WINTER/SPRING 2018

MIMS matters

Hi Everyone, welcome to our Winter / Spring 2018 MIMS Matters Edition

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MIMS New Zealand Ltd
eHealthWise Services Pty Ltd
Board Member – MSIA (Medical Software Industry Association) of Australia

As a C-Suite Executive, I never take for granted the importance and strength of having a great team surround me. 2018 has amplified this mantra for me. Fundamentally, my role (and the MIMS business), is as strong as my weakest link.

When I sit back and reflect that Winter (and now Spring) has nearly passed, and that we are on the doorstep of Summer, it reinforces to me how fast the year has gone by, and that within only a few weeks, it will be Christmas and the start of 2019. However, and most important to me, is to take some time and reflect on how the MIMS team has made this year a huge success, and yet again, we have delivered a record year of growth in our +55 year history in Australia.

The combination of: undertaking significant projects, attending numerous conferences, working with over 90 different medical software partners, onboarding new customers and partners, developing new solutions across all verticals of the healthcare sector, investing and sponsoring interns, academic departments and participating in the future of medicine, safety, adherence, while embracing new technologies is undeniably a fantastic achievement across the entire MIMS team.

If I sound proud, I am! I'm truly blessed to have a great team!

I would like to take a few moments to make special mention of the eHealthWise Services team. They have recently had significant wins within Queensland Health and are assisting me in preparing to embark on our APAC launch of eClaiming solutions in 2019.

It has also been a privilege to serve as a Board Member on the MSIA, and as we approach the MSIA AGM in late November, I hope that all Members feel that as the representative Association to our medical software industry, we have deepened and strengthened our relationships across Federal and State Health Departments, whilst always ensuring the best interests of our industry are served at all times.

I encourage you to read through our MIMS Matters Newsletter, and while it's not possible to include everything we have been involved in over the past few months, I hope it gives you a sense of comfort knowing that MIMS, one of the most trusted brands in Australian Healthcare, continues to be deeply involved across many facets of the healthcare ecosystem.

Thank you and warm regards,

This Issue...

APP2018 Conference

The 28th annual APP Conference was held at the Gold Coast Convention & Exhibition Centre between 3-6 of May and attended by over 6,000 delegates over the four days. The conference this year was opened by Federal Health Minister Greg Hunt with a very positive keynote address for Pharmacy, highlighting the Government's focus on protecting the long-term sustainability of the pharmacy sector.

APP is The Pharmacy Guild's annual national conference and the largest pharmacy conference and trade show in Australia. There were over 450 trade stands in the exhibition hall this year showing the latest products, services, software and industry trends. The major theme of the conference was on improving customer experience and looking outside the traditional roles of community pharmacy. This year's conference featured an exciting line up of over 100 international and Australian speakers across the education sessions.

There was a bit of positive innovation and change in this year's APP program, including a revamped opening plenary session which included the MIMS/Guild Intern of the Year Award for the first time. The Health Minister was also in attendance for this presentation.

This award is always a highlight for MIMS and was presented this year by our CEO and Executive Director, Robert Best. MIMS is always delighted to sponsor this award which showcases the innovation and excellence of interns. Tim Stewart from Lanyon Pharmacy in the ACT was announced as the winner. Robert presented the award to Tim in front of a full arena of delegates. Robert praised Tim for his passion for community pharmacy and his work on two novel professional programs in his pharmacy which provide support to cancer patients.

APP was a great opportunity for MIMS to spend time with some of our current MIMS integrated partners – Best Health Solutions, Mountaintop Systems, MedAdvisor, NPS Medicinewise, POSWorks, RxOne (who we work with both in Australia and NZ), WebsterCare and ZSoftware. It was wonderful to see their success at APP and to relish in their positive feedback about the advantages of MIMS integrated into their systems.

The social events were once again a highlight of the conference starting with the Welcome Reception on Thursday and finishing off with the ever-popular Street Party on Saturday night.

Overall the Expo was a great success and MIMS was able to connect and network with many existing and new vendor partners and customers.

MIMS Pharmacy Guild Intern of the Year Award … and the winner is

Tim Stew tells his story

After completing a Master of Pharmacy at the University of Canberra, I undertook an internship at Lanyon Pharmacy within the Life Pharmacy Group under the supervision of my preceptor Mark Leighton. I was pleased to work in a modern pharmacy within an inspiring team that prides themselves on exceptional service and patient care.

During my intern year, I was fortunate to have the opportunity to perform and shape a patient support service for patients across Australia who had been prescribed the breast cancer medication ribociclib. Providing this service proved to be challenging on many levels but equally as rewarding.

In another unique venture, I took my passion for men's health and used it to provide extra services for the men within our community. Using skills and knowledge passed on to me by one of my mentors, Brad Butt (Managing Partner, Cooleman Court Pharmacy), I provided men's health checks, Men's Shed talks, and consultations with men undergoing treatment for prostate cancer. I believe that these kinds of services gives an exciting insight into the future of community pharmacy and the broadening level of service that we are able to provide.

At the conclusion of my internship year I was nominated by my preceptor for the MIMS/ Guild Intern of the Year Award. Naturally, I was delighted with the nomination. After submitting a written piece explaining my involvement in the innovative programs mentioned above, I was shortlisted as a finalist. Finally, I was given the opportunity to express my passion for community pharmacy and the services that I had been able to provide to a panel of judges in a telephone interview.

I was absolutely honoured to be recognised as the MIMS/Guild Intern of the Year at the APP 2018 conference at the Gold Coast. With the prize of a travel and educational grant worth $4,500, I plan to enhance my knowledge and level of service in the men's health field. In particular, the money will help me to attend both the Asia-Pacific Prostate Cancer Conference in August, and the Urological Society of Australia and New Zealand 2019 conference. This award and prize has given me incredible opportunities to upskill myself, network with other like-minded professionals, and to be an advocate for a profession that I am passionate about.

Editorial Advisory Board meeting 2018

The first meeting of the new MIMS Editorial Advisory Board was held on Monday 19th of March 2018 at The Westfield Suite, Bondi Junction. The meeting was informal, with the aim being to allow new and returning board members and MIMS staff to meet and get to know each other before tackling some of the interesting discussions planned for the afternoon.

Ten of the 13 Board members were present (one via video link), having travelled from as far as Western Australia and Tasmania. They were joined by all three of the MIMS Alumni as well as a large contingent of MIMS staff including representatives from the Business Development units, the Product Development team and the entire staff of MIMS Editorial in Sydney.

CEO Robert Best commenced proceedings with a company overview including the history of MIMS and the current business ownership and structure.

Next, Dinah Graham and Jimmy Young spoke briefly about the Primary Care and Acute Care markets that MIMS currently services, before Gaurav Sood introduced some of the new areas of innovation that MIMS hopes to become involved in.

Lani Au and Sarah Keen then introduced Editorial operations in both Australia and New Zealand. They covered what the Editorial Team does, the Editorial process, Drugs in Sport and current Editorial projects including TGA Product Information Re-formatting and TGA Ingredient Name Changes.

It was then the turn of the Board members to introduce themselves and share their interests as well as what they hoped to bring to the table. It became apparent that MIMS has selected a diverse and incredibly talented group of individuals to help guide future direction for the company.

After an interesting and lively afternoon, it was time to retire to Bondi Pizza for dinner and drinks. Discussion about topics that had been raised during the day and also many others continued long into the evening as the MIMS team and the Honorary Editorial Board enjoyed a meal together.

Dinner was also the setting for the formal acknowledgement of the significant and valuable contribution the three Alumni have made to MIMS in the past, and the expression of hope that they remain part of the MIMS family for many years to come. The Alumni were presented with a commemorative trophy as a gesture of our appreciation.

All of the staff of MIMS Australia that participated during the day would like to thank the Board Members and the MIMS Alumni for their time and commitment to MIMS and look forward to future collaboration.

The Vulcan electronic discharge scripting application

St. Vincent's Hospital Melbourne Public Emergency Department was getting busier and busier. Since time immemorial, discharge prescriptions were manually written on paper pads. Doctors were struggling to make sense of PBS schedules – spending precious time which should have been spent treating patients. Pharmacists spent countless hours chasing authority numbers and deciphering handwriting. Any errors required an entirely new prescription to be written.

NEAT (4 Hour discharged from Emergency) targets were going unmet, as patients faced unacceptably long delays for simple antibiotics and analgesics. Meanwhile, the handwritten scripts were taking days to reach medical records, and then they were often very faint and at times impossible to read. The arrival of an enterprise clinical system was, and still is, years away, and we couldn't just buy an off-the-shelf solution which would work with our current systems. However, the risks were already here and we needed to fix it somehow.

The Vulcan electronic discharge scripting application was launched in the Emergency Department of St. Vincent's Hospital Melbourne in early September 2016. What was meant to be a temporary solution has been so successfully taken up by doctors, pharmacists and nurses that we're now rolling it out to the entire hospital.

What does Vulcan feature?

- Real-time review by clinical pharmacists, where modifications can be made before clinician approval
- Integrating with the Patient Administration System and Hospital Active Directory, patient and prescribing physician details are automatically added to the prescription
- Full integration of the MIMS medication data set – providing the correct medication spellings, all available strengths, maximum quantities, streamlined authority codes, indications and much more
- Predictive text functionality to speed up data entry based on generic or trade names
- Hyperlinks to electronic decision support systems for prescribers, such as PBS, Australian Medicines Handbook and Therapeutic Guidelines
- Instant uploading of an electronic record of approved prescriptions to the Medical Records Online system, saving on manual transport and scanning time, whilst optimising resolution quality
- Live time review of known Adverse Drug Reactions to reduce the incidence of prescriptions featuring the dynamic duo: "Augmentin, 1 BD 10/7. Allergies: penicillin (anaphylaxis)"

Quotes from real users:

- "It's a simple system to use so I don't think any formalised training is required aside from a quick demonstration" – a doctor from the Emergency Department.
- "When are we getting Vulcan on the wards?" – Matt, cardiology intern. His previous rotation was in the Emergency Department.
- "The ED pharmacist can now call me whilst completing the ward round and say the script is on Vulcan. I can now view this and start getting it ready for them without having to wait for the pieces of paper. Plus I don't have to worry about interpreting dubious handwriting. It's so much more efficient." – Jason, pharmacy technician
- "The integration of the MIMS dataset was a real turning point for the program development. The ED pharmacists spend less time chasing an authority for ciprofloxacin tablets, and more time saying 'Could we use a less broad-spectrum agent?' Another bonus is in catching prescribing slips; dangerous errors such as 'Alprazolam 15mg' when the doctor misinterpreted the generic of Alepam® - it's just not going to happen on a Vulcan Script." Stewart – Medicines Information Pharmacist.
- "We knew we had a problem, but there was no money for extra staff or an expensive enterprise system to fix it. Vulcan has far exceeded our wildest expectations." – Helen, Deputy Chief Pharmacist.
- "We're really excited for the next phase of Vulcan – which when launched on the wards will allow our clinical pharmacists to complete a medication history & reconciliation at the start of the admission. This information can then translate through the entirety of the admission and facilitate rapid documentation of a discharge prescription. Changes to therapy can be documented so GPs will know why things were started or stopped. The MIMS dataset is a massive boon in making this transfer rapid and accurate." – Andrew, Chief Pharmacist, St. Vincent's Hospital Melbourne.

SHPA third edition of Don't Rush to Crush

Australia's essential guide to safely administering oral medicines to people with enteral feeding tubes or swallowing difficulties has been comprehensively revised, ready for release this winter.

The third edition of Don't Rush to Crush contains a total of 570 oral medicines, including 50 additions, while some monographs have been combined to assist with efficiently referencing medicines.

The Society of Hospital Pharmacists Australia (SHPA) conducted extensive dispersion studies and consulted over 650 health professionals to develop a new format that enhances focus on patient-centred care, presenting essential information clearly as a series of options. A new "What to do for doses less than a whole tablet" section for selected medicines will assist health professionals when giving very small doses and includes instructions for preparing aliquots.

SHPA Publications Manager Nicki Burridge says Don't Rush to Crush remains an essential frontline resource to manage risk and ensure quality care in all healthcare settings.

'Having this information on hand at the point of care will help ensure patients receive their medicines in a manner that is safe and maintains medication efficacy.'

Subscriptions are available soon on the eMIMS Cloud platform and on MIMS Online.

3rd edition fast facts

- 570 oral medicines
- 50 new entries
- New small doses section
- Extensive dispersion studies
- Enhanced focus on patient-centred care

Queensland Health Update

eHealthWise

Metro North Hospital and Health Service hospitals Go Live with electronic hospital claims

Australia's largest public health service is in the process of rolling out electronic hospital claims using eHealthWise's award winning THELMA platform. Metro North HHS signed a new 3 year agreement with eHealthWise in 2017 to use the THELMA platform to streamline hospital claims by moving to electronic claim. The new electronic billing process allows Metro North billing staff to reduce the duplication and errors inherent in manual billing processes, and it has sped up private patient claim payment times, facilitating greatly improved cash flow.

As part of the ongoing roll out process, Royal Brisbane & Women's, Caboolture, Redcliffe and Prince Charles Hospitals are all now live with electronic claims to private health fund.

Business Development Director of eHealthWise Stuart Davies said "eHealthWise have worked with Metro North HHS to implement a rapid deployment of the THELMA platform across the group hospitals to enable end-to-end electronic billing of in-patient hospital claims to the private health funds via Medicare ECLIPSE."

QLD Hospital & Health Services Go Live with electronic Child Dental Benefits Scheme claims

QLD Health and the Office of the Chief Dental Officer are in the process of rolling out electronic claims to the Child Dental Benefits Scheme (CDBS) using eHealthWise's award winning THELMA platform. QLD Health signed a new 3 year agreement with eHealthWise in 2017 to use the THELMA platform to electronic CDBS claiming. The new electronic CDBS billing process allows Hospital & Health Services (HHS) across QLD Health to replace the old manual claiming process, thereby decreasing payment times and increasing efficiency.

As part of the CDBS electronic claim deployment: Darling Downs, Mackay, Metro South, Sunshine Coast, West Moreton, Wide Bay, Central QLD, South West and Central West Hospital & Health Services are all now live with electronic CDBS claims.

Business Development Director of eHealthWise Stuart Davies said "eHealthWise have successfully integrated THELMA with QLD Health's existing ISOH platform in order to offer a new electronic claiming functionality for the Child Dental Benefits Scheme. The ongoing deployment of this functionality across all the HHS in QLD is enabling end-to-end electronic billing of CDBS claims."

For more information about eHealthWise services visit **www.ehealthwise.com.au**

GP18

The Royal Australian College of General Practitioners (RACGP) 2018 annual conference, held this year on the Gold Coast, is the must-attend event of the general practice calendar. Bringing together GPs from around Australia for four days of education, skills building and networking this year's conference delivered a broad range of topics and issues that sit at the heart of general practice. It's worth mentioning that 96% of Australians over 65 years can identify their GP.

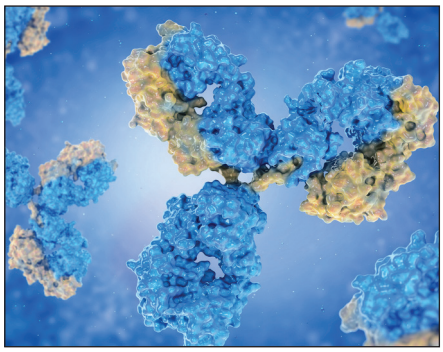
The Gold Coast weather turned into something one would expect in Manchester (UK), wild winds, rain and cold put paid to the Welcome Reception Garden Party which was moved inside. The damp outside didn't mean damp spirits inside and the welcome reception on Thursday evening proved to a be good opportunity for reconnecting with old friends and making new while navigating giant boards and doctors playing Chess, Jenga, Draughts. Education topics included Dermatology, Travel medicine, Mental health, Genetics screening and Palliative care to name just a few.

Brand new to the GP conference was the Dr Wellbeing Zone set up to bring the wellbeing of GPs to prominence. Delegates heard from and had the opportunity to talk to knowledge experts around the importance of mental wellbeing, hear tips and advice around managing stress and the daily challenges they face.

The MIMS team took the opportunity to connect with our partners that were exhibiting over the three days, including Best Practice, Medtech and Clinic to Cloud, and to meet with the corporate GP clinics that buy our reference products and/or use our data Integrated into their clinical software.

It was a short but sweet couple of days, some learning, some laughter and making new relationships while building on old ones.

Biosimilar Medicines



Advances in biotechnology and greater understanding of disease mechanisms has allowed for the development of many new biological medicines. The use of biological medicines in the management of serious health conditions including ankylosing spondylitis, rheumatoid arthritis, multiple sclerosis, inflammatory bowel disease, cancer, diabetes and chronic kidney failure has been increasing.[1] Through their interaction with target proteins or genes, biological medicines have the potential to change disease progression, rather than solely providing symptomatic relief.[2, 3]

Biological medicines are large, complex molecules, such as proteins, manufactured in living cells grown in a laboratory. Due to their complexity, biologicals are more difficult to produce than small molecule drugs, especially on a large scale. Their sensitivity to manufacturing and handling conditions (e.g. temperature and pH) can lead to unwanted or unintended changes in the final product. No two batches of a biological medicine are exactly the same due to the uniqueness of the cell lines and purification processes. Biologicals are usually administered by injection due to their size and instability in the gastrointestinal tract.[4]

When the patent expires on a biological medicine, other manufacturers can produce similar products, or biosimilars. A biosimilar medicine must be highly similar, but not identical, to an approved biological medicine (the reference product) in terms of safety, efficacy, physicochemical, biological and immunological characteristics. During development and registration of a biosimilar, characterisation studies must be conducted to ensure that the structural variability is not greater than that of the reference biological medicine.[1] Safety and efficacy of biosimilars must be assessed in clinical trials. Due to their similarity, comparability of a biosimilar in one indication may be extrapolated to the other indications of the reference product.[5]

Approved biosimilars have been assessed to have no clinically meaningful differences and to be therapeutically equivalent to the reference biological medicine.[1] However, even minor differences between two similar biological products can cause unexpected reactions in patients. Until further experience has been gained, subtle differences between biosimilars and the reference biologicals may not be fully apparent. Therefore, it is important to maintain accurate records of the biologicals administered to any patient, including brand name and batch number, so that adverse reactions may be reported to the corresponding manufacturer.[6, 7]

With the high cost associated with biologicals, biosimilar medicines expand patient access to these therapeutic interventions by allowing for competitive pricing with the reference biological and thus lower prices.[8] They also reduce the burden on the Pharmaceutical Benefits Scheme, allowing reinvestment into other areas of the Australian health system and expansion of access to subsidised biological medicines; as well as reducing the risk of medicine shortage.[9]

For a list of currently approved biosimilar medicines, visit **http://www.health.gov.au/internet/main/publishing.nsf/content/biosimilar-which-medicines-are-available-in-australia**.

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AACP CONPHARM 2018

Consultant Clinical Pharmacy Seminar

This year's ConPharm - the 14th Annual Consultant Clinical Pharmacy Seminar - was held at the Sofitel Brisbane Central Hotel from Friday 15 to Sunday 17 June. MIMS was again a major sponsor and exhibitor at ConPharm and has been since the very early days.

ConPharm is one of the most popular events on the CPD calendar for those actively involved in consultant pharmacy practice. Some of the main speakers this year included Professor David Currow Chief Cancer Officer of NSW, CEO of the Cancer Institute NSW and Professor of Palliative Medicine in the Faculty of Health at the University of Technology Sydney (UTS), rheumatologist Dr Paul Kubler and geriatrician Dr Anthony French. Other popular speakers were experienced pharmacists and researchers, Dr Andrew Stafford and Dr Brett MacFarlane.

The conference was attended by over 300 delegates who found the program very practical and useful for their daily practice. The usual trade exhibition had many stands promoting services and information specifically targeted to the role of accredited pharmacists.

ConPharm was a great opportunity for MIMS to spend time with consultant pharmacists and get feedback and ideas on how MIMS can be more helpful in the daily workflow of these pharmacists performing Medication Reviews. MIMS ran a daily question competition during the conference on eMIMS, IMGateway and Don't Rush to Crush modules with a bottle of Moet to be won each day, which proved to be very popular.

MIMS would like to again congratulate the three lucky winners: George Pajic, Annette Osmond and Cathy McLatchey.

The highlight for MIMS was the presentation of the 2018 AACP MIMS Consultant Pharmacist of the Year award. This year's winner was Dr Andrew Stafford from WA. Dr Stafford was first accredited as a consultant pharmacist in 2005 and is also an author, researcher and a great contributor to the pharmacy profession.

Joe O'Malley, Chair of AACP, was very grateful for MIMS longstanding support of AACP and he was delighted that MIMS had once again joined with the association to sponsor this award, which recognises outstanding contribution by an accredited pharmacist.

Robert Best, CEO of MIMS Australia and NZ said that presenting this award was the highlight for everyone at MIMS and MIMS is very proud to partner with AACP every year and will continue this partnership into the future.

Overall, it was a very well organised conference and we had a busy time at our stand. It was great to meet so many of our customers and hear so many positive comments about MIMS.

Why the IMgateway drug herb, and food interactions add value to your patient's safety

The IMgateway interactions database has now reached a significant milestone, boasting close to 1100 evidence-based interaction monographs and associated reports. The most recent additions made by researchers from the School of Pharmacy at the University of Sydney, reflect consumer use and demand including reports related to cannabis and their potent cannabinoid constituents, tetrahydrocannabinol (THC) and cannabidiol (CBD). The current, available evidence suggests caution should be exercised when combining medical cannabis products with psychotropic medications. Unfortunately, many published reports of herb-drug interaction studies lack adequate sample sizes and specific pharmacokinetic confirmatory studies.

Some of the notable interaction warnings recently added to the database include: A case report on curcumin combined with warfarin, demonstrating a potential increase in the risk of bleeding. This combination should be avoided until further evidence becomes available. Similarly, artichoke and colchicine combinations could result in increased risk of liver toxicity and should be avoided; Ginkgo biloba and sodium aescinate may also be associated with adverse events such as acute renal injury. Horsetail supplementation may interact with various anti-retroviral regimens including the following drugs: lamivudine, zidovudine, efavirenz, emtricitabine, tenofovir leading to subtherapeutic concentrations and reoccurrence of the viral disease.

Some recent additions to the herb-drug interaction database include monographs on probiotics such as Lactobacilli and Bifidobacteria suggesting positive synergistic effects when combined with minocycline for the treatment of acne. Saffron and crocin derivatives suggest improvements in depression when combined with a variety of anti-depressants. Saffron when combined with topical glaucoma medications such as timolol suggest improved control of intraocular pressure. Andrographis appears to be relatively safe and potentially beneficial when combined with a variety of medications for treating rheumatoid arthritis and ulcerative colitis. Similarly, N-acetyl cysteine appears to be safe and effective when combined with antibiotics and medications for treating diabetes.

Future interaction reports will address the effects of andrographolide on the pharmacokinetics of warfarin; the pharmacokinetic and pharmacodynamic interactions of Hibiscus with simvastatin; the combined effects of Korean ginseng with anti-viral agents; the pharmacokinetics of ginkgolides with midazolam, and curcuminoid interactions with glucose lowering medications.

Future Direction

Consumer organisations have already endorsed Unity Health's work in adapting the database for individual consumer access.

Currently the Breast Care Network of Australia is trialling this version through its extensive online membership and the findings are soon to be published.

NICM researchers, from Western Sydney University, in partnership with UnityHealth will develop and disseminate objective evidence-based information on Chinese herb-drug interactions as part of the future plans for the interactions database.

The expansion of the database to include Chinese herb-drug/ nutritional supplement interactions will help provide safe and reliable information to clinicians of Chinese medicine, western medicine, pharmacists, nurses and other allied health practitioners. A consumer database with information in plain language will also be developed. The databases will be available in English and Chinese and are intended for use internationally.

NICM project lead, Associate Professor Chun Guang Li says there are currently 45 commonly used Chinese herbs listed in the database, with the next phase of the research to focus on Chinese herbal medicines used by practitioners and over the counter pharmacy products, including the commonly used Chinese herbs and formulas in TCM clinics, and herbal products used by other allied health practitioners.

"The goal is to prioritise the Chinese herbs researched according to the most commonly used and formulated Chinese herbs for product consumed by the public - we are looking to have 100 herb-drug interaction summaries, monographs, by the end of the project," said Associate Professor Li.

To find out more about adding this module to your eMIMSCloud or eMIMS Classic subscription please call our Customer Care Team on 1800 800 629.

The Gut Microbiome and Adverse Drug Reactions

Prof Jeff Hughes, School of Pharmacy and Biomedical Sciences, Curtin University, Bentley, WA

As humans as much as we might look different to one another we are all remarkably similar when it comes to our genome, 99.9% identical.[1] This is not true of the organisms which live on and in us; our microbiota, where the difference amongst individuals ranges from 80-90%.[1] With 10-100 trillion symbiotic organisms (bacteria, fungi, protozoa and viruses) harboured by each human, mostly in their gut, they outnumber human cells 10 to 1.[1,2] The human microbiome (all of our microbes' genes) can be considered a counterpart to the human genome (all of our genes). The genes in our microbiome outnumber the genes in our genome by about 100 to 1.[1,2] As our knowledge of the diversity of gut microbiota has grown, so too has our appreciation of the role that gut organisms play in maintaining good health, and the negative impacts that disruption of gut flora (or dysbiosis) has. Figure 1 below illustrates the various roles the human microbiota play in the normal homeostasis of the human body, including enhanced metabolism, resistance to infection and inflammation, prevention of autoimmunity and effects on the brain-gut axis.[3]

Ever increasing we are gaining an appreciation that the human microbiome changes over the course of people's lives; influenced initially by their mode of delivery (i.e. nature birth versus caesarean section) and place of birth (hospital versus home), then whether they were breast feed or not, the introduction of solid foods, exposure to the environment, and as life progresses illness, disease, antibiotic exposure, stress, fever, injury and dietary changes.[4] Further, for the most part when exposed to such stresses the microbiome will normally return to the baseline, however this may take time or in some cases may not occur. It is in these times of dysbiosis that untoward health outcomes may occur, and be sustained.

Most health professionals would be aware of the effects of antibiotics on the gut microbiota, with disruption associated with diarrhoea, and in case of particular antibiotics an increased risk of developing ***Clostridium difficile*** associated diarrhoea (e.g. with clindamycin).[5] However the spectrum of adverse drug reactions secondary to gut dysbiosis from exposure to antibiotics is much more extensive, and their impact on a person's health can be profound. As shown in Figure 2 the timing of exposure to antibiotics during a person's life not only influences the diversity of their microbiome, it contributes to an increase risk of infection, asthma, allergies and type 1 diabetes, childhood obesity, type 2 diabetes in later life and ***C difficile*** infection.[6]

In the case of weight gain and obesity it is now know that disequilibrium of two phylum of bacteria, namely ***Firmicutes*** and ***Bacteroidetes*** play an important role. The microbiome of people who are overweight or obese typically show an over-representation of ***Firmicutes*** and a reduction in ***Bacteriodetes***.[7]

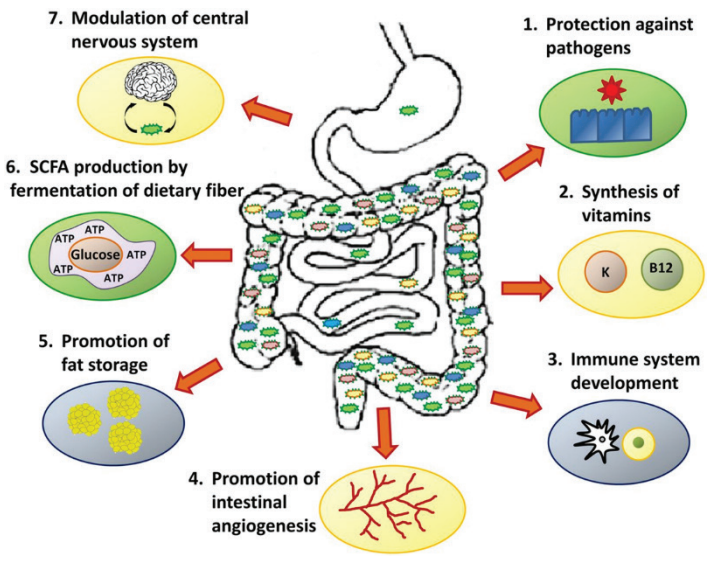

Figure 1: The human microbiome plays an important role in control of vital homeostatic mechanisms in the body[3]

Source: Amon P, Sanderson I. Arch Dis Child Educ Pract Ed doi:10.1136/archdischild-2016-311643

When we think of drugs which cause weight gain we commonly attribute this to their ability to stimulate appetite or diminish satiety, particularly through influencing histaminergic, serotoninergic, adrenergic, dopaminergic and muscarinic receptors. Receptors which influence energy intake and the control of metabolism. However, influencing the gut microbiome which controls energy harvest from the diet, modulation of endocrine signalling and promotion metabolic inflammation, is a more likely initial trigger for weight gain.[8] Case studies in which it has been reported that slim people who have received faecal transplants for overweight people to treat ***C difficile*** associated diarrhoea (CDAD) subsequently gain demonstrate the influence gut flora can have of weight homeostasis.[9] People exposed to the same diet but with different gut flora may harvest a significantly different number of calories and hence exhibit different propensities to gain weight. More recently, changes in the gut microbiome has been linked to weight gain associated with the atypical antipsychotic agents, olanzapine and risperidone.[10,11] In the case of the former, use of an antibiotic cocktail to return the microbiome to "normal" was associated with a reversal of the negative metabolic effects of the drug.[12]

Statins have been reported to increase the absolute risk of diabetes by 0.2%[13], which means for every 500 people prescribed a statin one will develop new onset diabetes. Here again disruption of the gut microbiome is the likely explanation, with the heterogeneity in the propensity of different statins to cause diabetes related to their ability to stimulate pregnane X receptor (PXR). In a study in mice with and without PXR who were exposed to high fat diet (HFD) together with pravastatin, atorvastatin or placebo, those mice given atorvastatin (PXR inducer) gained more weight, and developed glucose intolerance.[14] These changes were associated with a significant reduction in the diversity of the gut microbiome. This study demonstrated not only the importance the statin's impact on the gut microbiome, but also the interaction between specific drug receptors in the gut and dysbiosis.[14]

The development of irritable bowel syndrome with drugs such as proton pump inhibitors (PPIs) and non-steroidal anti-inflammatories (NSAIDS) alone or in combination has also been linked to changes in the microbiome[15], similarly the increased risk of CDAD with PPIs.[16,17] Undoubtedly over time more and more adverse drug reactions will be linked to changes of the human microbiome. It is known that gut microbiome changes may be associated with changes in the activation of certain prodrugs (e.g. lovastatin and sulfasalazine), alteration in drug bioavailability (e.g. simvastatin and amiodarone, possibly through PXR or PgP), production of toxic metabolites (e.g. irinotecan), reduced inactivation of drugs (e.g. digoxin inactivation by ***Eggerthella lenta***) and inhibition of liver detoxification due to the gut microbial metabolite p-Cresol (e.g. paracetamol).[18]

Many drugs which are not used as antimicrobials have inherent antimicrobial activity, and hence may impact the human microbiome. The concomitant use of multiple drugs, combined with myriad of other factors which can influence the human microbiome (i.e. host factors, lifestyle, early colonisation, medical practices, disease and health)[19] provides an environment where dysbiosis may occur and with it untoward drug effects.

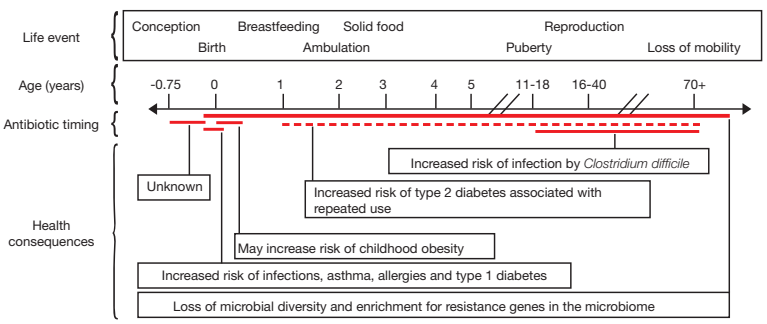

Figure 2: Health consequences linked to the disruption of human-associated microbiota involving antibiotic use during development and adulthood. Red lines indicate that a single dose of antibiotics within the time period has been linked to a health consequence, whereas a dotted red line indicates that multiple doses of antibiotics within the time period are required to observe a link. [6]

Source: Langdon A, Crook N, Dantas D. The effects of antibiotics on the microbiome throughout development and alternative approaches for therapeutic modulation. Genome Med 2016;8:39

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MIMS Continues to Support Charitable Healthcare

Earlier this year, MIMS sent some very needed healthcare resources to a charity organisation in Fiji called the Sai Prema Foundation.

The Sai Prema Foundation Fiji is a non-Government Organisation (NGO) and is a registered Charitable Organisation under the Charitable Trust Act of Fiji. The Foundation was founded in 2016 to serve the poor, underprivileged and needy people of Fiji through Medical, Educare and Sociocare initiatives.

In a short span of time, the Foundation has successfully executed a number of successful projects including providing free heart surgeries to the children of Fiji, regular medical camps in rural and remote islands, distributing free food and clothing to the needy, doing blood collection drives throughout Fiji and looking after orphaned children.

The foundation has also commenced the operation of a Medical Centre in the capital, Suva, for providing totally free quality healthcare to the underprivileged and needy.

This message from the Foundation Director:

"We take this opportunity to thank MIMS Australia for their generosity and contribution via donation of essential medicines information resources and books. The volunteer doctors, nurses and pharmacists are very grateful to have received this timely donation and will use the MIMS books daily during the operation of the medical centre."

It is always a privilege for MIMS to have the opportunity to help where we can. We hope the medicines information resources will come in handy and be helpful in the work of these amazing doctors, nurses and pharmacists.

PSA18 - The Pharmaceutical society of Australia annual Conference

This year MIMS was again an exhibitor at and sponsor of the PSA-MIMS Intern of the Year Award at PSA18 - the flagship annual conference for the Pharmaceutical Society of Australia (PSA). The three-day conference – with the theme of *Leading Pharmacy Future* – was held at the Hyatt Regency at Darling Harbour in Sydney between July 27-29. International and local speakers focused on expanded roles for pharmacists through innovation, diversity, leadership and speciality models of practice.

The opening plenary was delivered by Dr Catherine Duggan, CEO of the International Pharmaceutical Federation, and Dr Shane Jackson, National President of the PSA, and was engaging as always.

The delegates were treated to an inspiring and stimulating program which included a range of different panel sessions as well as more than 50 presenters. New to the program this year was the 'Pharmacy Shark Tank' session, where three pharmacists selected from around the nation pitched their pharmacy innovations to an expert panel. The 'Sharks' then chose who they will invest their money with. A three-pronged safety system aimed at cutting errors in medicine dosing in hospital settings from Sydney University was the winner.

PSA18 was a great opportunity for MIMS to spend time with our users and to get not only all the positive feedback, but also feedback around how we can improve eMIMS in the future.

The highlight for MIMS once again was presenting the PSA-MIMS Intern Pharmacist of the Year award. This year the award again went to joint winners – Deanna Mill from SA Pharmacy, and Angelica Lagoda from LiveLife Pharmacy, Yeppoon Qld. MIMS is always delighted to sponsor this award which showcases the innovation and excellence of all the interns. The award was present by MIMS CEO Robert Best, together with Dr Shane Jackson PSA National President and Graham Catt PSA CEO.

Robert Best, MIMS Australia and New Zealand CEO, presented the award and said "MIMS has been and continues to be committed to supporting young healthcare professionals from all parts of the healthcare ecosystem. It is with immense pleasure that we support community and hospital pharmacists and the interns within them by providing world class medications information. Being able to reward excellence to young innovative people is extremely exciting for the team at MIMS."

Overall, the Expo was a great success and MIMS was able to connect and network with our partners and customers.

Deanna Mill – One of the MIMS-PSA Intern Winner tells her Story

I completed my intern year with SA Pharmacy in the Southern Adelaide Local Health Network (SALHN). This involved rotating through multiple public hospitals and between dispensary and clinical rotations. Throughout the year I took all possible learning opportunities from leading nursing educations, to completing audits on medication use and reviewing local medication protocols in order to further my skills in education and research. During the year I joined our local PSA early career pharmacist working group where I was involved in consulting and collaborating on a range of issues that affect pharmacists. Not only that but the group had the added benefit of the endless support and wisdom that can only come from those who went before.

The year was a hectic one and I think that all pharmacists would agree that the challenge between balancing study, exams, full time work and other commitments is tough. However, my advice would be plan, surround yourself with supporters and it will be over quicker than you imagine with the ultimate reward at the end, your registration.

I had previously heard of the MIMS-PSA Intern of the Year award but had never even considered the possibility that I would be a good candidate. Towards the end of my intern year I was approached by one of my senior pharmacist colleagues who also happened to be my mentor and research project supervisor who thought I would be a good candidate and wanted to nominate me. This came as a surprise, but the prize was too good an opportunity to give up, so I decided to have a go and and the rest is history!

I feel honoured, humbled and proud to receive the award; it really helps me stay motivated and reaffirms my choice to be involved in the world of pharmacy. It's awesome to think that some of the things that I am most proud of are also seen as worthwhile in the eyes of my profession.

Given the award is to be used for educational purposes I think I may look at an international pharmacy conference which, may help me to experience a new world of pharmacy and make more international connections to be able to further collaborate on research and share ideas on driving pharmacy into the future that we want.

I am currently still working in SALHN as a rotational pharmacist. I continue to educate my allied health colleagues about our role within multidisciplinary teams and eagerly await the new and emerging roles for pharmacist into the future!

Precision medicine

Precision medicine aims to develop more targeted drug therapy by understanding disease at a deeper level in individuals or small groups of patients. This concept will transition away from the current 'one size fits all' approach. Precision medicine will require co-development of diagnostic and genomic tools to identify optimal therapy in individual patients[1,2].

Pharmacogenomics involves the study and application of the effect of genetic variation on the response to pharmaceuticals. Early application of pharmacogenomics has been seen with the drugs clopidogrel and warfarin[1]. This article will focus on current pharmacogenomic insights for clopidogrel, codeine, three proton pump inhibitors (lansoprazole, omeprazole, pantoprazole) and warfarin.

Clopidogrel

Clopidogrel is a thienopyridine antiplatelet agent acting on the purinergic $P2Y_{12}$ receptor, blocking ADP-mediated platelet activation and aggregation. Clopiogrel is converted to an active metabolite by CYP2C19. The CYP2C19 gene is highly polymorphic with 35 variant star (*) alleles identified[3].

The CYP2C19*17 (gain of function) allele is associated with increased enzyme activity and is present in rapid (one *17 allele) or ultrarapid (two *17 alleles) metaboliser phenotypes; these patients respond optimally to clopidogrel[3,4].

CYP2C19*2 and *3 (loss of function) alleles are associated with the intermediate (one non-functional allele) or poor (two non-functional alleles) metaboliser phenotypes (see Table 1); these individuals may be resistant to clopidogrel[3,4]. Approximately 2% of Caucasians and 14% of Chinese are CYP2C19 poor metabolisers; up to 45% of patients are CYP2C19 intermediate metabolisers[3].

Codeine

Codeine is an opioid analgesic, with its analgesic effect mediated via CYP2D6-dependent conversion to the active metabolite morphine. CYP2D6 importantly metabolises a quarter of all prescribed drugs, including antidepressants, antipsychotics, analgesics and β-blockers. The CYP2D6 gene is highly polymorphic with more than 100 variant star (*) alleles identified[3].

CYP2D6*1 (normal function) and variant *2, *33 and *35 (near normal function) alleles are associated with normal/near normal enzyme activity; 77-92% of individuals display the normal metaboliser phenotype and are most likely to respond to codeine[3].

Other CYP2D6 alleles produce a non-functional enzyme (*3, *4, *5, *6) or loss of function enzyme (*10, *17, *41). Some alleles are more common in Caucasians (*3, *4, *5, *6, *41) or Asians (*10). 2-11% of the population are intermediate metabolisers (carry either two loss of function alleles or one loss of function and one no function allele; see Table 1); these patients may respond sub-optimally to codeine[3].

5-10% of patients are poor metabolisers (carry two absent function (*4, *5) alleles); codeine will provide little or no pain relief.

Ultrarapid metabolisers carry at least three copies of the CYP2D6 gene (*1, *2); this phenotype risks an initial morphine 'overdose', more prevalent side effects and a shorter analgesic duration[3].

Proton pump inhibitors (PPI)

PPIs inhibit gastric acid secretion. CYP2C19 contributes to the metabolism of a range of clinically important drugs including antidepressants, benzodiazepines and some PPIs. CYP2C19 accounts for > 80% of the metabolism of lansoprazole, omeprazole and pantoprazole to inactive metabolites[5]. The CYP2C19 gene is highly polymorphic with 35 variant star (*) alleles identified[3].

CYP2C19*17 (gain of function) allele may enhance PPI clearance, resulting in less active PPI available to inhibit gastric acid secretion and potential therapeutic failure[3,5]. CYP2C19*17 allele frequency ranges from 3-21% across different populations[3].

CYP2C19*2 (non-functional) allele is associated with decreased PPI clearance, resulting in higher active PPI plasma concentration and enhanced treatment[3,5]. CYP2C19*2 allele frequency is around 15% in Caucasians and 29-35% in Asians[3].

Intermediate metabolisers carry one absent or reduced function allele (*2 or *3), while poor metabolisers carry two absent (*2) and/or loss of function (*3) alleles[3,5] (see Table 1). CYP2C19*3 allele frequency is around 2-9% in Asians[3].

Warfarin

Warfarin is a coumarin anticoagulant that inhibits synthesis of vitamin K dependent clotting factors via inhibition of vitamin K epoxide reductase complex subunit 1 (VKORC1, a vitamin K reductase that catalyses vitamin K recycling). Warfarin has a narrow therapeutic index and wide inter-individual variability in dose required and time to achieve target anticoagulation. Genetic factors (including variants in the VKORC1, CYP2C9 and CYP4F2 genes) contribute to this variability[3,4,6].

The CYP2C9 gene is highly polymorphic with over 60 variant star (*) alleles identified[3]. CYP2C9*1 (wild type) allele is associated with normal enzyme activity and the normal metaboliser phenotype.

CYP2C9*2 and *3 alleles are associated with reduced enzyme activity; individuals with two copies of *2 or *3 are more sensitive to warfarin, require lower doses and are at greater bleeding risk during warfarin initiation[3,4,6] (see Table 1). CYP2C9*2 allele frequency is 10-20% in Caucasians; CYP2C9*3 allele frequency is < 10% in most populations[3].

CYP4F2 (vitamin K oxidase) limits excessive vitamin K accumulation in the liver. Genetic variant CYP4F2*3 (loss of function) leads to a rise in hepatic vitamin K, necessitating a higher warfarin dose to achieve therapeutic anticoagulation. CYP4F2*3 allele frequency is 30% in Caucasians and Asians[3,4].

VKORC1, c.-1639G>A allele is a common non-coding variant associated with decreased hepatic VKORC1 expression, decreased warfarin requirements and increased ischaemic event risk. The allele's frequency is around 90% in Asians and 40% in Caucasians[3].

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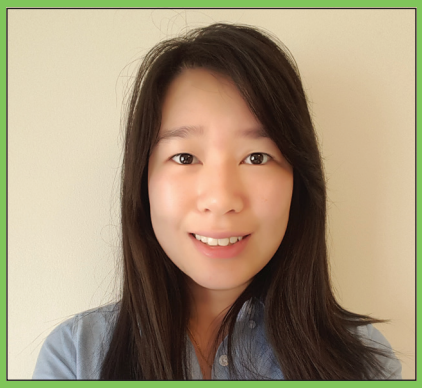
Table 1.

Drug	Gene*allele	Mutation effect	Phenotype	Clinical effect & dosing recommendations
Clopidogrel[3,4]	CYP2C19*1 CYP2C19*2 CYP2C19*3 CYP2C19*17	Normal function	Normal metaboliser *1/*1	• Use recommended dosing
		Loss of function	Intermediate metaboliser *1/*2, *1/*3, *2/*17 Poor metaboliser *2/*2, *2/*3, *3/*3	• Consider alternative antiplatelet therapy if no contraindication, e.g. prasugrel, ticagrelor • Clopidogrel resistance • Decreased antiplatelet action • Increased ischaemic event risk
		Gain of function	Ultrarapid metaboliser *17/*17 Rapid metaboliser *1/*17	• Use recommended dosing • Increased bleeding event risk
Codeine[3]	CYP2D6*1 CYP2D6*2 CYP2D6*4 CYP2D6*5 CYP2D6*6 CYP2D6*10 CYP2D6*17 CYP2D6*41	Normal function *1	Ultrarapid metaboliser *1/*1xN, *1/*2xN	• Avoid codeine use due to potential for toxicity
		Near normal function *2		
		Non-functional *4, *5, *6	Normal metaboliser *1/*1, *1/*2, *2/*2, *1/*41, *1/*4, *2/*5, *1/*10	• Use recommended age or weight specific dosing
		Loss of function *10, *17, *41	Intermediate metaboliser *4/*10, *5/*41	• Use recommended age or weight specific dosing • If no response, consider alternative analgesic
			Poor metaboliser *4/*4, *4/*5, *5/*5, *4/*6	• Avoid codeine use due to lack of efficacy
Lansoprazole, omeprazole, pantoprazole[3,5]	CYP2C19*1 CYP2C19*2 CYP2C19*3 CYP2C19*17	Normal function	Normal metaboliser *1/*1	• Normal metabolisers have lower plasma PPI levels and reduced acid suppression
		Non-functional	Poor metaboliser *2/*2, *2/*3, *3/*3	• Non-functional alleles (*2/*2) associated with higher plasma PPI levels (reduced clearance) and more pronounced acid suppression effect compared to normal function alleles
		Loss of function	Intermediate metaboliser *1/*2, *1/*3	
		Gain of function	Rapid metaboliser *1/*17	• CYP2C19*17 associated with lower plasma PPI levels (enhanced clearance) and potential increased therapeutic failure risk • Potential PPI underdosing in individuals with normal, rapid or ultrarapid metaboliser phenotypes • Variations in acid suppression less significant for PPIs with lower CYP2C19 dependent metabolism, e.g. esomeprazole, rabeprazole
			Ultrarapid metaboliser *17/*17	
Warfarin[3,4,6]	CYP2C9*1 CYP2C9*2 CYP2C9*3	Normal function	Normal metaboliser *1/*2	• Use recommended dosing
		Loss of function	Poor metaboliser *1/*3, *2/*2, *2/3, *3/*3	• Decreased warfarin metabolism • Decreased warfarin dose requirement (CYP2C9 contribution to dose variation usually less than 10%) • Increased bleeding event risk
	CYP4F2*1 CYP4F2*3	Normal function *1	Normal metaboliser	• Use recommended dosing
		Loss of function *3	Poor metaboliser	• Decreased CYP4F2 activity (CYP4F2 involved in vitamin K cycle) • Increased vitamin K concentration • Increased warfarin dose requirement
	VKORC1	Loss of function	Poor metaboliser c.-1639G>A	• Decreased VKORC1 expression • Decreased warfarin dose requirement (VKORC1 contribution to dose variation approximately 30%)

PPI - proton pump inhibitor; VKORC1 - vitamin K epoxide reductase complex subunit 1

MIMS Staff Profile



Michelle Liang
Editor, Lead

What is your role at MIMS Australia?

The high quality and reliability of medicines information delivered by MIMS is the culmination of dedicated and industrious team players that form the MIMS departments. As a medical editor, my role is primarily to review and maintain the integrity of healthcare information within the MIMS database. This information is distributed to medical practitioners, pharmacists and other healthcare professionals in various forms, including eMIMS, MIMS Online, mobile platforms and print. Thus, ensuring that the information is up-to-date and accessible in a user-friendly format is of vital importance. The team and I review updated product information from pharmaceutical companies, which is cross-referenced with the TGA, MedSafe, WHOCC and other sources. This information is abbreviated so that it is more efficiently interpreted. I also validate the data before it is released to ensure that the information is exported correctly. Ultimately, the end-user is the patient, for whom we strive to achieve optimal health outcomes.

What is your background?

I graduated from the University of Sydney with a Bachelor of Pharmacy (Industrial Major). Before my transition to MIMS, I was employed as a community pharmacist at a fast-paced, high energy pharmacy within a team of 4 to 10 dispensary staff. I was given the opportunity to train and practice as an immunising pharmacist. During this time, knowing and experiencing MIMS' utility and its positive impact on patient health outcomes motivated me to become a medical editor at MIMS.

What do you enjoy most about your role?

Since I joined MIMS, everyone has been supportive, interested and approachable. I enjoy working in collaboration with the editorial team, and extra-editorial members, sharing the common goal of streamlining medicines information and improving its useability in practice. Recently, I had the privilege of engaging with the prestigious members that form the MIMS Advisory Board at the editorial board meeting. With the multitude of background I encounter, culturally and professionally, I am able to discover and share insights and experiences. It has been an eye-opening opportunity and one that I do not take for granted.

What do you enjoy outside of the office?

I enjoy socialising with friends, playing badminton, mahjong or board games together. As a foodie, I like dining at various cafes and restaurants that appear on Instagram. My favourite cuisine is Japanese, but my favourite dishes are tom yum noodle soup and Singapore chilli crab. In my spare time, I enjoy cooking, reading, quilling, calligraphy, and watching documentaries. I was challenged to be more aware of how human habits affect the surrounding environment after watching A Plastic Ocean, which I highly recommend. I also enjoy exploring various places, trying different foods and having a greater appreciation for the world and its people around me.

Upcoming Conferences

HIMMS AsiaPac 18 Conference & Exhibition

5 November - 8 November 2018
BCEC, Brisbane

Medicines Management 2018 The 44th Annual SHPA National Conference

22-25 November 2018
BCEC, Brisbane

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