive practitioner-patient
- relationship essential
- 5. Outreach is utilised as a preferred mode of intervention, and
- 6. All people have the inherent capacity to learn, grow, and change.

While strengths-based practice has not been formally implemented in the medical system, analysis of its feasibility in the social work setting may inform its rollout across the broader health sector. There are three developmental stages of health professional learning: socialisation, internalisation, and identification [2]. Socialisation involves health professionals learning how to enable a strengths-based dialogue among their colleagues, so that their colleagues may then develop the knowledge and skills to empower others [2]. Internalisation in this context is the process whereby health professionals internalise strengths-based principles in order to counter any barriers to enabling patients to see their strengths [2]. Identification involves the recognition of tacit assumptions about patients, and the impact of these assumptions on health provider practice and their patient's cultural context of empowerment [2]. To shift our deficits-based approach to health care in Australia, health professionals must first be socialised to the concept of strengths-based practice, before we can then internalise its importance, and address any negative expectations we inadvertently hold of our patients.

The language we use to converse with our patients is often a product of the expectations and assumptions we hold of them. Paradoxically, our expectations are shaped by the broader public health discourse and problem-based learning that is indoctrinated into many doctors throughout their training. The rigidity of our health and medical education systems that institutionalise this deficits-based discourse make it difficult to universally adopt strengths-based practice across Australia. However as health professionals, we are still able to begin shifting this conversation and challenging the assumptions that we usually accept of our patients. Indigenous peoples in Australia are well versed in the power of strengths-based practice, and have identified three crucial ways we might enable positive change and start shifting our health discourse away from a mindset of deficit [13]:

- 1. Create safety: enable a space and process for robust discussion.
- 2. Challenge mindsets, habits, and conversations: take responsibility, find courage, and lead by example.
- 3. Co-create transformative pathways: engage with community groups to develop change and spread the word to engage in a national dialogue.

A deficits-based health discourse extends beyond interpersonal interactions of doctor and patient. As health professionals, our opinions



are respected and hold legitimacy in public health discourse. How we talk about people matters because it plays a major role in shaping the public dialogue, and subsequently assists in setting a national health agenda for our politicians to action. We should be engaging in strengths-based health rhetoric and promoting the wellbeing of all individuals, rather than focusing on their limitations. As a result of our privilege, we have a duty to amplify the voices of individuals and communities who are working hard to shift our national dialogue to a narrative of strength, resilience, and opportunity.

#### Changing the conversation

Over recent decades, an emerging theme in the public health discourse has been a focus on health disparities between your "average Australian" and specific sociocultural groups. Arguably, this well-intentioned advocacy has been successful in fostering the next generation of compassionate and socially conscious health professionals. Many of my fellow students would attest that they entered their medical degree because they saw it as an effective means of helping people they perceived to be marginalised in our society. This motivation is exciting and provides fertile ground to generate unprecedented change to the inequities that persist in the Australian health system. But the fundamental assumption that our current deficits-based medical curriculum will enable us to effect positive change for marginalised groups is flawed. We assume that a medical degree, taught through problem-based learning, will provide us with the knowledge, skills, and sensitivity to offer the help that is needed. However, without realising the strengths of all individuals and communities, we are missing out on an enormous opportunity to celebrate resilience, reinforce positive health identities, and improve health outcomes for all.

Attention to sociocultural determinants of health has allowed us to raise awareness of persistent inequalities in our health system. However, focusing solely on deficits is detrimental to the broader narrative of the diverse sociocultural groups in our society. Drawing back upon the example of Indigenous health in Australia, large health promotion campaigns have been incredibly valuable in shedding light on the inequalities that persist between Indigenous and non-Indigenous Australians. These campaigns have also ensured that Indigenous

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health and education remain on political agendas, and they have secured funding for important programs. However, these awarenessbuilding education and health promotion strategies have inherently focused on the "gaps" experienced by Indigenous people, and are an ineffective substitute for a whole government commitment to address the broader social determinants of health and shift our discourse away from deficit [9]. If we constantly emphasise life expectancy "gaps" in our public discourse, without closely examining our role in the discriminatory policies and practices that maintain these "gaps", we will only perpetuate the inequities that exist between Indigenous and non-Indigenous Australians. By continuing to allow deficits to eclipse individual strengths, we are doing our patients, their communities, and our broader society, a colossal disservice.

Our health discourse does not exist in a vacuum. As modern health professionals, we have an obligation to celebrate the individual strengths of each of our patients, and a duty to use our respected voice to shape the rhetoric that currently marginalises the diverse sociocultural groups that exist in Australia. So challenge expectations, transform mindsets, and check your assumptions at the door – together we can ensure better health outcomes for all.

#### Acknowledgements

Scott Gorringe, for his patience, persistence, resilience, strength, and friendship.

Nicholas Fava, for his invaluable assistance in proofreading this piece.

#### **Conflicts of interest**

None declared.

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### Diluted medicine: the tension between biomedicine and homeopathy

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Abstract: With a concerning number of individuals with serious health conditions favouring homeopathic medicines over conventional treatment, Australia's National Health and Medical Research Council (NHMRC) recently declared that homeopathy was not efficacious for treating any health condition. Given homeopathy has existed and been used since the 18th century as an alternative medical approach to treatment, the declaration naturally sparked tension with leading homeopathic authoritative bodies and practicing homeopaths. To help alleviate this tension, the purpose of this article was to review the laws and regulations underpinning homeopathy and its preparations in Australia, and to critically appraise the opinions of major organisations for and against the use of homeopathic medicines in treating serious health conditions. It also aimed to provide a brief overview of how clinicians can address the issue of using homeopathic remedies as an alternative to mainstream medicine with patients. Despite the defensive position of two leading homeopathic authoritative bodies, the Australian Homeopathy Association and Complementary Medicines Australia, against the NHMRC declaration; there is strong evidence to suggest the need for stricter industry regulations of homeopathic practice and preparations in Australia so as to maximise the health and safety of consumers. There is also strong scientific evidence to suggest that homeopathic remedies are unlikely to have clinical effects beyond placebo. Given this, it is now up to clinicians to educate their patients and provide them with all the relevant information to not only maximise their health outcomes but also facilitate wellinformed decision making when it comes to homeopathy.

#### Introduction

Homeopathy, a branch of complementary and alternative medicine founded in the 18th century, is commonly being used in Australia and worldwide on a regular basis as a form of treatment for a number of health conditions. It is based on two principles: 1) minute doses of substances that mimic illness or symptoms in healthy individuals can be used to treat the same illnesses or symptoms in those who are unwell; and 2) highly diluted preparations retain "memory" of original substances. In March 2015, the National Health and Medical Research Council (NHMRC), Australia's peak medical research organisation, declared that homeopathy was not efficacious for treating any health condition [1], sparking tension with practicing homeopaths. The investigation was prompted after a concerning number of individuals with serious health conditions put their health at risk or delayed evidence-based treatment by favouring homeopathic medicines [2]. To arrive at this conclusion, the NHMRC undertook a systematic review, overseen by their Homeopathy Working Committee (HWC) in which only controlled studies were considered i.e. those that compared a group of people who received homeopathic treatment with a similar group of people who did not receive homeopathic treatment [2]. Following this major systematic review, the latest NHMRC Strategic Plan 2013-15 has responded by broadening its aim to facilitate informed decisionmaking by Australians regarding their healthcare and the use of nonevidence based treatment [3]. Since the declaration by the NHMRC has sparked tension with leading homeopathic authoritative bodies,



this article aims to review the laws and regulations underpinning homeopathy and its preparations in Australia. It also aims to critically appraise the opinions of major organisations for and against the use of homeopathic medicines for treating serious health conditions through evidence and case studies. Lastly, a brief overview of how clinicians can address the issue of using homeopathic remedies as an alternative to mainstream medicine with patients will be provided.

#### Basic principles of homeopathy

Homeopathy, first articulated by a German physician in the 18th century, Dr Samuel Hahnemann (1755-1843), refers to a unique scientific system of medicine based on the principle of similarity ("like cures like") [4,5]. Hahnemann describes this principle as a reactive process whereby giving minute doses of a substance thought capable of inducing a series of symptoms in healthy individuals can be used to cure the same symptoms in those suffering ("similia similibus curantur") [4,5]. Derived from the Greek words *hómoios* meaning similar and *pathos* meaning suffering, disease; the aim of this "simile-based" therapy is to restore health using a "holistic" approach by individually tailoring homeopathic remedies to enhance the individual's natural healing processes and strengthen their body's ability to fight against susceptibility of disease [6,7].

The phenomenon underpinning homeopathy as described by Hahnemann was that for homeopathic substances, the higher the dilution, the higher the potency [8]. In Britain, for example, two common preparations are sold over-the-counter: 6C and 30C dilutions. The 30C dilutions are significantly more dilute than the 6C (1 in 100<sup>30</sup> vs. 1 in  $100^6$  respectively), with the former considered to be more potent [4]. To explain this phenomenon, Hahnemann described that when the preparation is vigorously shaken between each dilution, the energy or essence of a substance is transferred to a solvent, a process called "potentiation" and "succession", whereby a "memory" of the initial substance is retained in the solution [2,5]. This process is how the purported therapeutic effect is achieved [8]. The most common dilution factor is  $10^{\rm 60}\text{,}$  which can vary depending on the constituents and strengths [5]. Homeopathy is thus a form of therapy based on similarity and dilutions that considers the person as a whole so as to enhance the body's natural healing processes against various health



conditions. However, it is important to highlight here that due to the extensive dilution, standard scientific theory would attest that the final homeopathic preparation is statistically unlikely to contain a single molecule of the original active ingredient [9,10].

## Laws and regulations underpinning homoeopathy and homeopathic preparations in Australia

Originally, homeopathy was a self-regulated industry in Australia controlled by individual-state based organisations [11]. In 1997, these organisations merged to form what is known today as the Australian Homeopathy Association (AHA), which is the only national association of professional homeopaths in Australia that maintains the Australian Register of Homeopaths (AROH) [11,12].

Currently, to acquire a private health fund rebate for their services, homeopathic practitioners must be registered with AROH [13]. The AROH guidelines for registration necessitate that all registered practitioners have either passed a competency test for those who have not studied a homeopathic course accredited by AROH or have attained a three-year Advanced Diploma Course at a recognised institution; hold a current first aid certificate; maintain annual professional indemnity insurance; and undergo regular continuing professional development requirements [14]. Furthermore, homeopaths must abide by the AHA Code of Conduct as endorsed by the National Council, which requires them to refer patients with serious illnesses back to medical practitioners for evidence-based treatment [15].

The Australian national regulatory framework for homeopathic practice and its preparations is not as strict as some may anticipate. Homeopathic preparations are seldom registered with the Therapeutic Goods Administration (TGA), the national regulatory organisation that ensures the safety and quality of various therapeutic goods [16]. Those that qualify for registration are homeopathic preparations of no more than 1000-fold dilution, or contain apparent quantities of animal or human ingredients [17]. Most, however, either have undetectable amounts of the "active" ingredient or are too diluted. Such preparations are thus deemed exempt from the TGA good manufacturing practice requirements, circumventing the rigorous testing for safety and efficacy by TGA that other drugs must undergo [17]. This, in turn, raises the question regarding the safety and efficacy of homeopathic treatment.

On the Australian Register of Therapeutic Goods, complementary medicines including homeopathic preparations can either be "registered" or "listed" depending on the level of risk that the medicines carry [17]. As "registered" medicines carry a high level of risk, they must undergo rigorous and detailed assessment and regulation of all relevant randomised controlled trials so as to provide comprehensive quality, safety, and efficacious data [17]. In contrast, "listed" medicines are not evaluated by TGA as they are of low risk, however, the products must have proven safety, quality, and efficacy as per legislative requirements [17]. Currently, no homeopathic preparations are registered and those listed and claiming to be efficacious must be labelled with the disclaimer "contains homeopathic ingredients without approved therapeutic indications" [17].

The AHA website provides a list of homeopathic medicine suppliers, which is publicly available, with most being sold through health food shops and pharmacies [18]. Such preparations are commercially manufactured and made available to homeopathic practitioners by three Australian suppliers: Pharmaceutical Plant Company, Martin & Pleasance homeopathy lab, and Brauer [18]. In addition, the AHA stress that each homeopathic practitioner has their own unique approach to making custom prescriptions [6], however, no centralised body exists to regulate such practice in Australia [5].

#### Opinions, the evidence, and case studies

Since the NHMRC declared homeopathy to be ineffective in treating any health condition, a number of disputes have been made by major organisations in favour of homeopathy. Australia's two peak industry organisations, Complementary Medicines Australia (CMA) and the AHA, both argue in their letters to the NHRMC that the position was prejudiced based on a draft position statement leaked in 2012 stating "it is unethical for health practitioners to treat patients using homeopathy, for the reason that homeopathy (as a medicine or procedure) has been shown not to be efficacious [19,20]." Furthermore, both the CMA and AHA highlight serious concerns regarding the prelude to and instigation of the work of the NHMRC's HWC as well as the conduct of the review itself to finalise their conclusion on the use of homeopathy. Several grave issues were raised in both letters with five common key flaws cited: (1) no explanation was provided as to why level 1 evidence including randomised control trials were excluded from the review; (2) the database search used was not broad enough to capture complementary medicine and homeopathic specific content, and excluded non-human and non-English studies; (3) no homeopathic expert was appointed in the NHMRC Review Panel; (4) prior to publication, the concerns raised over the methodology and selective use of data by research contractor(s) engaged for the HWC review were abandoned for unknown reasons; and (5) no justification was provided as to why only systematic reviews were used [19,20]. Other serious accusations made by the AHA in their response letter to the NHMRC involved the blatant bias of the NHMRC evident by: the leakage of their draft position statement in April 2011 and early release of the HWC Draft Review regarding homeopathy to the media; no discussion of prophylactic homeopathy i.e. preventative healthcare; and no reference to the cost-effectiveness, safety, and quality of homeopathic medicines [19].

Despite the NHMRC findings being strongly disputed, they are further supported by positions taken by a number of large and respected organisations. For example, in 2009, the World Health Organization (WHO) advised against the use of homeopathic medicines for various serious diseases following significant concerns being raised by major health authorities, pharmaceutical industries, and consumers regarding its safety and quality [21]. They reported the clinical effects were compatible with placebo effects [21]. Similarly, in Australia, the Australian Medical Association (AMA) further supports the NHMRC findings by stating in their position statement released in 2012 that there is "limited efficacy evidence" regarding most complementary medicines, thereby posing a risk to patient health [22]. More recently, in May 2015, the Royal College of General Practitioner's (RACGPs) strongly advocated in their position statement against general practitioner's prescribing homeopathic medicines, and pharmacists against supporting or recommending it, given the lack of evidence regarding its efficacy [23]. This is particularly pertinent to conventional vaccines given the recent case between the Australian Competition and Consumer Commission (ACCC) vs. Homeopathy Plus! Australia Pty Ltd. The Federal Court found Homeopathy Plus! Australia Pty Ltd guilty of contravening the Australian Consumer Law by engaging in misleading and deceptive conduct through claiming that homeopathic remedies were a proven, safe, and effective alternative to the conventional vaccine against whooping cough [24].

The positions of the NHMRC, WHO, AMA, and the RACGPs regarding homeopathy is further supported by Cochrane reviews, which provide high-quality evidence with minimal bias [25]. Of the twelve homeopathy Cochrane reviews available in the database, only seven address homeopathic remedies directly and were related to the following conditions: irritable bowel syndrome [26], attention deficit/ hyperactivity disorder or hyperkinetic disorder [27], chronic asthma [28], dementia [29], induction of labour [30], cancer [31], and influenza [32]. Given most of these reviews were authored by homeopaths, bias against homeopathy is unlikely [26-32]. The overarching conclusions from these reviews fail to reveal compelling evidence regarding the efficacy of homeopathic remedies [26-32]. For example, Mathie, Frye and Fisher show that there is "no significant difference between the effects of homeopathic Oscillococcinum<sup>®</sup> and placebo in prevention of influenza-like illness: risk ratio (RR) = 0.48, 95% confidence interval (CI) 0.17-1.34, p-value = 0.16 [31]." The key reasons given for this failure to provide compelling evidence relate to low quality or unclear data, and lack of replicability, suggesting homeopathic remedies are unlikely to have clinical effects beyond placebo [26-32].

Sadly, the ACCC vs. Homeopathy Plus! Australia Pty Ltd is not the only case that has made headlines in Australia in recent years. An article in the Journal of Law and Medicine coincided with the NHMRC report regarding the number of deaths attributable to favouring homeopathy over conventional medical treatment in recent years [33]. One such case was that of Jessica Ainscough, who passed away earlier this year after losing her battle with a rare form of cancer - epithelioid sarcoma after rejecting conventional treatment in favour of alternative therapies [34]. Although doctors recognise Ms. Ainscough's right to choose her own cancer treatments and understand why she refused the disfiguring surgery to save her life, they fear her message may influence others to reject conventional treatments that could ultimately save their lives [35]. Another near death case was that of an eight-month-old boy whose mother was charged with "reckless grievous bodily harm and failure to provide for a child causing danger to death" after ceasing conventional medical and dermatological treatment for her son's eczema as advised by her naturopath (an umbrella term that includes homeopathy) [36]. The "all-liquid treatment plan" left the boy severely malnourished and consequently, he now suffers from developmental issues [37]. This case is rather similar to that of R vs. Sam in 2009, where the parents of a nine-month-old girl were convicted of manslaughter by criminal negligence after favouring homeopathic treatment over conventional medical treatment for their daughter's eczema. The girl died from septicaemia after her eczema became infected [36,37].

#### How clinicians can make a difference

As the aim of the latest NHMRC Strategic Plain 2013-15 is to assist Australians in making informed decisions regarding their healthcare, the NHMRC published a resource in April 2014 "Talking with patients about Complementary Medicine – a Resource for Clinicians" [38]. This was developed to facilitate discussion between clinicians and

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[8] Teixeira MZ, Guedes CHFF, Barreto PV, Martins MA. The placebo effect and homeopathy. *Homeopathy*. 2010;99(2):119-29. their patients regarding their use of complementary medicines so patients can make well-informed decisions about their healthcare options [38]. Available through the NHMRC website, this resource provides background information on complementary medicines and its regulation in Australia as well as suggestions on how clinicians can initiate discussion with patients regarding its evidence, reliability, effectiveness, and potential risks [38]. For example, to initiate discussion, clinicians can ask their patients if "they have tried anything else to help with their problem" [38]. Such discussion is imperative as many patients fail to disclose they are taking complementary medicines, which in itself may lead to adverse outcomes. The resource also provides further additional information, resources, and links to help clinicians in providing patients with all relevant information so he/ she can make a truly autonomous well-informed decision as per the AMA Code of Ethics [38,39].

#### Conclusion

Significant repercussions have followed the major review and final position statement by the NHMRC HWC regarding the efficacy of homeopathic remedies in treating health conditions. Despite the defensive position of the AHA and CMA, there is strong evidence to suggest that there is a need for stricter industry regulations for homeopathic practice and preparations. Furthermore, given that the efficacy of homeopathic remedies for treating any health condition is unlikely, it is now up to clinicians to provide and ensure that their patients have all the relevant information so they can make a well-informed decisions regarding their health. With a concerning number of individuals with serious health conditions favouring homeopathic medicines over conventional treatment, collaboration between leading regulatory bodies, clinicians and patients is vital in maximising patient safety and health outcomes.

#### Acknowledgements

The author would like to acknowledge the use of the AHA and CMA as the leading authority bodies regarding contemporary homeopathy practices.

#### **Conflict of Interest**

None declared.

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### Music as analgesia in the perioperative setting

#### **Dr Elliot Anderson**

MBBS (Hons), BMedSc (Hons) Monash University Dr Anderson is completing his internship at the Alfred Hospital. Travelling to Tonga and experiencing healthcare from another perspective was a very rewarding experience which Elliot highly recommends. He hopes to return to Tonga soon.

Abstract: Pain is a complex and predictable component of the perioperative experience. Music, as a non-pharmacological pain management modality, is cheap and easy to implement as an analgesic adjunct to reduce patient pain, stress, and anxiety. It has particular benefit in healthcare settings where first-line pharmaceutical pain management options are less available. This review finds an increasing body of evidence supports the use of music to reduce pain in the perioperative setting. Certain musical elements such as a constant tempo, gentle timbre, and smooth melody combined with patient musical preference have been shown to have the greatest analgesic effect. The mechanism by which music alleviates pain is not clearly defined, but may involve distraction, or regulation of the autonomic nervous system. The perioperative utilisation of music in the perioperative remains low. Standardised guidelines are required to instruct and assist with its application. Music therapy has demonstrated benefit with minimal side effects and should be used liberally in the management of perioperative pain.

#### **Clinical scenario**

Late last year, I exited a jumbo jet and took my first steps in the Kingdom of Tonga. This marked the start of a three-week adventure that I now count as one of the best experiences of my medical degree. As part of a four-member medical volunteer delegation, I travelled to the picturesque island of Vava'u, in Tonga's far north. There, my time was divided between undertaking free community health checks and working with the doctors and staff of the Prince Wellington Ngu Hospital. The hospital was an old sprawling collection of buildings on top of a hillside overlooking the local village. The hospital was operating at capacity and despite the resourcefulness and efficiency of the staff, the hospital suffered from a marked lack of resources. It was under these circumstances, in a sparse medical ward that I first met 63- year-old, Mrs Place\*.

Mrs Place had presented to the hospital three weeks prior with a large, infected foot ulcer. The ulcer had first developed after she had innocuously cut her left foot four months earlier. The severity of the wound was compounded by her poorly controlled diabetes and peripheral vascular disease. After the failure of appropriate conservative and medical management, a below-knee amputation of her left leg was conducted. When I saw Mrs Place two days after her operation, she was grimacing and moaning in pain. She reported her pain score to be 9/10 despite receiving a routine regimen of paracetamol and codeine. Her treating doctor explained that stronger opioid medication would help Mrs Place but was unavailable due to resource limitations. Instead, a novel form of pain management was used in these situations. To my amazement the nurses, doctors, and other patients began to sing local church hymns, in a contained, harmonious, and pleasant manner. No one seemed surprised and everyone was familiar with the songs. The singing continued over the course of the morning, and while doctors and nurses moved on with their daily activities and the hospital continued to operate, a constant melody echoed out of Mrs Place's ward. Sometimes the music was loud, propagated by family members, and other times it



was soft, with a lone voice maintaining the euphony. Three hours later, Mrs Place was visibly more comfortable. She described her pain score to be 6/10 and credited the lessening of her suffering to the singing for which she was very grateful. While it is unclear to what extent the patient's pain improved directly as a result of the music, the apparent effectiveness of music as a pain management modality created an information gap in my medical knowledge that I was determined to explore. A literature review was performed using the electronic databases, Pubmed, Embase, and Medline. The search terms used were "music therapy", "pain", "postoperative", "pain measurement" from 2000 until present.

#### Discussion

Pain has been described as an unpleasant sensory and emotional experience associated with actual or potential tissue damage [1]. It is a complex problem that is compounded by its subjective nature and the wide spectrum of pain tolerance that exists within the community. The majority of people, at some stage of their life, will undergo a surgical procedure and although pain is a predictable component of the postoperative experience, pain management is often insufficient. The resultant clinical and psychological harm may affect patient morbidity [2]. Negative clinical outcomes associated with inadequate postoperative pain management include deep vein thrombosis, pulmonary embolism, coronary ischaemia, myocardial infarction, pneumonia, poor wound healing, and insomnia [3]. Effective pain management contributes to avoiding the human and economic costs of these sequelae. Pharmacological agents form the current standard of care for the management of postoperative pain [4]. These medications are best applied according to the World Health Organization's "pain ladder" that advocates for the controlled escalation of pain relief medication [5]. Music, as a non-pharmacological pain management modality, is not widely utilised in the current healthcare environment, whether this relates to a paucity of information within the medical fraternity or an inherent scepticism towards complimentary analgesic methods is uncertain [6]. However, the paradigm is now changing due to a landmark systematic review and meta-analysis conducted by Hole et al. After synthesising the results of 73 randomised control trials, they concluded that music played in the perioperative setting can reduce postoperative pain, anxiety, analgesia requirements, and increase patient satisfaction [7]. This pivotal study adds to an existing body of research that confirms music to be a beneficial compliment to pharmacotherapy in managing perioperative pain [4,8,9].



The first use of music as a therapeutic intervention was recorded in the cuneiform writings of the early Mesopotamia, circa 4000 BC [10]. Since then the use of music in the clinical setting has been commonly employed throughout history. Notably, Florence Nightingale was a strong advocate for its use during the Crimean War, specifically citing the effectiveness of singing and flute melodies to alleviate pain [11]. Today, music may be used in the healthcare setting to reduce emotional distress and the patient's perception of pain [12]. Given the wide spectrum of music genres and the singular nature of personal preference, determining the most effective music for alleviating pain and anxiety requires careful consideration. It is suggested that there are definitive musical elements that promote analgesia; these include a consistent tempo, gentle timbre, smooth melody, and a limited percussion component [13,14]. In addition Mitchel et al. concluded that music self-selected by the individual provides greater pain control [15]. This improved analgesic experience was postulated to stem from a greater emotional valence with music. For the greatest effect, music used to relieve pain in the perioperative setting should include the known and accepted musical components combined with patient preference [16].

The mechanism by which music alleviates pain is not clearly defined. Modern theories of pain are based on the gate control theory [17] and the subsequent neuromatrix theory [18]. Music is thought to be able to act as a distraction and dampen the patient's experience of pain. Physiologically, pain impulses travel from the site of injury to the brain via the spinal cord. Within the spinal cord there are neural gates that can be opened or closed to different degrees that allows for the regulation of pain impulses communicated to the brain. When these gates become obstructed, the patient's perception of pain may be reduced. The use of music therapy may block these pain gates by causing descending signals to be sent from the brain down the efferent pathways in the spinal cord [19,20]. This means that fewer ascending pain impulses will reach the patient's awareness. Using magnetic resonance imaging, Valet et al. showed that distraction caused an increase in the activation of the cingulofrontal cortex, the periaqueductal gray, and the posterior thalamus. Through this neural network, distraction may exert a top-down influence in order to reduce the unpleasantness or intensity of a person's pain [21].

Music may also help reduce pain by acting on the autonomic nervous system activity within the body. Emotional distress adversely affects how an individual experiences pain; anxiety in particular has been identified as a risk factor for developing the chronic sequela of pain [22,23]. Anxiety occurs commonly in patients who are undergoing medical procedures and may decrease a patient's pain threshold and tolerance causing them to experience more pain [24]. When a person is anxious, their pituitary-adrenal axis and sympathetic nervous system are stimulated, resulting in the release of hormones that are responsible for the patient's experience of anxiety [25]. The physical expression of anxiety includes increases in heart rate, respiratory rate, and blood pressure [26]. Ozer et al. conducted a case control study that was designed to investigate the impact of music therapy on a number of postoperative physiologic parameters and the patient's perception of pain. They found that patients who received music therapy had a statistically significant increase in oxygen saturation and a decrease in their reported pain score [4]. In this study, the patient's oxygen saturation was used as a surrogate marker for their relaxation level and the effectiveness of music therapy as an anxiolytic. Other physiological parameters such as blood pressure, heart rate, and respiratory rate were not shown to have any significant association with music therapy, which corroborates the findings of other studies [27-29].

The role for music in the operating room is less certain. A small percentage of patients undergoing general anaesthetic retain unwanted intraoperative awareness throughout their procedure, which increases their likelihood developing post-traumatic stress disorder [30]. The use of music intraoperatively may benefit these patients by providing distraction. What effect music has on the medical professionals treating the patient is unclear. Allen *et al.* found that surgeon selected music reduced autonomic reactivity and improved surgical performance, however all of the study participants were biased towards the beneficial effect of music [31]. A more recent literature review suggests that music in the operating theatre is harmful, interrupting communication, hindering work, and risking patient safety [32]. Individual surgical teams can therefore guide the use of intraoperative music, with the option of personal electronic music players on a patient-by-patient basis.

The effectiveness of music therapy in reducing a patient's pain has been well demonstrated. However, due to the wide range and varying complexity of pain assessment tools that have been employed, the level of analgesic impact is difficult to quantify. A rudimentary assessment has shown that music therapy may improve a patient's pain by 10% to 40% [9,12,27,33-35]. However, despite the apparent benefit, clinical interest in the use of music remains in its infancy. As such, there are no guidelines available to instruct and assist with its application. This lack of standardisation may damage the future endorsement of this modality due to the potential for uneven application, poor compliance, and unrealistic expectations regarding outcomes. While there are no evident physical side effects from music therapy, exposure to unappealing music may irritate patients, impacting on their mental health and overall wellbeing. Legal issues involving copyright and intellectual property need to also be considered. Further research is required to clearly demarcate the biological pathways that mediate the beneficial effects of music. Without a proper understanding of the physiological basis for the observed positive effect, the most appropriate application cannot be determined and completely explored. For example, does the proposed benefit extend to all forms of audio-visual stimulus or is there something unique about music? Active distraction through the use of electronic gaming has been shown to increase a patient's pain tolerance as well as the amount of pain that they reported. Interestingly, this form of active distraction was shown to be superior to passive distraction (watching television), suggesting that other passive distractions, such as listening to music, might be less effective [36]. Future research should evaluate the effects of tailored music that is designed for this specific setting or for individual patients or patient groups. For example, a three-pronged comparative study could be conducted in Tonga to explore the effectiveness of spiritual music given its strong cultural background, in addition to the broader questions regarding efficacy, protocol, and utility. Likewise, the differences in the effect of music interventions related to patients' gender, age, and ethnicity should be further evaluated.

#### Conclusion

Music therapy should not be seen as a primary treatment option for the management of postoperative pain. In most clinical situations it will not completely alleviate the patient's pain and should instead be used to facilitate patient functionality, improve quality of life, and reduce consumption of pharmacological analgesics. With no known side effects, wide applicability and the ability to be utilised in conjunction with other pain management therapies, the potential for music therapy is significant. In settings where first-line pain management options are not available, the benefits of this non-pharmacological management are magnified. Music therapy has demonstrated benefit and should be used liberally in the management of postoperative pain.

#### Acknowledgements

None.

#### Conflict of interest

None declared.

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# The role of general practitioners in the management of, and advocacy for, newly resettled refugees in Australia: an overview

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#### Abstract:

"You have to understand That no one puts their children in a boat Unless the water is safer than the land" – Warsan Shire

Across the world, millions of people are fleeing the ravages of war and internal conflict, only to find themselves in unfamiliar territory with little to no support. By the time a refugee or asylum seeker has landed in Australia, he or she has undergone immense physical, psychological, and financial hardship. Much of the onus falls on doctors and other healthcare providers to engage with these individuals and help them piece together what they have lost along the way.

In 2014, the number of globally displaced persons was 59.5 million, a figure that is projected by this year to reach an all-time high [1]. It is estimated that one person out of every 122 in the world is fleeing home for fear of persecution or death [2], an alarming indication of the scale of what can accurately be called a global crisis. A subsequent increase in resettled refugees is expected in Australia [3,4], which will create the necessity for a healthcare system that is prepared to address the needs of such a uniquely vulnerable population. Although adequate healthcare is a crucial component for the restoration of refugees' lives, access to essential healthcare services and medicines has been particularly restricted in this demographic [5-7]. As general practitioners (GPs) are often the first port of call for refugees with health needs, the strengthening and monitoring of primary healthcare programs have been identified as key areas for improvement by the United Nations High Commissioner for Refugees (UNHCR) [8] and by local health authorities [9]. GPs have a unique platform to bring refugee rights into daily discourse and advocate for their right to equal and affordable healthcare. This article aims to provide a brief introduction to the common health concerns faced by resettled refugees in Australia, barriers in terms of access to essential care and medications, and ways in which GPs can improve their service provision to refugees.

## Common health concerns of refugees and the importance of intervention

#### Physical health

The compromised wellbeing of newly resettled refugees is the result of a combination of factors. These include interrupted or reduced access to healthcare before departure; prolonged exposure to harsh environments; and reduced access to basic needs, such as clean drinking water, food, shelter, education, and safety. These may be exacerbated by trauma and extended periods of deprivation, particularly if in detention [9]. Tuberculosis, hepatitis B, and intestinal parasitic diseases all occur more frequently in refugees than Australian-born residents and may complicate chronic conditions and undernutrition, which are often overlooked [10]. Refugees commonly have poor dental and optical health and are incompletely vaccinated [10,11]. Anaemia and iron deficiency are also extremely common and have been found in 10-30% of refugee children in Victoria, frequently accompanied by low vitamin D, B12, and folate levels [11].



Unfortunately, another common occurrence among refugees is the presence of the physical effects of torture and trauma. It is predicted that approximately 35% of the world's refugees have had at least one experience of torture [10]. Patients may exhibit signs and symptoms of chronic pain, amputation of body parts, disfigurement, poor mobility, reduced hearing, and urogenital complications [12]. A further 125 million women and girls in the world are estimated to have been subjected to female genital mutilation (FGM), which greatly increases the risk of pelvic infections, menstrual blockage, sexual dysfunction, pain, secondary infertility, and complications of childbirth [13].

#### Mental health

Psychological trauma amongst refugees may be the result of a number of influences, including, but not limited to: violence and torture; deprivation; upheaval; and separation from, and loss of, loved ones. These commonly result in feelings ranging from guilt and shame to helplessness and anger, which often endure post-resettlement due to experiences of discrimination and hostility in their host communities and knowledge of the continued hardship of friends and family abroad [14]. Uncertainty about the future is another prevailing sentiment that inhibits the rehabilitation of many refugee families, particularly those on temporary protection visas, which expire within 3 years [15]. Refugees undergoing resettlement have an increased risk of poor mental health [14]. Although a 2008 systematic review of refugee mental health in Australia identifies that the time course of symptomatology varies greatly, a dose-response relationship between the severity of mental illness and the level of trauma experienced is consistent [16]. The conditions encountered are both complex and diverse, and include syndromes, such as posttraumatic stress disorder, acute stress disorder, anxiety, depression, somatisation, bereavement disorders, and anger reactions [16,17].

Psychiatric conditions in young people are of particular concern, as children make up more than 40% of newly arrived refugees and are particularly vulnerable to the pressures of upheaval and the stresses that accompany a journey to unfamiliar territory [6,10]. Prolonged periods of detention lead to the arrest or delay of developmental milestones, sometimes creating long-term issues in terms of behaviour, physical wellbeing, and mental health [6,10]. These are complicated by the adverse effects of detainment on parenting and
family relationships [18]. Furthermore, adults often underestimate the prevalence and degree of trauma in their children and are frequently suspicious of external help [6].

### **Entitlements and accessibility**

Given the extensive list of health needs that individuals from refugeelike backgrounds are likely to have, access to healthcare services becomes a key issue in disease management. However, several external and intrinsic factors undermine the equity of healthcare provision in this population.

### Visas and entitlements

Resettled refugees and asylum seekers have reduced access to health care, in comparison to the majority of Australian residents [4-7]. This is due to a combination of institutional restrictions on entitlements and a number of cultural, economic, and linguistic obstacles experienced by the individuals. Entitlements are established by the type of visa under which the refugee has entered the country. Those who have formally sought and gained international protection are categorised as refugees and therefore, may be granted a Permanent Protection Visa (PPV) under the government-funded Offshore Humanitarian Reclamation Program [19,20]. The PPV, much like permanent residency, permits access to Medicare, a healthcare card, the Higher Education Contribution Scheme (HECS), work rights, and income support, along with services pertinent to their status as refugees, such as an initial health assessment and an early intervention program. Initial health assessments are conducted in primary care settings in most states of Australia, providing invaluable opportunities for the screening and engagement of individuals in the Australian healthcare system [10]. However, patients are only eligible for initial health assessments within the first 12 months of their resettlement [21].

Those who seek international protection but have not been granted the authority to enter another country are called asylum seekers. Asylum seekers who arrive without permission in Australia are placed in detention and may remain there for several years with few rights and little advocacy. A small percentage will be given Temporary Protection Visas (TPVs) lasting three years or less [22]. These come with work rights and Medicare assistance, as well as an initial health assessment; however, they are not eligible for other benefits, such as free settlement services, job assistance, or HECS support. Consequently, non-PPV holders rely heavily on volunteer-run and community-based services and networks. Despite these options, the detrimental psychological effects of uncertain migration status and reduced amenities are welldocumented amongst these visa holders and can adversely affect their ability to cope [10,22].

### Communication and cultural competence

By far the greatest barrier to satisfactory healthcare is that of communication, which affects access at every level, from first contact with a primary practice through to treatment and follow-up [7,9]. Available interpreting services are under-utilised (particularly by specialists), largely due to the extra time required in a consultation. However, it has been documented that the exclusion of this service leads to reduced patient satisfaction and quality of care [23]. Children or other family members are often used instead, causing ethical concerns that children may incorrectly interpret information that they cannot understand and may even be disturbed by the consultation's sensitive nature [6]. On the other hand, children may also choose to censor or willingly leave out vital information.

Cultural differences also contribute strongly to difficulties in communication and should be addressed as a potential cause of misapprehension. One Australian study involving 76 GPs revealed that almost 50% of participants were confident in handling refugee cases despite having little or no experience in this area [24]. This is contrary to the pool of data highlighting the difficulty that refugees have in opening up to, and being heard by, health practitioners and other figures of authority in their settlement countries [6,25]. It is therefore important to recognise that deficiencies in cultural competence do exist and can affect patient outcomes despite any obvious signs of this.

### Education and health literacy

Limited knowledge of health and healthcare systems is another factor restricting the full utilisation of services by refugees [26]. This may be due to the existence of a very different healthcare system in their countries of origin, or the interruption of health education due to oppression and upheaval [7]. Health literacy and the understanding of the need for the prevention and treatment of asymptomatic conditions are particularly important points to consider when educating a patient, and should be assessed to ensure that self-management is carried out appropriately [7].

### Cost

Yet another consideration when dealing with refugee families is the often debilitating cost of relocation and unemployment, and the implications for access to some health services [6,10]. Refugees are often unwilling to use non-Medicare covered dental, allied health, and specialist services, and may face several added restrictions in the form of a lack of transport and unfavourable waiting times [6,25].

### The role of primary care and available strategies

Consultation and health screening

General practitioners should make full use of the first contact they have with refugees, as there is no guarantee that the patients will be seen again in the same practice. GPs should keep in mind that initial health assessments are only available to refugees who arrived in Australia less than 12 months ago, and so should encourage eligible patients to undertake them as early as possible [21].

Mental illness makes a large contribution to the disease burden experienced by refugees. It is therefore of utmost importance to adequately screen for sources of psychosocial distress during the consultation. Table 1 is a comprehensive psychological assessment created by the Victorian Foundation for Survivors of Torture Inc [10] and is useful for this purpose.

Murray et al. [14] encourage a social model of treatment that involves families and the community in the management plan of individuals with psychosocial issues. This method has been found to be highly effective and may play a part in reducing stigma, increasing mental health service utilisation, and adding cultural significance to a patient's journey through the healthcare system. Communication between community networks and local general practices should therefore be nurtured and maintained. The use of bilingual written material and multimedia have also proved to be helpful and encourage patients to approach their healthcare providers with further questions and concerns [25].

### Communication

GPs should also be aware of the free Translating and Interpreting Service (TIS National), as well as the poorer outcomes observed from its omission from consultations [23]. Care should be taken to ensure that the interpreter is politically, culturally, and socially acceptable to the patient and his or her family [6]. The provision of gender-sensitive consultations has produced further improvements in patient outcomes [25]. As with any consultation, doctors should get a complete idea of each individual's understanding and expectations of their symptoms, illness, and treatment [7]. A thorough history will also determine the barriers to access of treatment for different patients. Referral to refugee support networks can connect patients with less costly or *pro bono* health and social services, which are particularly helpful for temporary visa holders, who are not eligible for government-funded health programs [25].



 Table 1. Comprehensive psychosocial assessment: key areas and their rationale. From Promoting Refugee Health: a guide for doctors, nurses and other health care providers caring for people from refugee backgrounds. Reproduced from Victorian Foundation for Survivors of Torture Inc [10]. Reproduced with permission.

Consider	Will indicate	
Country of origin	<ul> <li>Nature and likely duration of exposure to hardship, privations, violence, conflict</li> </ul>	Services and familiarity
Country (countries) of transit	As above	
Date of arrival	<ul><li>Settlement stresses can be anticipated</li><li>Need for orientation</li></ul>	Need for refugee health assessment
Migration status	Traumatic journey to Australia	Asylum seeker and detention history
Preferred language	Interpreter requirements	
Religion (preface with explanation for enquiry)	Beliefs and practices that need to be accommodated in care	
Family composition and family functioning	<ul> <li>Family links</li> <li>Missing family members</li> <li>Stresses and psychological reactions can be anticipated regarding separation, death, concern for family members left behind</li> </ul>	<ul> <li>Emotional and practical support available</li> <li>Need for referral for migration assistance, tracing services</li> <li>Indicators to promote assessment of other family members</li> </ul>
Trauma History	<ul> <li>Extent of exposure to traumatic experiences and likelihood of psychological (and physical) sequelae</li> <li>Importance of consideration of gender</li> </ul>	<ul> <li>Implications for family functioning and health of other family members</li> <li>Need for referral(s)</li> </ul>
Current stresses	<ul> <li>Need for settlement support and material needs – housing, economic concerns</li> </ul>	<ul><li>Need for psychological support</li><li>Relevant referrals</li></ul>
Social resources and support	Need for links to community/services	Need for one to one professional relationship
Psychological health (including client's interest in sharing psychological concerns)	<ul> <li>Screening (see overleave) will indicate areas to follow up</li> </ul>	<ul><li>Referrals for specialized assistance</li><li>Options for most appropriate response</li></ul>

Table 2. Summary of recommendations and resources for GPs managing the care of patients from refugee-like backgrounds.

Issue	Recommendations	Resources
Communication and cultural competence	Use of translating services and patient education	Atkin N, 2008 [23] Australian Government Translating and Interpreting Service [29]
	Cultural sensitivity training and further education Gender-sensitive consultations	ACEM E-learning courses [30] RACGP E-Learning course 22305 – Refugee Health [31] Victorian Foundation for Survivors of Torture Inc. courses and education [32]
		Family Planning Victoria, 2012 [12]
Medical problems	Initial health assessment Adequate history and examination	Australian Family Physician, 2016 [21] Victorian Refugee Health Network [33]
Psychosocial problems	Adequate psychosocial assessment	The Victorian Foundation for Survivors of Torture Inc., 2012 [10]
Education and health literacy	Use of bilingual reading material Patient education and counselling	Victorian Refugee Health Network [34]
Follow-up and referral	Provide copies of medical records Use of appropriate referral services Call beforehand	National Directory of Asylum Seeker and Refugee Service Providers [35] Victorian Refugee Health Network [33]
Advocacy	Contact with policy makers and media Activism	The Refugee Council of Australia [28] Refugee Action Coalition Sydney [36]

### Education and training

In 17 different studies, cultural sensitivity training resulted in an increase in patient satisfaction, reporting of symptoms, referrals, health, and access [25]. Bridging the cultural gap can thus prevent valuable missed opportunities for appropriate care and health promotion. However, if unsure about any aspect of the interaction, Bellamy *et al.* [7] encourage doctors to ask patients how this aspect of the consultation is usually performed in their home countries. This not only displays respect but also allows the patient to feel accepted, and in return may inspire the acceptance of Western practices.

### Referral and follow-up

It is always ideal to maintain a relationship of continuing care with one's patients; however, refugees in their first few years of resettlement will likely relocate several times, making follow-up unfeasible. To facilitate a smoother transition for these patients, GPs should provide them with hardcopies of all their medical records. When making referrals to services such as pathology, radiology, and allied health, GPs are encouraged to call beforehand to ensure that the practices are open to using interpreting services and to prepare them for patients with special needs [10].

### Advocacy

Those who have direct contact with refugees have the unique privilege of seeing these groups at their most vulnerable, and often do not face the same time lag that is experienced by research and the media. This gives them the knowledge and credibility to take early action in the support of refugees in their local communities. Health professionals may consider writing to Members of Parliament and Parliamentary Committee Chairs about these issues. The Refugee Council of Australia (RCOA) is the umbrella refugee organisation in Australia and provides some useful information on methods of contact and communication with policy makers [27,28]. Those who choose to voice their concerns directly with the media must maintain patient privacy and informed consent, as many refugees may be put in grave danger if their identities and locations are revealed [27]. Several local organisations also regularly campaign for refugee rights; membership of these committees may open doors for further advocacy and activism.

Table 2 provides a brief summary of recommendations and resources for GPs who find themselves managing a patient from a refugee-like background.

### Conclusion

It is evident that providing appropriate and accessible refugee healthcare is a multifaceted task that requires the co-operation of a diverse team of skilled and dedicated professionals. The health of refugees is intrinsically linked to their migration status, education, culture, family situation, and the kaleidoscope of experiences that have landed them in their current situation. General practitioners have a central role in engaging these individuals in health care and the wider community. They must strive to use their position in society to advocate for this underprivileged group and educate resettled refugees on their rights and privileges in their new homes, thus upholding the very pillars of beneficence, autonomy, and justice that encompass the practice of medicine.

### Acknowledgements

None.

**Conflicts of interest** None declared.

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# Opening up the gate on suicide prevention for young Victorians through gatekeeper training

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The author is a second year medical student at Deakin University, who is currently the General Practice Student Network Chair at his university. After completing a Bachelor of Commerce/Bachelor of Laws at Monash University, he made the transition to a BMBS. He sees opportunity to blend his previous experience with medicine to further support his patients and develop health policy in Australia.

**Abstract:** VicHealth released its Bright Futures report in December 2015 identifying youth suicide as a problem facing young Victorians over the next 20 years. Youth suicide rates have fallen in Australia since the National Youth Suicide Prevention Strategy, however, data shows that there is still room for improvement. Prevention strategies to date have been understudied for a variety of reasons, including ethical limitations and being studied as part of a broader suicide policy. The author proposes that gatekeeper training should be piloted across Victoria to determine whether it will independently reduce youth suicide rates. It has potential benefits upon integration in schools, general practices, and rural Victorian settings given that it focuses on training people who are associated with those directly at risk of suicide.

### Introduction

For young Australians aged 15 to 24 years, suicide is the leading cause of death [1]. Between 1997 and 2012, suicide rates among this age group have fallen by 47% [1]. This reduction may be attributable to the introduction of the National Youth Suicide Prevention Strategy (NYSPS) in 1997, which reduced access to lethal methods of suicide, changed prescription patterns of antidepressants, and saw the introduction of catalytic converters in new cars [2]. Worryingly, however, 76% of deaths are still "considered potentially avoidable" [1], illustrating the need for further intervention nearly 20 years on.

In 2000, the Australian government established the National Suicide Prevention Strategy (NSPS), which integrated and expanded on the NYSPS [3]. Victoria has integrated this national strategy into the Victorian Mental Health Reform Strategy 2009-2019 [4]. In December 2015, the Victorian Health Promotion Foundation published the 'Bright Futures' report and highlighted suicide as part of a "megatrend" that may threaten the stability of young Victorians over the next 20 years [5]. It was hoped that the report would provide a foundation to guide future policies and improve community understanding of mental health, as well as explore the changing nature of service delivery models. Since this report, new data has been published by the Australian Bureau of Statistics (ABS) flagging the 2014 suicide rate as the highest in 10 years, at 12.0 deaths per 100,000 people in Australia [6]. Unfortunately, intentional self-harm continues to remain the leading cause of death in those between the ages of 15 and 44 [7].

This new data is particularly alarming as the ABS was unable to attribute the 2014 rise to administrative system changes in the coding of these deaths [8], which highlights the need to act on reducing these potentially avoidable deaths. Hence, gatekeeper training should be evaluated in a pilot study aimed at young Victorians. Gatekeeper training aims to equip individuals with the skills to "identify at-risk individuals and direct them to appropriate assessment and treatment" [9]. Gatekeepers are people who have primary contact with at risk groups and are able to identify them through recognition of suicide risk factors [10].



### Summary of the 'Bright Futures' Report

VicHealth state that the future health and prosperity of Victoria is dependent upon the mental wellbeing of the youth, that is, those aged between 12 and 25 years [5]. The report highlights that in contrast to the falling rates of suicide across other Organization for Economic Cooperation and Development (OECD) countries, there has been a rise in Australia from 6.2 deaths by suicide per 100,000 people in 2004 to 10.1 per 100,000 people in 2013 across all age groups. Vulnerable groups identified include Indigenous Australians, males, and people living in rural and remote areas, with suicide rates being 66% higher in country areas compared to metropolitan areas. Of particular concern is the alarming rate of suicide among young people aged 19-24, where suicide is the leading cause of death [5]. Finally, the report states that to reduce these risks, efforts need to be made to develop preventative programs that target mental wellbeing [5].

### Suicide in Australia and around the world

In 2012, the global age-standardised suicide rate was 11.4 per 100,000 people and accounted for 1.4% of deaths worldwide. More specifically, the World Health Organisation (WHO) estimated that in 2012 the suicide rate for high-income countries was closer to 12.7 per 100,000 people [11]. For young people aged between 15 and 29 it is the second leading cause of death internationally, accounting for 8.5% of deaths in this age group [11].

According to the ABS, there were 2,864 deaths from intentional selfharm in 2014 [7]. This made suicide the 13th leading cause of death in Australia [7]. For males, it was the tenth-leading cause of death, as approximately three-quarters of those who died by suicide were male. The overall suicide rate was 12.0 per 100,000 people in 2014, up from 10.9 in 2013 [7,12].

Suicide only accounts for a small proportion (1.9%) of deaths in Australia overall, however, it is in the context of specific age groups that the results become alarming. For example, suicide was the cause of death for "over a third" of males between the ages of 15 and 19 in 2014 [7].

Finally, the median age of death from suicide was 44.2 years, compared to a median age of 81.8 for deaths via all other causes in 2014 [7]. These figures illustrate that there are many years of life lost to suicide, particularly amongst the youth.

### Suicide prevention strategies

Suicide prevention models differ around the world. The WHO divide suicide interventions into three categories that focus on: population level policies, selective preventative strategies to target vulnerable groups, and prevention strategies that target specific vulnerable individuals in a population [11]. Gatekeeper training is an example of a selective preventative strategy that targets vulnerable groups, and is the focus of this article.

### Pros and cons of gatekeeper training

Gatekeeper training has been shown to be a promising initiative for suicide prevention [9,10], particularly for vulnerable groups that may be at increased risk of suicide [11]. In a 2016 article, Krysinska *et al.* state that gatekeeper training, as part of an overall preventative strategy, can lead to reductions in suicide [13]. Mellanby *et al.* demonstrated that amongst veterinary undergraduates, who are at increased risk of suicide, a suicide workshop provided confidence in identifying the signs of suicide and asking about suicide [14].

The strengths of gatekeeper training include:

- The ability to equip gatekeepers with targeted skills to work with a specific vulnerable group [10], such as Indigenous youth [15,16]
- Increasing an individual's knowledge about suicide [17]
- Training people who are already within a population and are familiar with the environment, as opposed to "outsiders" [10]
- Addressing and reducing stigma surrounding suicide through training [9]

There are some limitations surrounding gatekeeper training. A Cochrane Collaboration states that there is an inability to demonstrate longerterm effects, and questions whether suicide prevention programs are effective in post-secondary educational institutions [18]. This is further supported by the WHO, who state that there is "no conclusive link ... with reduced rates of suicide or suicide attempts", but that gatekeeper training is "best practice" [11]. However, a study published by Isaac et al. argues that the limited evidence is attributable to the fact that gatekeeper training exists within a broader suicide prevention strategy, which makes it difficult to isolate the effect of gatekeeper training alone [10,19]. Moreover, a randomised controlled trial published subsequent to the Cochrane Collaboration, demonstrated that Applied Suicide Intervention Skills Training (ASIST), a form of gatekeeper training, was able to improve feelings of hope and reduce pro-suicidal feelings in a Lifeline call centre [20]. This is important, as feelings of hopelessness are closely related to suicidal ideation [21], and this may therefore provide some evidence to illustrate changes in suicide behaviour.

### Why Victoria should trial a gatekeeper training model

Gatekeeper training, like many suicide preventative strategies, needs further evaluation [9,16]. Given Victoria's commitment to the NSPS and their identification of suicide as part of a megatrend, there is a need to explore and develop evidence for prevention strategies.

Firstly, suicide rates are twice as high in rural areas as metropolitan areas, which is precisely why gatekeeper training in particular needs to be introduced [5]. Gatekeeper training can be deployed at the ground level and provide individuals within a regional or remote town, who are already familiar with the local environment, the skills to identify those at risk of suicide.

Moreover, gatekeepers can be introduced within the institutions that young Victorians frequent (i.e. schools and universities). This could be achieved through equipping teachers with the skills to act as gatekeepers, which has been shown to lead to an "increase in recognition" of "suicidal students who manifest explicit warning signs" [22,23]. This is especially pertinent now, as VicHealth has flagged the future rise of artificial intelligence and emerging economies as potential challenges for young Victorians to remain competitive in the job market. Such competition is likely to require young people to seek further education and remain in education institutions for longer [5].

Gatekeeper training may also be applicable to primary healthcare, and act as another avenue to target young Victorians. There is evidence to suggest that training general practitioners can substantially reduce deaths by suicide [13,19]. This is supported by Mann *et al.*, who state that "many suicide [victims] have had contact with primary care physicians within a month of death" [9]. Unfortunately, there is some evidence to suggest that primary care physicians do not routinely screen for suicide risk amongst adolescents, and may lack sensitivity when discussing this issue due to a lack of training [10,24]. More recent qualitative evidence has shown further support for the provision of suicide risk assessment training to general practitioners [25]. Therefore, providing general practitioners with gatekeeper training may enable them to better detect, and subsequently treat, youth who are contemplating suicide.

The flexibility of this approach, the vast Australian landscape, and access to a broad range of potential trainees through the established network of general practitioners across Australia suggests that the gatekeeper training model is a suitable strategy to target the high suicide rate among young Victorians.

## Challenges that will be faced in implementing suicide prevention strategies

The research to date has focused on the efficacy of suicide prevention strategies as part of a broader overarching suicide policy [13], which is pre-existent in Victoria and Australia. This is based on the understanding that suicide is multifactorial and one preventative strategy will not provide a definitive solution, as each individual is a unique and complex case [16]. To exacerbate this difficulty, suicide research in general is limited, and many preventative strategies implemented thus far have not been scientifically tested [16]. Some of the reasons for this include [10,16,26,27]:

- The complexity of causes of suicide leads to difficulty in examining interventions
- Using control groups is difficult
- Suicide is a rare event in contrast to other deaths, which limits the research designs that may be utilised
- Outcomes measured are often qualitative rather than quantitative as they can measure decreased feelings of hopelessness rather than lower rates of suicide

Given these mixed results, Suicide Prevention Australia has provided a basis for future research of gatekeeper training, with a focus on key measurements and identifiable targets [26]. Some identifiable targets include [10]:

- Quantity of training required
- Referral patterns of gatekeepers
- Retraining requirements for gatekeepers

Consequently, I urge VicHealth to undertake a pilot study that quantitatively measures the implications of gatekeeper training alone across Victoria.

### Conclusion

To address suicide prevention for young Victorians, a multifaceted approach needs to be taken that ensures that all vulnerable young populations are nurtured. However, further research should focus on quantitative measurements of gatekeeper training, to determine if such policy actually yields results. Ultimately, youth suicide rates are largely avoidable, and this needs to be urgently addressed to ensure that Victoria's youth develop resilience in the coming 20 years.

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### Acknowledgements

None.

### **Conflicts of interest**

None declared.

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## Stopping the silent epidemic: my summer internship with the WHO

### **Carrie Lee**

BMed/MD (expected graduation 2019) University of New South Wales Carrie Lee is a third year UNSW student who encountered global health in Papua New Guinea and has not looked back ever since. Her current interests include viral hepatitis and health in disadvantaged populations. Sustained by coffee and to-do lists, her spare time is spent reading and writing, listening to Triple J radio, and managing social media for Hepatitis B Free.

**Abstract:** Viral hepatitis has been historically under-recognised and under-addressed in the global health community. This is despite causing a serious disease burden worldwide due to chronic liver disease, cirrhosis, and liver cancer. The World Health Organization (WHO) has been involved on a global and regional level in the response to the epidemics of hepatitis B and C. A summer internship with the WHO Regional Office in Manila provided insights into modelling techniques to estimate the disease burden and treatment strategies to combat this silent epidemic. With effective antiviral treatments to cure hepatitis C and suppress hepatitis B, the prevalence, complications, and high costs of these diseases can be dramatically reduced.

### Introduction

"Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity [1]." No prizes to guess whose definition of health this is (pun intended). You've probably recited it word-for-word at some point in your medical studies. We look to the World Health Organization (WHO) for leadership in global health. The WHO provides technical guidelines, responds to health and humanitarian emergencies, and advocates and coordinates engagement across health, policymakers, and civil society [2]. What goes on behind the public face we see – the guidelines, press releases, and targets? How does the organisation operate on a global, regional, and country-level? How does the WHO respond to communicable threats such as polio, HIV, and viral hepatitis? What does it take in the quest to achieve the highest attainable quality of health for all?

Curious to understand and experience the well-oiled bureaucratic machine that is the WHO, and specifically to contribute in a small way to its response to viral hepatitis, I undertook a summer internship with the WHO at the Regional Office for the Western Pacific (WPRO). This Regional Office bridges Headquarters in Geneva and the 37 Member States under its care; a diverse belt of countries spanning down East and South-East Asia, the Pacific Islands, Australia, and New Zealand. For 8 weeks, I experienced life as an intern in the HIV, Hepatitis and Sexually Transmitted Infections Unit, within the Division of Communicable Diseases.

I also had a glimpse into life in Manila, the bustling metropolitan capital of the Philippines, where colonial powers and local revolutionaries have crossed for control of the island nation, and where for me, crossing the road proved to be a regular, life-threatening exercise. My first impression of Manila was stepping out of the airport into its balmy, honking embrace. From thereinafter I was accompanied in every waking moment by the cacophony of taxis, jeepneys, and motorcycles. There was not a moment of silence. Which, as it happens, is the exact opposite of the description of viral hepatitis.

### The silent epidemic

Viral hepatitis is a silent epidemic in every sense of the word. The majority of people living with chronic infection, mostly hepatitis



B and C, don't know they have the disease. Left untreated, years of asymptomatic infection can lead to the deadly sequelae of liver cancer or cirrhosis. The dearth of testing services available also contributes to the "silence" around chronic hepatitis, especially in resource-limited areas where the highest burden lies. About half of the 218,000 people in Australia with hepatitis B aren't aware they are infected [3]. This is even higher globally, 70-80% in the United States and more than 90% in many Asian countries (except Japan) [4]. In Europe, only 10-40% of people with hepatitis C are diagnosed [5]. That is to say, there are those who are living with chronic hepatitis, those who know their infection status, and those who are receiving treatment. In between, there are broad gaps, disparities in testing and treatment across both higher and lower income countries.

Whilst viral hepatitis has been unrecognised in the past, its burden is substantial. Hepatitis B and C, the biggest contributors to mortality and morbidity from the group of diseases caused by hepatitis viruses, are endemic in parts of South East Asia, Sub Saharan Africa, and South America. The Western Pacific Region, which includes Australia, bears over a third of global mortality from hepatitis - this translates to 1500 deaths every day [6]. Viral hepatitis is the seventh leading cause of mortality worldwide, according to the Global Burden of Disease Study in 2010 [7]. The WHO estimates that 2 billion people -1 in 3 people globally - have been exposed to hepatitis B during their lifetime [6]. With 1.3 million deaths each year [6], the mortality from viral hepatitis is on par with those of better-known infectious diseases associated with poverty such as HIV, tuberculosis, and malaria.

Yet, in comparison to these conditions, hepatitis has received little to no public health and political attention. Of the 240 million people worldwide living with chronic hepatitis B [8], and the 80 million living with chronic hepatitis C [9], only a small proportion have access to life-saving antiviral treatment. Highly effective antiviral regimens are now available but high costs, local clinical trial requirements, import licensing, and a lack of drug procurement systems and treatment programs keep them out of reach for millions. Diagnostics and laboratory capacity are also challenging: hepatitis serology, DNA viral load testing, and liver function biochemistry are costly and not widely available.



How has WHO responded to combat this silent epidemic? In 2010, the World Health Assembly made a statement to the world in the form of a resolution on viral hepatitis (WHA63.18). This resolution urged member states to act through prevention, control, and management [10]. This was followed by another resolution (WHA67.6) four years later calling for more rigorous technical guidance and strategies linked to measurable targets [11]. In the Western Pacific Region, there has been significant progress over the last decade, especially in vaccination. Supporting immunisation programmes for the birth dose and triple dose, as well as catch-up vaccination, has helped to reduce childhood prevalence of hepatitis B. Global hepatitis B vaccination coverage reached 82% in 2014, and over 90% in the WHO Region of the Americas and the Western Pacific Region [12]. Indeed, as of January 2016, 13 of the 20 countries in the Western Pacific Region had achieved the target of less than 1% hepatitis B childhood prevalence by 2017. This has substantial public health benefits: from 2011-2020, hepatitis immunisation efforts in 73 countries are estimated to avert a total of 4.9 million deaths [12].

Whilst prevention through immunisation has laid important groundwork, the next challenge and opportunities lie in upscaling treatment. With the advent of new, highly effective antiviral medications that can cure hepatitis C and control hepatitis B, we are reaching a new tipping point in the response to viral hepatitis. The transition to inclusion of treatment in public health programmes is both logical and necessary.

More recently, the Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, calls for the elimination of hepatitis in goal 3.3: "By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases and other communicable diseases [13]." Whilst only committing to 'combat' and not to end the scourge of viral hepatitis, this is still in progress: hepatitis did not receive even a mention in the Millennium Development Goals (MDGs) [14]. Part of the reason why hepatitis was not included in the MDGs was the misconception that its global burden was not as significant. Contrary, whilst the burden was high, there was limited research demonstrating prevalence and incidence, and also the link between viral hepatitis and liver cancer [15]. This was compounded by inclusion of only acute hepatitis, which accounts for only a minor proportion of mortality from viral hepatitis, and not including deaths from liver cancer and cirrhosis that were related to hepatitis B or C [16]. The SDGs present a new opportunity for public health, clinicians, policymakers, and civil society to galvanise behind the cause towards the goal of eliminating viral hepatitis. It is a promising step in the right direction, but much more is needed to tackle the epidemic.

### What if? Modelling future disease burden of hepatitis

Understanding the enemy is one important facet of the response. Analysing the current burden of hepatitis, predicting future trends, and implementing prevention and treatment strategies to reduce morbidity and mortality are part of the solutions. In public health terms, this may typically start with gathering surveillance data. However, the underreported and underserviced nature of viral hepatitis has resulted in limited national data in many severely affected countries. Whilst addressing these issues in surveillance is a priority, alternate methods must be used in the interim to build the epidemiological picture of hepatitis in each country.

Disease burden modelling is successfully being used to estimate disease burden of hepatitis B and C and propose public health strategies for countries across the Western Pacific Region. The methodology uses a mathematical model created and operated by the Center for Disease Analysis (CDA) in the United States, responsible for hepatitis disease burden analysis in over 65 countries worldwide [17]. The model simulates a country's populations (using baseline demographic statistics) and develops a baseline picture of the burden of hepatitis (using local epidemiological information), and also the costs of diagnostics and treatment. It then predicts the future trends in prevalence, complications, and mortality using the natural history of hepatitis through stages of fibrosis to cirrhosis, liver cancer, and death/ liver transplantation. The information is drawn from a variety of sources including national surveys and surveillance data (where available), hospital data, unpublished studies, and local clinician consensus. As such, the process is always a collaborative effort between the CDA, local health authorities, researchers, and clinicians, as well as the WHO.

Once a baseline picture of prevalence and future disease burden is established, the model simulates various treatment strategies. It is important to emphasise that the the focus is on upscaling treatment, as many countries are on track with immunisation, however, older populations with high rates of asymptomatic carriers will be at future risk of disease and death if left untreated. The strategies may involve starting treatment programmes where none have previously existed, or replacing older antivirals with new highly effective regimens. The treatment 'scenarios' can be also be goal-driven, for example by increasing treatment to reduce mortality, or to achieve elimination of hepatitis by 2030. By simulating these treatment strategies, the model can predict how many lives can be saved by diagnosing and treating more people for their disease.

The disease burden analysis, together with economic analysis, transforms the case into an advocacy tool to present to policymakers. Whilst the economic analysis involves various processes, one noteworthy financing strategy (not unique to hepatitis treatment programmes) is the use of public-private co-payment. This is where the costs of treatment are shared between the public health budget, health insurance (for example, in the social security budget), and the individual patient. This is modelled at a rate that ensures that patients are able to afford care and treatment without being sent into impoverishment due to 'catastrophic health expenditures'. The cost-effectiveness - even cost-saving - outcomes of these treatment strategies makes a strong case for investment. The reality is that treating complications of cirrhosis and cancer is very expensive. In addition to medical costs is the loss of productivity of a substantial amount of the working population, due to years lived with chronic, disabling illness. Treating earlier not only saves lives, but minimises the population progressing to those end-stage complications. The message has been clear: treating now saves lives.

### Reflections

Before my internship with the WHO, I was somewhat apprehensive and sceptical about the practical impact of "epidemiology" and "policy" in public health, and specifically, global health contexts. On some level I knew they were important, but their tangible effect was a mystery. Coming away from this experience, I realise that epidemiology and disease burden modelling have a specific and powerful role in bridging the divide between public health challenges and ways for policy-makers to enact change. Presented in the right way, data becomes a case for investment, which if solidified as policy and action, can transform millions of lives through treatment and other public health measures.

Whilst at times I felt swallowed up within the intense WHO environment, I learnt a lot about the structure of the organisation and gained an appreciation for the amount of ongoing work required to keep it going. One can also feel disillusioned by the constant stream of meetings and seemingly menial details in editing and chasing publications, a sentiment shared by many an intern. Whilst my contribution during the internship was minor in the grand scheme of things, it was incredibly humbling to have a small but tangible role to play in the emerging field of hepatitis with the WPRO. I was able to meet clinicians and public health professionals dedicated to reducing the burden of hepatitis in the Philippines, the Western Pacific, and globally. This was both from day-to-day work at the WPRO as well as during a technical advisory meeting in Ha Noi, Viet Nam where experts met to discuss current challenges and strategies affecting the region. The experience showed me in ways I had never known about the impact of hepatitis on people's lives, as well as on entire populations. I left without a doubt as to the absolute necessity of the world to listen and act. We are starting to break the silence around viral hepatitis, but it can't stop there. Much more needs to be done if we are ever to end the epidemic and ensure that no one need suffer from this preventable disease.

The WHO offers internships from 6 – 12 weeks in duration in a variety of locations worldwide. See the website for more details http://www.who.int/employment/internship/interns/en/.

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### Acknowledgements

None.

### **Conflicts of interest**

None declared.

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### Indigenous health: what they don't teach you in medical school

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Abstract: Indigenous health education is an important part of the curriculum for medical students. However, there are limited opportunities within the course for students to interact with patients from an Indigenous background. Following an Indigenous health placement in a remote community in the Eastern Kimberley region, a final year medical student reflects on how her medical education did not prepare her for the overwhelming social issues impacting on the health of Indigenous Australians. This article explores how, in the author's experience, the current medical curriculum offers limited opportunities for first-hand exposure to Indigenous health, with a large proportion of Indigenous health content delivered in a lecture format. This style of teaching does not allow students to discuss, explore, and understand the many complex social issues that contribute to the health of Indigenous Australians. This combination of suboptimal teaching style and little or no first-hand experience results in medical students that are not well prepared to deal with these issues as junior doctors. It is necessary to review the current teaching methods and consider implementing interactive workshops to improve Indigenous Health education, which will in turn improve the health of Indigenous Australians.

This year, I spent my six-week elective rotation in Kununurra, a small town in the Eastern Kimberley region with a population of about 8,000 people [1]. Kununurra is a remote town situated approximately 500 km, 800 km, 1,000 km and 3,000 km from Katherine, Darwin, Broome and Perth respectively, which are the nearest major centres. There is a relatively large Indigenous population, with 34.8% of residents identifying as either Aboriginal or Torres Strait Islander [1]. The traditional owners of the Kununurra area are the Miriwoong Gajerrong peoples, and Kununurra is an anglicised version of Goonoonoorrang, the name of the Ord River that flows west of Kununurra. Colonisation has led to much disruption for this community, having serious impacts on health and wellbeing [2].

My placement was with an Aboriginal Health Service, a GP clinic with visiting allied health and specialist services, so the vast majority of patients that I saw were Aboriginal. I was unprepared for what I observed in this placement in remote Western Australia, in particular the social and environmental determinants of health that contribute significantly to the health of Indigenous Australians. The variety of issues that I experienced in Kununurra brought into relief the difference between my understanding of Indigenous Health from the taught medical curriculum, and the reality in Kununurra. This essay explores this gap by illustrating with anecdote some of my personal experiences of social determinants of Indigenous health, with comment on how student understanding might be improved in the teaching of medical students. The examples relate to my experiences in Kununurra only; it is important to note that each community has its own unique issues and that what is pertinent in Kununurra may not accurately reflect Indigenous health in a broader sense.

Prior to my brief placement in Kununurra, I had very little exposure to Indigenous health other than what I had learnt in the classroom. My lack of knowledge and experience became immediately apparent; I felt



completely out of my depth with regard to the many complex medical and social issues that I was seeing, hearing, and learning about. One particular morning, as I left my house at quarter to eight, there was a man walking down the street with his young family; he had a bottle of wine in one hand and was pushing a stroller with the other. When I arrived at the clinic I jumped into the 4WD with one of the nurses and we drove to a community over 90 minutes away. This outreach clinic used to be serviced regularly by staff from Kununurra, but due to staff shortages it was months since the clinic had been open. In near 40-degree heat, bare-footed patients walked down the road to the clinic, which itself was covered in dirt, dust, and cobwebs, with overgrown weeds outside, broken windows, and blocked plumbing. Dead frogs were swept out from behind toilets and under desks. It was certainly not something I ever thought I would see in Australia, yet the patients were just grateful to have the clinic up and running again. We went to the school to see if any of the 11 students required immediate attention; as there was no doctor with us, anything less urgent would have to wait. While we were there, we provided dressings and antibiotics for a child with boils (a very common complaint) and removed a foreign body from a boy's ear that thankfully turned out to be paper rather than a maggot.

Over the course of my stay in Kununurra, I saw a heavily-pregnant woman who smoked 80 cigarettes a day with no intention of stopping, a lady with a total thyroidectomy who had stopped taking thyroxine, a man who refused treatment and further investigation for a cryptococcal infection because he "felt fine", and patients in their forties on dialysis. I had patients tell me they share a three-bedroom house with 20 people and saw children who had not attended school for weeks, and who wandered the streets with their friends at night, completely unsupervised. I had a 17 year-old boy openly tell me that he smoked cigarettes and "gunja" (marijuana), but who vehemently denied drinking alcohol because "it only causes violence"; and for the first three weeks of my placement, there was at least one person every week who presented after an attempted hanging, the youngest of which was 12 years-old. This was also highlighted in a speech given by Dr Marion Scrymgour, the CEO of the Wurli Wurlinjang Health Service and Chair of the Aboriginal Medical Services Alliance NT [3]. After six weeks in a remote Indigenous community, I was only just beginning to understand the complexity of a problem for which there is no simple

solution. I began to reflect on why it had been so overwhelming; was there something missing from my education that could have better prepared me for this experience?

To understand what is lacking, we must first identify what is included in the Indigenous health curriculum. In a packed medical course, my education skimmed the surface, with lectures on culture and history that included topics such as the Stolen Generation, traditional medicine, and the different family structure of Aboriginal communities. I learned that the burden of chronic disease is much higher in the Aboriginal population, and that this is the primary reason that the life expectancy is, on average, ten years less for Aboriginal people than the rest of the Australian population. While this is worthwhile knowledge, it is an inadequate summary that only superficially touches on Indigenous health issues because it does not allow us to delve into the much more important discussion of why these discrepancies exist and *how* they can be rectified.

In 2004, the Committee of Deans of Australian Medical Schools (CDAMS) audited existing Indigenous health content and released the Indigenous Health Curriculum Framework, now called the Medical Deans Indigenous Health Project, which has become part of the accreditation requirements for all Australian medical schools [4]. This framework is comprehensive and meticulously developed by people with a significant amount of experience in the field. It is important to acknowledge that Indigenous health teaching is not the same across all universities and has been constantly evolving since I started my degree five years ago. However, based on my own education, I still felt very under-prepared.

There are numerous and varied reasons as to why current Indigenous health education is inadequate preparation for medical practice. Firstly, as outlined by the Indigenous Health Curriculum Framework, Indigenous people are a "non-homogenous population" with a "diversity of cultures, experiences, histories and geographical locations" [5]. It is difficult to convey that the issues encountered by urban, rural, and remote Indigenous communities seeking health care can be so vastly different. For example, the education that I received gave me essential background knowledge and an understanding of Indigenous health issues in urban areas, but failed to convey the difference between this and the difficulties faced by Indigenous Australians in remote areas. Furthermore, even within a particular setting (for example, a remote setting), there is a large variation between communities, so that the issues seen in one remote community may not be the same as those seen in other nearby communities. Secondly, thorough assessment of even the most well-constructed learning objectives is difficult to achieve. Assessment, often in the form of assignments and examinations, determines if students are meeting the desired outcomes, and from this we can extrapolate about the quality of teaching. Without this data, we are unable to accurately identify the effectiveness of teaching strategies, and are therefore unable to make appropriate changes and improvements. Professor Richard Murray, a doctor with 14 years of clinical experience in Aboriginal health services in the Kimberley region, and the current Dean of James Cook University Medical School, illustrated this point beautifully when he said in a personal email addressing my enquiries about the Indigenous Health curriculum, "course or subject outcomes are too high level and abstract to satisfy" [6]. Therefore, not only is the curriculum difficult to implement, it is also difficult to assess its effectiveness.

One of the biggest challenges associated with Indigenous Health education is that many of the learning objectives and concepts are difficult to grasp in a classroom, especially with regard to the social determinants of health. One of the guiding principles of the Indigenous Health Curriculum Framework states that the health of Indigenous people is more associated with "historical and social determinants of health than with inherent Aboriginality" [5]. My experiences demonstrate this as well; the previously-mentioned examples are all symptoms of many complex underlying issues affecting the health of people in these communities. Many of the cases I saw would not occur if it were not for the effects of low socioeconomic status and deficits in the other social determinants of health seen across the globe: inadequate access to health care and education, health literacy and compliance issues, alcohol and drug dependence, physical and sexual assault, mental health issues and suicide, poor living conditions, and overcrowding.

For example, only 76% of Indigenous children aged 5-14 years in the Northern Territory have access to schooling, as compared to 95% of non-Indigenous children of the same age [7]. Indigenous people are less likely to drink alcohol, but twice as many drink at levels considered to be risky or high-risk for long-term harm compared to their non-Indigenous counterparts. 15% of homes with Indigenous people are considered overcrowded, which increases up to 42% in very remote areas, as opposed to 4% of other households. Furthermore, some of these houses do not have reliable water and electricity, or adequate sewerage [7]. Despite these appalling statistics, Indigenous Australians have the oldest, continuous living culture in the world, showing an incredible ability to adapt to change [8]. As a student, it is very difficult to imagine the enormity of the impact that all these factors have on health. As an example, it is difficult to explain complex health issues and the importance of treatment to patients with little or no education and health literacy. It is even more challenging to treat and prevent the spread of communicable diseases. Consider the management of scabies or head lice which often require the entire household to be treated concomitantly; it is near impossible to achieve this in communities where overcrowding is rife. True understanding of this only comes from seeing it first-hand [9]. However, providing every student with the opportunity to go to an Indigenous or remote community is not a financially viable option for most universities, and accommodating large numbers of health science students is not necessarily feasible (or wanted) in Indigenous communities. This is one of the largest obstacles to providing the educational opportunities required to meet the outcomes outlined in the curriculum framework. Without the ability to provide the correct learning environment, it is unreasonable to expect that graduates will have an in-depth understanding of the complex interplay between these particular social determinants and health outcomes.

It is not the quality of the learning objectives and curriculum framework that limit Indigenous Health education, but rather the difficulties associated with the implementation and assessment of these objectives. The best teaching format, particularly with regard to the social determinants of health, is experience-based learning. While this is not feasible for every student, the lecture based format of Indigenous health education is suboptimal. The content is often too robust to really impart understanding of the complex health and social issues that many Indigenous people face. Other options must be considered and implemented; for example, workshops may allow educators to facilitate the discussion required to dissect more complex issues, such as why these disparities exist and how they may be overcome. Indigenous community members speaking to small groups of students about their life experiences, medical issues, and involvement with healthcare services would give students the opportunity to interact and ask questions, whilst fostering understanding and practising cultural sensitivity. Regardless of how the content is delivered, it is imperative that the social issues are emphasised within the curriculum, so that medical students graduate considering the patient in the context of their community and surroundings, because it is difficult to improve health without first improving the foundations. Students must learn that it is not enough to simply treat the presenting complaint; even our best medical efforts are not nearly as effective in promoting positive



health outcomes as advocating to ensure the basic social needs (safety from violence, basic education, and adequate housing and nutrition) of our patients and communities are being met. Only when this is achieved will we see significant change in the health outcomes of Indigenous Australians. This is perhaps the biggest lesson omitted from the Indigenous health curriculum, and it is unlikely to be learnt in a classroom.

### Acknowledgements

I would like to acknowledge Professor Michelle Leech and Professor Richard Murray for their helpful advice during the information gathering stages. I would like to thank Associate Professor Karen Adams, who suggested resources and ensured the article was written in a culturally-sensitive manner. I would also like to acknowledge the

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Deans and their representatives of all the Australian medical schools who provided me with their Indigenous health objectives or other resources. Thanks also to Dr Alexandra Van Rijn, who provided advice during the drafting stages of this project.

### **Conflicts of interest**

None declared.

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