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Foreword

The Pharmacy Project Abstract booklet is meant to give a taste of research work carried by postgraduate students, the MSc and MPharm students as well as the undergraduate pharmacy students. The areas covered by the MPharm students include Pharmaceutical care, Treatment Protocols and Pharmacotherapy, Point-of-Care Testing, Pharmacy Administration, Pharmacy Information, Regulatory Affairs and Industrial Pharmacy. Drug Design is a more recently added area which is selected by seven students.

The Master of Science Projects cover clinical and administrative research aspects ranging from Prescribing Trends in Parkinson 's Disease, Management of Hypertension, Standard Operating Systems in Community Pharmacies, Drug Information Bulletin, Diabetic Patient Monitoring to Analysis of Drug Dispensing at Mater Dei Hospital.

The abstract book also has descriptions of projects carried out between the second year and the fourth year of the pharmacy course. The areas covered by the 4th year students, who this year have the option of completing the BSc (Hons) in Pharmaceutical Sciences, include a vast range of topics. Areas of pharmacy practice covered include quality systems and standard operating procedures at Karin Grech Hospital pharmacy, analgesia in open heart surgery, testing for *Helicobacter pylori*, pharmacovigilance, Maltese dictionary of pharmacy terms, prescribing of analgesics, pharmacoeconomic aspects comparing costs of cardiovascular drugs, drug administration to elderly, access to pharmacy services, metabolic syndrome and patient management, formulary for products not listed in the BNF, course for pharmacist prescribing, gastric amylase activity, pharmacist recommended non-prescription medicines, chronic renal failure, INR Testing, penetration of clindamycin in peripheries, continuing education for pharmacists, quality of life tests in local scenario and directory of pharmacists. A number of drug design related projects included the creation of two- and three-dimensional molecular database of drugs used to target the endocrine system, the respiratory system and in malignant disease and immunosuppression, and drug design at the peroxisome proliferator-activated receptor. Other aspects of computational chemistry projects involved investigating anti-oestrogenic effects of ephedrine and synephrine and development of computational chemistry practicals.

Third year and second year students presented a few lines describing their work-in progress in various areas ranging from history of pharmacy and museums, clinical aspects, analytical processes, pharmaceutical terms dictionary, point of care testing, cardiac markers, rheumatoid arthritis, psychiatric disorders, administrative aspects such as the Pharmacy of Your Choice scheme and pharmacist prescribing. A number of computational chemistry projects featuring drug design and creation of databases for drugs used in various conditions such as skin conditions, anaesthetic drugs and ophthalmology.

The mentioned projects do not in any way reflect any preference or standards of the projects. They were picked up in a random way to give the reader an insight into the depth and width of the range of projects carried out during the pharmacy course indicating the versatility of the pharmacy graduate, a feature that explains partially why notwithstanding the comparatively large number of pharmacists graduating each year in Malta, they all succeed to be recruited in a professional job often matching to their own preference.

Professor Anthony Serracino-Inglott

Pharmacy Practice Projects Co-ordinator

Introduction

Pharmacists have a specific contribution within a health system. They are graduates who have followed a professional degree that provides knowledge of the chemical entities that are developed into medicines, the processes for formulation development into a medicinal product and how the use of medicines interacts with the patient. Pharmacists are today expected to contribute to these activities and to become involved in a wide array of research activities including basic sciences, clinical, policy, educational and administrative studies.

The Department of Pharmacy within the Faculty of Medicine and Surgery was a pioneer in introducing the concept of a 'project' way back in the 1980's as an initial step to prepare graduates to experience hands-on research skills. This concept has evolved over the years and is now a structured component within the two-cycle programme leading to an M.Pharm. degree. With the first cohort of students graduating with an M.Pharm. degree this year, the project component has been developed to a dissertation. Within the project-dissertation modules students develop skills in critical scientific thinking and creativity, literature tracking and evaluation, technical skills in pharmacy research and skills in dissemination of research results. As part of the project modules students are expected to develop research protocols, posters for in-progress projects and to summarise the results of the dissertation as an oral presentation.

This model of a mentored-research experience that has been developed at the Department was used as a model in developing such programmes in schools of pharmacy in other universities. The projects followed by the students are part of the programmes led by the research groups within the Department undertaken in collaboration with colleagues from other departments or practitioners.

The Department has areas of interest in pharmacy practice, clinical analysis, pharmaceutical technology and *in silico* drug design. These research programmes have led to a number of publications in research journals including the Journal of Applied Therapeutic Research, the International Journal of Pharmacy Practice, the Journal of Pharmaceutical Health Services Research and the International Journal of Lower Extremity Wounds. The areas covered in these research publications include chronic disease management, oncology and pain, quality standards and protocols, point-of-care testing, clinical analysis and chronopharmacology.

The research completed last year by Doris Baldacchino and presented at the 2011 Symposium has now been published as a book by LAP Lambert Academic Publishing, Germany, a leading publishing house of academic research. Ms Baldacchino carried out a research study on the use of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and patient safety under my supervision as her dissertation leading to a Master of Science in Pharmacy degree.

Professor Lilian M. Azzopardi

Head, Department of Pharmacy

M.Pharm. Students
Project Abstracts

Pharmaceutical Care

Pharmacist Intervention in a Heart Failure Clinic
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Sarah Baldacchino

Perception of Oral Anti-Cancer Treatment
Stephen Camilleri

Pharmacist Intervention in a Heart Failure Clinic

Marie Claire Aquilina

Background: Heart failure (HF) is a condition in which patients experience shortness of breath at rest or during exertion, fatigue and signs of fluid retention such as pulmonary congestion or ankle swelling.[1]

Objective: To introduce and evaluate the pharmacist's participation in the Heart Failure Clinic (HFC).

Design: Fifty patients participated and completed a questionnaire twice over 6 weeks. The researcher gave advice concerning their condition, self-care and the management of their disease and prepared a treatment chart. Data was analysed using SPSS® version 17 (Wilcoxon signed-rank test).

Setting: HFC, Mater Dei Hospital.

Main Outcome Measures: Quality of life, lifestyle, management of HF, adherence to therapy.

Results: A significant improvement in quality of life was observed ($p=0.001$). Patients' lifestyle habits improved with a significant change in daily self-monitoring of weight ($p=0.008$). Results also showed an increase ($p=0.000$) in the number of patients who refer to the pharmacist for advice before buying any new medication. Adherence issues improved since patients statistically observed the benefit of a personalised treatment chart. Lack of adherence was found to be due to side-effects, forgetfulness, price of medication and lifestyle. Statistically significant relationships ($p<0.05$) were found between quality of life and other factors including age, number of medicines taken and number of concurrent diseases, suggesting that the pharmacist should emphasise the importance of care in such patients. Within a sample of 35 patients, a significant increase ($p=0.000$) was seen in those who agreed that pharmacist intervention is required at the HFC.

Conclusion: The pharmacist's participation in the health care team at the HFC has significantly improved aspects of HF care in terms of quality of life, self-care, therapy issues and adherence.

Reference:

1. Dickstein K, Cohen-Solal A, Filippatos G, McMurray J, Ponipowski P, Poole-Wilson P et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. Eur Heart J 2008;29(19):2388–442.

Quality of Life in Hypertensive Dialysis Patients

Anne Marie Mercieca

Background: Hypertension (HT) is a major risk factor in the progression of kidney dysfunction and development of heart disease.[1]

Objectives: To determine adequacy of blood pressure (BP) control in dialysis patients, evaluate effects of dialysis and HT on quality of life (QoL), identify antihypertensive medications used and assess compliance.

Design: Sixty dialysis patients were interviewed at baseline using the KDQoL-SFTM questionnaire[2] and a compliance questionnaire[3] used for patients on antihypertensive medications. A pharmacist-led educational intervention was carried out. BP measurements for 3 consecutive visits were collected from patients' files. After 6 months, patients were re-interviewed using the same questionnaires and BP measurements were recorded. A control group of 50 non-dialysis patients were interviewed using the SF-36 and the compliance questionnaire.

Setting: Renal Unit, Mater Dei Hospital

Main Outcome Measures: BP readings, QoL, compliance

Results: Forty five patients were identified as hypertensive at baseline and 44 patients were hypertensive after 6 months. There were no significant differences in the BPs recorded at baseline and at the end of the study. Improvements ($p<0.05$) were found in 5 QoL scores for all dialysis patients. No significant differences were found between hypertensive and non-hypertensive dialysis patients. Higher QoL scores were obtained with non-dialysis patients.

Conclusion: BP is adequately controlled in Maltese dialysis patients. Dialysis treatment has a negative impact on patient's QoL, that is not affected by HT and a pharmacist-led educational intervention had a positive outcome on QoL.

References:

1. Tan KS, Johnson DW. Managing the cardiovascular complications of chronic kidney disease. Aust Prescr 2008;31:154-8.
2. Kidney Disease Quality of Life Working Group. Kidney disease and quality of life short form questionnaire v. 1.3. RAND & University of Arizona;1995.
3. Zammit L, Azzopardi LM, Serracino Inglott A, Zarb Adami M, Cacciatolo J. Compliance and antihypertensive therapy. Clinical Pharmacy Europe 2006;3:41-2.

Use of Diuretics in Elderly Patients with Congestive Heart Failure

Sean Ryan Atkins

Background: Diuretics are essential for symptomatic relief when fluid retention is present in congestive heart failure (CHF). The dose of loop diuretics should be decreased to the minimum required amount to maintain a fluid-free state after excess fluid-loss occurs. This is recommended to decrease the risk of dehydration and occurrence of side-effects.[1]

Objectives: To classify and analyse loop diuretic dose management and to evaluate pharmacist intervention in diuretic therapy.

Design: The medical records of patients (N=113) over 65 years of age with a past medical history of CHF were consulted. The relevant data was collected using a formulated patient profile. Patients were chosen by convenience sampling and were classified into the control group (n=54), where there was no clinical pharmacy service, and the intervention group (n=59), where a clinical pharmacist participated within the healthcare team. Data was analysed using SPSS® version 19 and the chi-square test was used.

Setting: St. Vincent de Paul Residence (SVPR) - control group, Rehabilitation Hospital Karin Grech (RHKG) - intervention group.

Main Outcome Measures: Evaluation of pharmacist intervention.

Results: Many of the patients on loop diuretics participating in the study had a dose of bumetanide higher than 1 mg (or its equivalent as furosemide), with the control group proportion being 42.6% and intervention group being 47.5% (excluding the portion of the sample where attempts have been made to decrease the dose to no avail). There was no statistically significant difference in loop diuretic dose management between the institutions (p=0.604).

Conclusion: This study highlights the need of a clinical pharmacist intervention to follow appropriate loop diuretic dose management as most patients remained on a high dose.

Reference:

1. Dickstein K, Cohen-Solal A, Filippatos G, McMurray JJV, Ponikowski P, Poole-Wilson PA et al. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. Eur Heart J 2008;29(19):2388-442.

Development of Tools to Assess Risk in Diabetic Patients

Sarah Baldacchino

Background: Complication risk factors (predictors) in type 2 diabetes mellitus (DM) very often interact synergistically and negative health repercussions arise if all physiological parameters are not effectively controlled.[1]

Objectives: To identify significant predictors which contribute to complication risks in Maltese type 2 DM patients and to establish local diabetic neuropathy (DNeurI), retinopathy (DRI), nephropathy (DNephrI) and macrovascular (MVI) indices.

Design: A 5-point Likert scale for the assignment of complication risk scores was devised with an expert panel. One hundred and twenty randomly selected patients aged between 25 and 70 years, diagnosed with Type 2 DM ≤1yr and taking metformin 500mg twice daily, perindopril 5mg once daily and simvastatin 40mg once daily gave their written consent to participate in the study. Data was collected from patient medical files and computerised records. Twenty two predictors were collected and three resident specialists assigned complication risk scores. SPSS® version 17 was used for covariance model analyses and backward elimination variable selection ($p<0.05$).

Setting: Endocrine and Diabetes Centre, Mater Dei Hospital.

Main Outcome Measures: Development of tools which predict risks in diabetic patients.

Results: All necessary data was retrieved for 92 out of 120 subjects. Although International Diabetes Federation targets for HbA1c, systolic blood pressure (SBP) and serum total cholesterol (STC) were not reached in 81, 68 and 42 subjects respectively, 49 patients had a SBP of ≤140mmHg and 78 subjects had STC levels of ≤6mmol/L. The best predictors for DNeurI, DRI, DNephrI and MVI were body mass index (BMI) (p=0.000), SBP (p=0.000), SBP (p=0.000) and waist circumference (p=0.000) respectively.

Conclusion: The significant predictors were age, genetic predisposition, alcohol abuse, BMI, waist circumference, SBP, HbA1c, STC, serum fasting triglycerides, serum urea, urinary glucose and albumin-creatinine ratio. An average mild complication risk was obtained for the participants but medication review is required to improve control.

Reference:

1. Cutajar J. An evaluation of type 2 diabetes care in the primary care setting. MMJ 2008;20(3):21-31.

Perception of Oral Anti-Cancer Treatment

Stephen Camilleri

Background: In Malta cancer is the second most common cause of death and the third largest contributor to disease burden.[1]

Objective: To evaluate perception of healthcare professionals (HCPs) and patients of the use of oral anti-cancer drugs (ACDs).

Design: Two questionnaires addressed to HCPs and patients were adapted from Weingart et al[2] and Catania et al[3] respectively, validated and tested for reliability according to Guttmann Split-Half Coefficient. The questionnaires were disseminated to all (N=46) HCPs and 50 patients. Data was then analysed using SPSS®.

Setting: Sir Paul Boffa Hospital

Main Outcome Measures: Perception of HCPs and patients on ACDs.

Results: Guttmann Split-Half Coefficient was 0.90 for the HCPs questionnaire and 0.92 for the questionnaire addressed to patients showing excellent reliability. Most HCPs (n=41) agreed that patients should be offered a consultation with a pharmacist and 34 HCPs were concerned about safety of ACDs. Thirty one patients thought that intravenous (IV) treatment causes more side-effects but is more effective.

Conclusion: It is clear that a pharmacist would be accepted in the HCP team and might help reduce certain misconceptions. Patients do think that IV ACDs are more effective and cause more side-effects than equivalent oral ACDs. A pharmacist in the HCP team may correct misconceptions.

References:

1. World Health Organization [Online]. 2010 [cited 2010 Feb 13]; Available from: URL: http://www.who.int.
2. Weingart SN, Flug J, Brouillard D, Morway L, Partridge A, Bartel S et al., Oral chemotherapy safety practices at US cancer centres: Questionnaire survey. BMJ 2007;334(7590):407.
3. Catania C, Didier F, Leon ME, Sbanotto A, Mariani L, Nolè F et al. Perception that oral anticancer treatments are less efficacious: Development of a questionnaire to assess the possible prejudices of patients with cancer. Breast Cancer Res Treat 2005;92(3):265-72.

Treatment Protocols and Pharmacotherapy

Implementation of Protocols for Paediatric Care
Martina Muscat

Compliance with Protocols in Dental Conditions
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Dissemination of Protocols on the Management of Urinary Tract Infections during Pregnancy by Community Pharmacists
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Implementation of Protocols for Paediatric Care

Martina Muscat

Background: Protocols are a valuable tool in supporting pharmacists in the provision of care specific to the needs of the paediatric population. They provide guidelines on the correct and effective use of non-prescription medicines.[1]

Objectives: To disseminate six previously developed protocols[2,3] to pharmacists and students, to test their applicability and practicality and evaluate use of the protocols as training tools for pharmacy students.

Design: The previous protocols were reviewed and modified. A booklet and a website were developed and disseminated to all managing pharmacists (n=210) and all pharmacy students (n=195), together with an 'Evaluation Questionnaire' and a 'Website Evaluation Survey'. A stratified random sample of 40 pharmacy students was selected and administered a 'Student Knowledge Evaluation Test' before and after reading the protocols. The results were calculated using the paired sample t-test.

Setting: Community pharmacies; Department of Pharmacy, University of Malta

Main Outcome Measures: Evaluation of the dissemination strategy and the use of the protocols; Evaluation of the student training programme.

Results: Response rate: 72% pharmacists, 80% students; 77% of pharmacists and 86% of students used the protocols whilst responding to paediatric symptoms. A significantly larger proportion of participants used the booklet format (72%) rather than the website (56%) (Z=3.37). There was a significant improvement in the students' knowledge after reading the protocols, where the post-test score (85.0) was considerably higher than the pre-test score (50.7) (p=0.000).

Conclusion: The dissemination strategy and the student training programme were successful.

References:

1. Rodgers R. PJ practice checklist: sale of medicines protocols. Pharm J 1996;178:34-6.
2. Azzopardi R. Development of protocols of paediatric care [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2005.
3. Magro SL. Validation of protocols for paediatric care [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2009.

Compliance with Protocols in Dental Conditions

Daniela Attard

Background: Protocols for use in dental practice should be developed from the latest information available to ensure maximum benefit that can be provided to patients.[1]

Objectives: To develop treatment protocols for community pharmacists concerning oral diseases and to assess their compliance with the protocols through the dissemination of case studies.

Design: Three treatment protocols on recurrent aphthous ulcers, xerostomia and dental abscess were developed. The protocols were reviewed by a panel of experts consisting of 2 community pharmacists, 2 general practitioners and 2 dentists. The protocols were modified according to suggestions made during the validation process. They were then presented in an A5 booklet which was distributed to 203 local community pharmacies, together with a case study on each condition. A marking system was developed for grading compliance to these protocols. Data was analysed using Microsoft® Office Excel 2007 and SPSS® version 17.

Setting: Community pharmacies around Malta and Gozo.

Main Outcome Measures: Pharmacists' compliance with the protocols.

Results: Out of the 203 case studies distributed, 125 (62%) were collected. The average percentage compliance for all the three protocols was 73%. This was highest for dental abscess (77%; range: 42-100%), followed by xerostomia (74%; range: 35-100%) and recurrent aphthous ulcers (68%; range: 19-100%).

Conclusion: The overall average percentage compliance obtained (73%) is high, indicating that pharmacists are providing quality care. The higher compliance rate obtained with the dental abscess protocol reveals that pharmacists tend to be more cautious when dealing with more severe conditions which require referral. The lower compliance rate obtained with the recurrent aphthous ulcers protocol reflects unnecessary referral.

Reference:

1. Hewitt-Taylor J. Clinical guidelines and care protocols Chichester: John Wiley & Sons; 2006.

Dissemination of Protocols on the Management of Urinary Tract Infections during Pregnancy by Community Pharmacists

Katya Busuttil

Background: Protocols lead pharmacists through a therapeutic plan to take evidence-based decisions to select the most appropriate medications for their patients.[1]

Objectives: To review, modify and update a protocol on the management of urinary tract infections (UTIs) during pregnancy which was developed and validated in two previous local studies[2,3] and to ensure that the protocol is practical for use to be disseminated in community pharmacies.

Design: During the first part of the study the protocol was reviewed and updated using evidence-based information. This material was validated with a panel of experts and a shorter, more user-friendly version of the protocol was developed. Feedback regarding the usefulness of implementing this protocol in the community setting was assessed through a questionnaire given to a sample of 30 pharmacists and 30 physicians chosen by stratified random sampling from 30 community pharmacies. Data was analysed using SPSS® version 20.

Setting: Community pharmacies

Main Outcome Measures: Evaluation of the practicality of the protocol booklet in the community setting.

Results: Review of the protocol by the panel of experts revealed that the length of the explanatory text was a major issue. A total of 48 (80%) healthcare professionals completed the questionnaire with 13 and 21 stating that the practicality of the protocol is of a very good and of a good level respectively.

Conclusion: There is a common agreement that the protocol presented is important for use in community pharmacy. Both healthcare professionals agreed that the changes made to the previously published protocol resulted in a final version which was practical for use in the community setting.

References:

1. Desselle SP, Zgarrick DP. Pharmacy management: Essentials for all practice settings. New Jersey: Mc Graw-Hill Professional; 2008. p.101.
2. Aquilina A. Treatment Protocols in Pregnancy [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2004.
3. Fenech R. Treatment Protocols in Pregnancy [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2008.

Dissemination of Protocols in Gastro-intestinal Disorders

Marija Carmen Carbonaro

Background: Community pharmacists are often approached by patients for advice on gastro-intestinal disorders.[1]

Objectives: To review and update previously developed treatment protocols[2] for the treatment of gastro-intestinal disorders and to disseminate the protocols to pharmacists and pharmacy students.

Design: The protocols were reviewed, updated and validated by a panel of health care professionals. A protocol booklet and website were created and disseminated to community pharmacists (n=208) and pharmacy students (n=199). Pharmacist compliance with the protocols was assessed via case studies in 10 community pharmacies.

Setting: Community pharmacies in Malta and Gozo; pharmacy students at Department of Pharmacy.

Main Outcome Measures: Assessing pharmacist compliance to the protocols and evaluation of pharmacist and student perception of the protocols.

Results: The original 7 protocols were merged into 5 protocols and 2 new protocols for non-steroidal anti-inflammatory drugs (NSAID)-associated complications and *H.pylori* infection were developed. The case studies revealed approximately a 20% increase in mean compliance to the guidelines after the protocols were introduced. Out of the 208 questionnaires distributed, 86 (41%) were returned. The majority of pharmacists (n=50) found the protocols to be practical and applicable. The majority of pharmacy students (94%) responded that they would feel more confident dealing with patients when following such protocols.

Conclusion: The compilation of the protocols and information sections into a protocol booklet and website were found to be practical and acceptable by pharmacists and pharmacy students, with the latter finding them useful as training tools.

References:

1. National Institute for Clinical Excellence (NICE). Dyspepsia Management of dyspepsia in adults in primary care [Online]. UK: NICE; 2004 [cited 2012 Jan 26]. Available from: URL: www.nice.org.uk/CG017NICEguideline.
2. Ellul S. Treatment Protocols for Disorders of the Gastro-Intestinal Tract [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2009.

Compliance with Protocols in Eye Conditions

Bianca Maria Stivala

Background: Protocols are guidelines which serve to establish standards and assist professionals in determining a course of action.[1] They support pharmacists when responding to symptoms thus highlighting their intervention as active participants in the primary healthcare setting.[2]

Objective: To design new flow-chart protocols to guide pharmacists in the diagnosis and management of external segment and eyelid conditions, conjunctivitis and dry eye disease.

Design: A preliminary literature review was carried out to identify the conditions for which protocols would be designed. Three flow-chart protocols with an accompanying explanatory text, case studies and a result sheet to assess compliance with protocols in the management of the designed case studies were formulated and distributed to a validation panel of 6 healthcare professionals. The protocols were subsequently compiled in an A5 booklet and the explanatory text was designed as a printable online document. The material was distributed to all community pharmacies in Malta and Gozo (n=211).

Setting: Community pharmacies

Main Outcome Measures: Development of protocols for eye conditions; pharmacist compliance with the protocols.

Results: Three flow-chart protocols consisting of 34 (external segment and eyelid conditions), 34 (conjunctivitis) and 28 (dry eye disease) steps were designed. Out of the 211 pharmacies, 133 completed the result sheet, giving a response rate of 63%. The percentage compliance to the protocols was 92.5% for external segment and eyelid conditions, 93.2% for conjunctivitis and 95.8% for dry eye disease.

Conclusion: Pharmacists found the protocols clear and easy to follow. They commented that the result sheet intended to assess compliance with the protocols was convenient and not time-consuming.

References:

1. Desai A, Weiss M, Rees JA. Use of protocols and guidelines by community pharmacists and NHS Direct nurses. Pharm J 2000;265(7114).
2. Berenguer B, La Casa C, de la Matta MJ, Martín-Calero MJ. Pharmaceutical care: Past, present and future. Curr Pharm Design 2004;10(31):3931-946.

Methods for Dissemination of Protocols on the Management of the Common Cold

Lawrence Mayo

Background: Previous studies by Buttigieg Scicluna[1] and Mercieca[2] led to development and validation of treatment protocols providing the pharmacist with a guide towards a particular action when treating symptoms in the community. Dissemination of these protocols is an important step to achieve implementation in the community.

Objectives: To investigate the impact of the current dissemination method and study the feasibility of developing electronic formats of the protocols.

Design: A pharmacist questionnaire was developed to compare the protocol handbook with the website and observe whether any significant difference exists between the two dissemination methods which can affect the use of protocols in the community pharmacy. The tool was psychometrically evaluated for validity and reliability.

Setting: 218 community pharmacies in Malta and Gozo

Main Outcome Measures: Preference by community pharmacists of the presentation of the protocol.

Results: Out of 218 pharmacists, 52 pharmacists completed the questionnaire. The handbook was rated "good" for dimension (n=44) and number of pages (n=42). It was considered an effective dissemination method by 31 pharmacists and most rated it as being unpractical for the real life scenario in community pharmacy (n=27). There were 33 pharmacists who stated that an electronic version would increase the use of protocols whilst 37 agreed that the website makes the protocols more practical and reported that the protocol website should be the main dissemination method with the handbook being used secondary to it (n=36).

Conclusion: Results show that although the protocol handbook is effective for the dissemination of protocols to community pharmacies it may be unpractical for use. An electronic version such as the developed website seems to be a better method of dissemination as most pharmacists agreed that the website increases protocol usage and is more practical for pharmacy use.

References:

1. Buttigieg-Scicluna C. Development of protocols for the treatment of common cold [project]. Msida, Malta: Department of Pharmacy, University of Malta; 2005.
2. Mercieca D. Validation of protocols for the treatment of the common cold [project] Msida, Malta: Department of Pharmacy, University of Malta; 2009.

Use of Compliance Aid Devices

Deborah Cachia

Background: Non-compliance to medication therapy can be due to forgetfulness, taking the incorrect dose or cessation of treatment once symptoms subside.[1]

Objective: To evaluate the use of different compliance aid devices.

Design: A demonstration on how to use the 'Pill Splitter' and 'Multi Dose Pill Box' was carried out on 50 patients chosen by convenience sampling. A questionnaire was completed. Another 10 patients were identified and the electronic 'Pill Box Reminder' was given to them to use for a week. Patients were asked to complete a questionnaire before and after using this device.

Setting: A community pharmacy

Main Outcome Measures: Practicality, cost-effectiveness of the devices and patients' compliance towards their medication.

Results: Thirty one out of the 50 patients need to split a tablet in half before taking their medicine and 12 of these patients split it by using their hands. Twenty- five patients are non- compliant due to polypharmacy. Twenty-seven patients would not buy these devices as they may have no effect on their compliance, while 17 patients said that they do not need these devices. Out of 10 patients, 4 patients use a manual pill box, 5 patients consider the electronic pill box device to be worth buying and 6 patients consider suggesting this device to other patients as it may help them to increase their compliance.

Conclusion: A compliance aid device would be useful to lower the chance of medication errors and increase compliance in some patients. Pharmacists should review the treatment of patients who are taking medications for chronic conditions and identify those who would benefit from these devices.

Reference:

1. Agarawala A, Greenberg S, Ho G. The context-aware pill bottle and medication monitor. Department of Computer Science; 2004. Available from: URL: http://grouplab.cpsc.ucalgary.ca/grouplab/uploads/Publications/Publications/2004-Pillbottle.UBICOMP.pdf

Management of *Aeromonas*-Associated Gastroenteritis

Lisa Cuschieri

Background: *Aeromonas* organisms are the cause of soft tissue infections, sepsis and gastroenteritis.[1] Microbiology laboratories, including local ones, do not perform stool cultures for *Aeromonas*.

Objectives: To determine the antimicrobial sensitivity locally and the optimal antibacterial treatment.

Design: Biochemical tests were performed on all the stool samples submitted during a 6 month period. *Aeromonas*-positive specimens underwent species identification and antibiotic sensitivity testing. No selection criteria were chosen in order to determine the prevalence, seasonality, gender and patient age-groups that are most affected. The chi-squared test was used.

Setting: Bacteriology Laboratory at Mater Dei Hospital

Main Outcome Measures: Prevalence and sensitivity to antibacterials

Results: The local prevalence of 0.90% of this organism is similar to that of other European countries. There were no statistically valid associations for gender, seasonality and age. Local strains were found to be sensitive to many antibiotics however resistance is on the increase. The best antibacterial agents to treat *Aeromonas* gastroenteritis are the fluoroquinolones.[2]

Conclusion: This test offers more complete screening with little added expense and has been approved to be used on all stool samples submitted daily to the laboratory.

References:

1. Janda JM, Abbott SL. The genus *Aeromonas*: Taxonomy, pathogenicity and infection. Clin Microbiol Rev 2010;23(1):35-73.
2. Gilbert DN, Moellering RC, Eliopoulis GM et al. The Sanford Guide to Antimicrobial Therapy, 40th ed. USA: Antimicrobial Therapy Inc.; 2010.

Point-of-Care Testing

Faecal Occult Blood Testing in Community Pharmacy
Adrian Agius

Point-of-Care Testing of Chlamydia
Anne Marie Zammit

Quality of Blood Glucose Meters and Blood Pressure Monitors
Kimberly Zammit

Pharmaceutical Services in Overweight and Obesity Management
Vanessa Petroni

Faecal Occult Blood Testing in Community Pharmacy

Adrian Agius

Background: Faecal occult blood (FOB) tests for point-of-care testing (POCT) provide near immediate results for the patient which improve diagnosis and can enable improvement in patient care by detecting traces of blood in the faeces.[1]

Objectives: To assess the availability of FOB test kits for POCT and to evaluate the applicability of the test to community pharmacies.

Design: Availability of FOB test kits was assessed by contacting local importers. Three test kits were identified to be used in the study. Seventy participants (all over the age of 45) were recruited and each participant was given a test kit to perform the test at home. The participants filled in a questionnaire after completing the test. Another questionnaire was administered to the 9 community pharmacists where the test was carried out.

Setting: Community pharmacies

Main Outcome Measures: Feasibility of FOB testing in community pharmacy; participants' and pharmacists' perception.

Results: Eleven out of the 70 participants had never heard of colorectal cancer and 32 had never heard of FOB testing prior to this study. Sixty-six participants considered performing the test routinely every two years and were eager to take the stool sample for analysis to the community pharmacy if this service were to be offered by community pharmacists. The majority of participants (n=34) would be willing to pay at least €4 for this service (cost of kits ranged between €0.90 to €3.45). Eight pharmacists were willing to offer this test to their patients and a minimum service fee of €2 (over the cost of kit) would be requested by the majority of pharmacists (n=6).

Conclusion: It would be feasible to introduce this test as a new point-of-care service in the community pharmacy setting. The majority of participants are in favour of this test being available in the pharmacy and are ready to pay for such a service while the majority of pharmacists agree to perform this test if there is a service fee in return.

Reference:

1. Colorectal Cancer Health Centre (CCHC). Fecal Occult Blood (FOBT). WebMD.com [cited 2011 April 9]. Available from: URL: http://www.webmd.com

Point-of-Care Testing of Chlamydia

Anne Marie Zammit

Background: An accurate diagnostic test that can detect *Chlamydia trachomatis* (CT) could allow clinicians to test, treat and counsel patients in one visit, which could result in a reduction in the spread and morbidity associated with CT.[1]

Objective: To compare the practicality and accuracy of a point-of-care (POC) diagnostic test (Clearview® Chlamydia MF) to a laboratory-based polymerase chain reaction (PCR) test for the detection of CT and to review chlamydia care practices, attitudes and beliefs of healthcare professionals (HCPs) in primary care settings.

Design: The study was divided into two phases. During phase A the first 39 females who presented themselves and fitted the study criteria were enrolled in this study. Each patient had two specimens collected. One of the specimens was tested using the POC diagnostic test, whilst the other specimen was tested by the PCR test. The results obtained from each patient were compared using Cohen's Kappa Measure. In phase B, a questionnaire was developed, validated and distributed to a convenience sample of 77 HCPs. Data was analysed by SPSS® version 19.

Setting: Genito-Urinary Clinic at Sir Paul Boffa Hospital; Virology Laboratory at Mater Dei Hospital

Main Outcome Measures: CT results produced by Clearview® Chlamydia MF and PCR test for each patient; practices, attitudes and beliefs of HCPs regarding CT.

Results: The prevalence of CT was 7.69%. The sensitivity and specificity of the POC diagnostic kit were 33.3% and 97.2% respectively. A fair agreement of 0.36 was noted between the two tests, as 36 out of 39 tests led to the same result. Half of the HCPs stated that they would definitely use a POC kit to test for CT.

Conclusion: Whilst HCPs accept POC tests for CT, Clearview® Chlamydia MF has low accuracy.

Reference:

1. Van Dommelen L, Van Tiel FH, Ouburg S, Brouwers EEHG, Terporten PHW, Savelkoul PHM et al. Alarmingly poor performance in Chlamydia Trachomatis point-of-care testing. Sex Tranm Infect 2010;86:355-59.

Quality of Blood Glucose Meters and Blood Pressure Monitors

Kimberly Zammit

Background: Self-monitoring is an integral component in different chronic disease management programs. Device accuracy and reliability is critical in achieving successful control.[1]

Objectives: To determine accuracy of device technologies used for point-of-care testing (POCT) compared to reference tests and to determine their quality and reliability as self-assessment tools.

Design: One hundred volunteers were recruited for the blood glucose (BG) study and another hundred for the blood pressure (BP) study. The BP study was a single-site, single-visit comparison of three monitors, Artsana® Mercury syphgmomanometer, PicIndolor® aneroid sphygmomanometer and the automated Visomat Comfort® monitor. For the BG study, volunteers scheduled for venous sampling were tested with the Bionime Rightest® and Accu-Chek® Go. Results were compared to reference values.

Setting: BG meters study: Diabetes and Endocrine Centre at Mater Dei Hospital; BP monitors study: A community pharmacy.

Main Outcome Measures: Analytical accuracy using paired sample t-test, Pearson correlation coefficient and clinical relevance.

Results: BG levels recorded by the Bionime Rightest® and AccuChek® Go differ statistically from the reference test ($p<0.05$) but showed positive correlations (Bionime Rightest® 0.989; AccuChek® Go 0.942). Bionime Rightest® has all values in the clinically acceptable error grid zone, whilst the AccuChek® Go has 1 outlier. The ISO standard (≥95% of values within 20% of reference) was met by the Bionime Rightest® (99%) but not by the AccuChek® Go (90%). Average BP readings recorded by the aneroid sphygmomanometer and automated monitor gave statistically different results from the mercury but showed positive correlations of 0.999 and 0.998 respectively.

Conclusion: Results demonstrate close agreement between devices used for POCT and reference tests. Different BG meters gave statistically different results but are clinically acceptable. BP monitors differ statistically but correlate well, with the best correlation between the mercury and aneroid sphygmomanometers.

Reference:

1. Spollett GR. Self-monitoring of blood glucose: An underutilized tool. Clin Diabetes 2010; 28: 127-9.

Pharmaceutical Services in Overweight and Obesity Management

Vanessa Petroni

Background: Pharmacists are in an ideal position within communities to manage overweight and obesity situations, via lifestyle modification interventions and point-of-care testing.[1]

Objectives: To set up and implement a weight monitoring program in community pharmacies, to assess its effectiveness and to analyse patients' opinions regarding the pharmacists' role in weight management.

Design: Twenty community pharmacies were selected by stratified random sampling. Ten patients were recruited from each pharmacy via systematic sampling and were equally divided into experimental and control groups. Weight, body mass index (BMI), waist circumference (WC), blood pressure (BP), heart rate (HR), blood glucose (BG) and blood cholesterol (BC) levels were recorded at initiation and at the end of a 4-month program for the control group patients. The experimental group was similarly monitored at 3-week intervals and subjected to the prepared weight management handbook, flyers and pre- and post-intervention questionnaires. Data was analysed using the paired sample t-test and chi-square test by SPSS® version 20.

Setting: Community pharmacies.

Main Outcome Measures: Control and experimental group weight, BMI, WC, BP, HR, BG and BC level monitoring; Experimental group knowledge and opinion evaluation at program initiation and termination.

Results: Knowledge assessment scores increased significantly by 2 score points from 6.56 to 8.56. Patients' opinions regarding pharmacists' knowledge in weight management increased significantly ($p=0.003$). WC decreased significantly in both groups. BG and BC level increased in both groups, with significance ($p<0.05$) in the control group. There was no significant difference in the other parameters for both groups.

Conclusion: Interventions improved patient knowledge and views on pharmacists' availability to provide weight monitoring advice.

Reference:

1. Lenz LT. Minorities and disease prevention in pharmacy practice. Am J Lifestyle Med 2009;3(3):198-200.

Pharmacy Administration

Framework for a Register of Biological Agents in Rheumatology
Florinda Camilleri

Temperature Control and Storage of Medicines in Community Pharmacy
Daphne Coleiro

Perception of Bar Coding in Pharmacy
Colette Galea

Patents in Pharmacy
Lara Giudice

Framework for A Register of Biological Agents in Rheumatology

Florinda Camilleri

Background: Two hundred and fifteen patients currently undergo therapy with biological agents in the Rheumatology Unit (RU) at Mater Dei Hospital (MDH) suggesting the need for a tailor-made pharmacovigilance register.

Objectives: To design a framework for a register of biological agents drawing from other European registers, tailoring it to suit the local situation (smaller population, less resources in the healthcare sector).

Design: Three meetings were held between 2009 and 2011 with a 7-member expert panel (2 rheumatologists, 2 professors of pharmacy and 3 members of the healthcare team of the RU). A framework for this register was set-up following discussions with the panel based on their clinical experience and information from European registers. The framework was validated in November 2011 through administration of a specially formulated expert panel questionnaire (EPQ).

Setting: RU at MDH

Main Outcome Measures: Assessment of quality, clinical feasibility and need for the register through the EPQ.

Results: Six experts strongly agreed and 1 agreed that there is a need to introduce this register in the RU at MDH. Five experts strongly agreed while 2 agreed that the register provides sufficient patient demographics and complete, unbiased data. Five experts strongly agreed, 1 agreed and 1 remained neutral on whether establishment of the register could provide an overall improvement in patient care. While 2 experts strongly agreed and 4 agreed that patients are able to fill in questionnaires without help, 1 expert disagreed. Members of the RU team expressed doubts regarding the lack of time in the busy clinical setting.

Conclusion: Establishment of a register for biological agents in the RU of MDH is a necessity that can be addressed by assigning a healthcare professional to run the register.

Temperature Control and Storage of Medicines in Community Pharmacy.

Daphne Coleiro

Background: The impact of exposure of medicinal products to temperatures outside room temperature (25°C) and fridge temperature (2-8°C) is not well documented and little is known about the effect of specific products if left outside these limits.

Objectives: To compile evidence of storage requirements and give practical examples on how to save on electricity while storing pharmaceuticals within the required temperature conditions.

Design: Storage conditions were compiled for the medications listed in the Marketing Authorisation List– Revision 48–06/2010. Data was gathered from published research papers[1,2], summary of product characteristics and patient information leaflets. When information was not available, the manufacturing company was directly contacted and asked to provide specific data for the Maltese climate.

Setting: Department of Pharmacy

Main Outcome Measures: Data compiled on CD; estimate of electricity bill savings with temperature storage segregation.

Results: Out of the 1794 drugs investigated, it is possible to store 1039 drugs (58%) (stable at 25°C) in an area set at 24°C separately from the remaining 755 (42%) drugs (stable below 30°C) stored at 29°C. Thirty eight out of 40 medical devices could be stored in the area kept at 29°C. Using a typical pharmacy plan, the rate of heat loss was investigated. Electricity bills can be reduced by over €700 and CO_2 emissions by over 4000 kg per pharmacy if temperature storage segregation is adopted for the 5 summer months when temperatures above 30°C are reached.

Conclusion: Whilst ensuring that all pharmaceuticals are stored in accordance to their storage requirements, it is still possible to save on electrical consumption and reduce CO_2 emission.

References:

1. Cohen V, Jellinek S, Teperikidis L, Berkovits E, Goldman W. Room temperature storage of medicines labeled for refrigeration. Am J Health-Syst Pharm 2007;64:1711-5.
2. Strawbridge JD, Van den Dungen A, O'Leary P. Guarding the cold chain: Y2K and beyond; 2008.

Perception of Bar Coding in Pharmacy

Colette Galea

Background: Barcodes are a means of automatically identifying a medicinal product and are useful in several aspects of pharmacy particularly because of the prevention of medication errors.[1]

Objectives: To identify the usefulness of barcodes in pharmacy, to establish what is already being done locally and to suggest any possible improvements to current systems.

Design: A questionnaire on the use of a bar coding system in community pharmacies was distributed to 53 community pharmacists where the system is available. Interviews were carried out with 16 pharmacists working at Mater Dei Hospital (MDH). Results were analysed using SPSS® version 19. The Chief Executive Officer of the 'Pharmacy of Your Choice (POYC)' scheme was interviewed to identify the use of a bar coding system in this scheme.

Setting: Community pharmacies, MDH, POYC Department

Main Outcome Measures: Opinions of pharmacists on the use of bar coding systems in various aspects of pharmacy.

Results: Although some problems were encountered, 52 community pharmacists thought that the use of barcodes is advantageous and would recommend a computerised system as an effective means of monitoring stock. Fifteen hospital pharmacists interviewed agreed that a bar coding system at MDH would be useful, with 4 stating problems that must be overcome. A bar coding system for the POYC scheme has been planned from a very early stage and is targeted for the near future.

Conclusion: Most community pharmacists where a bar coding system is in place have found the system useful and would recommend its use. Hospital pharmacists believe that a bar coding system would be useful in a hospital setting although some difficulties must be overcome for this to be feasible. A bar coding system will be implemented in the POYC scheme to create an auditable system which improves the identification and traceability of medication.

Reference:

1. Cochran GL, Jones KJ, Brockman J, Skinner A, Hicks RW. Errors prevented by and associated with bar-code medication administration systems. Jt Comm J Qual Patient Saf 2007;33(5):293-301.

Patents in Pharmacy

Lara Giudice

Background: Intellectual property denotes legal rights granted as a product of the human intellect.[1] Intellectual property rights refer to the rights granted to the owners and which do not allow others from making use of a particular tangible or intangible asset. They include patents, copyrights, trademarks, and industrial designs, amongst others.[2]

Objectives: To examine the legislation affecting intellectual property and how this affects the pharmaceutical industry, including a study about patentability and the provisions with which the industry must abide.

Design: An examination about patentability was implemented by setting up a series of interviews to study patents and their history in Malta. Bodies which were interviewed include the Industrial Property Registrations Directorate, the Patent Office, the Malta Regulatory Unit and lawyers specialising in intellectual property. A profile on the patents which have been registered in Malta was also created. Interviews were carried out with the local pharmaceutical industry.

Setting: Government agencies and the local pharmaceutical industry

Main Outcome Measures: Patents registration in Malta, analysis of the establishment and development of the local pharmaceutical industry and how this was affected by the regulatory environment.

Results: Statistical data of the history of patents in Malta was generated and trends were observed and compared to those of other European countries. A timeline was created so as to map out what happened in the 10 year lifespan where the industry flourished in Malta.

Conclusion: It is evident that the ever-changing regulatory environment affected the growth of the local pharmaceutical industry.

References:

1. WIPO Intellectual Property Handbook: Policy Law and Use. 2nd ed. Geneva: WIPO Publication; 2004: p.3-4.
2. Davis J, Intellectual Property Law. London: Butterworths LexisNexis; 2001: p. 1-12.

Pharmacy Information

Evaluation of the Pharmacy Practice Resource Unit
Jaclyn Azzopardi

Development of an Adverse Drug Reactions Database-Driven Website
Stephanie Bezzina

Development of a Database of Medicines used in Veterinary Practice
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Impact of an Internet Awareness Campaign for Women's Health
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Angie Marie Brincat

Diabetic Patients Information on Dietary Habits
Ramona Cini

Evaluation of the Pharmacy Practice Resource Unit

Jaclyn Azzopardi

Background: The Pharmacy Practice Resource Unit (PPRU) serves as an information centre and experiential learning site for pharmacy students. It provides students with the opportunity to carry out research-informed and practice-based learning in a simulated community pharmacy setting.[1]

Objectives: To update, evaluate and increase student familiarity with the PPRU as an experiential learning centre.

Design: Evaluation of the students' awareness of the educational benefits of the PPRU was carried out by dissemination of a questionnaire to all pharmacy students (N=106). Following promotion of the unit, a second questionnaire was designed and disseminated to students visiting the PPRU who took part in point-of-care testing (POCT) sessions. The One-Way ANOVA test was used to analyse the student's satisfaction with the PPRU.

Setting: PPRU at the Department of Pharmacy

Main Outcome Measures: Students' perception of the PPRU setup, its resources and POCT demonstrations.

Results: Out of a total of 106 students, 25% (n=27) were not previously aware of the resources in the PPRU and none had used it for research purposes. Forty seven students visited the PPRU following promotion of the unit. All of the students agreed with extending opening hours and the majority would visit the PPRU again to practice POCT (n=38). A mean rating score of 3.9 (highest score = 5.0; lowest score = 1.0) was elicited for the overall layout of the PPRU. The resources accessed most frequently were the medication cupboards (n=35) and the tablet and capsule display (n=33).

Conclusion: Student familiarity with the PPRU as a suitable resource centre and as an experiential learning site improved significantly.

Reference:

1. Dyke M. An enabling framework for reflexive learning: Experiential learning and reflexivity in contemporary modernity. Int J of Lifelong Education [Online] 2009;28(3):289-310 [cited 2011 Feb 13]. Available from: URL: http://www.informaworld.com

Development of an Adverse Drug Reactions Database Driven Website

Stephanie Bezzina

Background: Efficient sources of information and knowledge about the risks involved with drug prescribing limit negative consequences. Database systems are effective in displaying and updating information related to medicine such as adverse drug reactions (ADRs).

Objective: To develop a database accessible through a website containing several classes of ADRs and the drugs that cause them.

Design: ADRs corresponding to 5 classes namely, 'Ear and Labyrinth Disorders', 'Eye Disorders', 'Musculoskeletal and Connective Tissue Disorders', 'Nervous System Disorders' and 'Psychiatric Disorders' were extracted from the Summary of Product Characteristics (SPCs) of each product present in the Malta Medicines List. All drugs known to cause one of these ADRs were listed accordingly in a database created using MySQL. The database was incorporated into a website using PHP programming language built purposely to act as a search tool for this database whereby the user may enter a specific ADR and the list of drugs which causes it are displayed according to incidence.

Setting: Personal computer system equipped with internet services, MySQL, PHP, Apache local host, PHPMyAdmin and HAPedit.

Main Outcome Measures: Use of the database driven website.

Results: Out of 941 products present in the Medicines List, 635 (67%) are known to cause at least one ADR corresponding to the 5 classes included in the database. A total of 996 different ADR terms found within SPCs were collected and classified as follows: 142 'Musculoskeletal and Connective Tissue Disorders', 380 'Nervous System Disorders', 170 'Psychiatric Disorders', 44 'Ear and Labyrinth Disorders' and 260 'Eye Disorders'. Each term was linked to its' 'Preferred Term' within the Medical Dictionary for Regulatory Activities (MedDRA).

Conclusion: The database is an organised way of representing data. Such a database system increases the awareness of risks related to drugs and theoretically the database can make the detection of ADRs and the identification of the culprit drug causing the ADR a much faster process.

Development of a Database of Medicines used in Veterinary Practice

Bernard Soler

Background: The practice of veterinary pharmacy is a relatively new concept in Malta. Most pharmacists practising in a community setting have been presented with prescriptions from pet owners at some time during their career. There is current need for the development and documentation of innovative and effective approach for pharmacists to gain knowledge in this area.[1,2]

Objectives: To develop and compile a practical veterinary pharmaceutical compendium of medicines that are found and used locally.

Design: A list of medicinal products available in the local market, issued by the Veterinary Medicinal Unit, Market Authorizations issued by EMEA and Malta Medicines Authority, were used to identify medicinal products to be included in the Veterinary Compendium. Details included for all the medicinal products were; Indication/s, Species, Method of Administration, Dose/s, Withdrawal Period, Therapeutic Group, Pharmacodynamics, Caution and Contraindications, Side Effects, Pregnancy and Lactation Period, Trade Name/s, Storage Conditions, Manufacturer, Classification as Veterinary or Human Medicine, Presentation/s of drug, Drug Interaction/s and Reference.

Setting: National and international pharmaceutical information, Veterinary Clinics, Veterinary Pharmacies and Community Pharmacies

Main Outcome Measures: Publication of the first edition of the Electronic Veterinary Compendium

Results: The publication includes 462 different active ingredients that can be used in the Veterinary Practice, of which 257 active ingredients are registered as Veterinary Medicinal products and 205 active ingredients are registered as Human Medicinal Products which can used in Veterinary Practice

Conclusion: The compendium presents information about medicinal products used in veterinary medicine only and for medicinal products intended for human use which can also be used in animals. The details included provide background that support pharmacists during dispensing and advising on the use of medicines in animals.

References:

1. Ceresia ML, Fasser CE, Rush JE, Scheife RT, Orcutt CJ et al. The role and education of the veterinary pharmacist. Am J Pharm Educ 2009;73(1):1-9.
2. Grech W. Veterinary pharmaceuticals: A local perspective [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2007.

Perception of a Newsletter for Community Pharmacists

Caroline Mercieca

Background: 'Keeping Abreast' is a newsletter published by Actavis in collaboration with the Department of Pharmacy at the University of Malta between December 2010 and October 2011.

Objective: To publish and evaluate periodic newsletters issued intended to emphasise the importance of pharmacists keeping up-to-date with advances in medicine and providing patient advice.

Design: Five newsletter issues were published and distributed to pharmacists in 208 local community pharmacies, in total 1040. Each newsletter was sent by post with an evaluation questionnaire adapted from a previous study.[1] The newsletter was designed using Microsoft Office Publisher 2007 by adapting an Actavis company template. Each issue consists of 2 articles and an advertorial. The topics covered treatment of medical conditions, medicines and local issues affecting community pharmacy.

Setting: Community pharmacies

Main Outcome Measures: Publication and evaluation of 5 newsletter issues

Results: A response rate of 64.32% (669 questionnaires) was obtained. The majority of pharmacists were between 31-40 years (35%) and 71% were female. Pharmacists agreed that the newsletter layout was attractive (97%, 652) and professional (97%, 649) and the font was clear (95%, 639) and of adequate size (97%, 647). The articles were interesting (98%, 653), informative (97%, 649), useful (95%, 634) and well-written (95%, 633). Pharmacists agreed that article length should be neither longer (83%, 556) nor shorter (84%, 559). English was the preferred language (99.8%, 668). As to further improvements, 11 pharmacists wanted more articles in each issue and 4 pharmacists requested more issues.

Conclusion: The results show that the newsletter is positively regarded by community pharmacists. Pharmacists appreciated the newsletter as an easy way to keep abreast with current developments, local pharmacy issues and as a means of professional update.

Reference:

1. Galea R. Newsletters to community pharmacists [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2009.

Development and Evaluation of a Herbal Medicine Formulary

Maria Spiteri

Background: A herbal medicine formulary is an essential tool for healthcare professionals (HCPs) to assist them while dispensing, prescribing and counseling patients.[1]

Objectives: To compile a formulary containing information on individual drug herbs and herbal medicinal products (HMPs) available locally, distribute it to all community pharmacies and health shops and evaluate its usefulness.

Design: Monographs on every drug herb available locally were assembled after contacting local importers for a list of HMPs that they import and distribute. Each monograph includes the family and medicinal parts, indications, cautions, contraindications, side-effects, drug interactions and dose for all the products containing a particular herb. Validation of the indications was carried out by interviewing 29 patients and 18 HCPs. A questionnaire was distributed to 30 HCPs after printing and distribution of the formulary to evaluate its usefulness.

Setting: Community pharmacies and health shops

Main Outcome Measures: Publication and evaluation of a herbal medicine formulary

Results: A total of 177 herbal monographs have been compiled and 612 herbal products listed. All the 30 participants who completed the questionnaire found the formulary useful with 19 claiming to use it frequently and 7 quite frequently. Twenty nine participants strongly agreed that the formulary helped them learn which HMPs are available locally and 26 participants strongly agreed that the information within the formulary was useful. Participants agreed that it is user-friendly (n=27), that the information included is up-to-date and well referenced (n=29) and that there is the need for a formulary of this kind in Malta (n=28).

Conclusion: The formulary was found to be a very useful tool supporting healthcare professionals in providing advice on the use of herbal medicines

Reference:

1. Atmakuri LR, Dathi S. Current trends in herbal medicines. Journal of Pharmacy Research 2010;3(1):109-13.

Impact of an Internet Awareness Campaign for Women's Health

Daniela Fenech

Background: Through health promotion, evidence-based information is disseminated to target populations to improve current knowledge about health issues and empower individuals to be able to alter their lifestyle behaviour and allow them to self-manage their health.[1]

Objectives: To assess women's current knowledge on eating disorders (13-16 years), pregnancy (>18 years), breast cancer (>25 years) and menopause (>40 years) and to evaluate the impact of an awareness intervention through articles about these conditions, available online on a new educational website 'www.sahhti.com'.

Design: One hundred and seventy nine women were recruited between August and December 2011: Eating disorder (n=63), pregnancy (n=31), breast cancer (n=49) and menopause (n=36). Each participant completed one questionnaire intended to assess knowledge about the condition before the online intervention. The same questionnaire was completed by the same women after the intervention. Comparison of the mean total scores before and after the intervention was statistically analysed using SPSS® version 19 and the paired sample t-test.

Setting: Community Pharmacies in Ghaxaq and Mosta, Gynaecological Clinic at St. James Hospital, General Practitioner Clinic and Private School.

Main Outcome Measures: Evaluation of an online educational intervention on women's health.

Results: The mean total score percentages prior to the online intervention were: Eating disorder (57.5%), pregnancy (58.6%), breast cancer (61.6%) and menopause (67.7%). The women's knowledge scores were tested for improvement after the intervention. The mean total scores of all the conditions obtained in the post-intervention phase were significantly higher than those obtained in the pre-intervention phase (p=0.000).

Conclusion: The online intervention significantly improved the women's knowledge regarding all the conditions indicating that pharmacist intervention was effective.

Reference:

1. Green J, Jones K. Health promotion: Planning and strategies. 2nd ed. London: Sage Publication Ltd; 2010.

Human Papillomavirus Awareness

Angie Marie Brincat

Background: Human papillomavirus (HPV) is the primary cause of cervical cancer.[1]

Objective: To assess the knowledge and awareness on HPV infection and prophylaxis amongst females and healthcare professionals (HCPs).

Design: Two self-administered questionnaires were designed, developed and psychometrically evaluated.[1,2] The women's awareness questionnaire was distributed to 500 adolescent females, young females and patients visiting gynaecological clinics. The HCPs' awareness questionnaire was distributed to pharmacists and general practitioners (GPs). Statistical analysis was carried out using descriptive statistics and the chi-square test on SPSS® version 19.

Setting: 85 community pharmacies, 2 health centres, 2 private clinics, 4 educational institutions, Gynaecology Outpatients and Obstetrics and Gynaecology Ward at Mater Dei Hospital.

Main Outcome Measures: Females' and HCPs' awareness of HPV and the HPV vaccines.

Results: A response rate of 91% (N=457) was obtained for the women's awareness questionnaire and 76 (66%) pharmacists, 40 GPs (31%) and 20 (57%) gynaecologists returned the HCP questionnaire (response rate of 48.6%). There was a statistically significant correlation between sexual activity and knowledge about HPV in females with a higher knowledge occurring in sexually active females (p=0.005). For HCPs, Forty percent of HCPs are aware of the correct dosing schedule for both HPV vaccines locally available whilst 82.4% incorrectly think that barrier contraceptives may prevent HPV transmission.

Conclusion: Sexually active females are more aware of HPV and the vaccines used to prevent it. HCPs have information predominantly about one of the vaccines available.

References:

1. Attard R. Women's awareness of cervical smear test [project]. Msida (Malta): Faculty of Health Sciences, University of Malta; 1994.
2. Pitts M, Clarke T. Human papillomavirus infections and risks of cervical cancer: What do women know? Health Educ Res 2002;17(6):706-14.

Diabetic Patient Information on Dietary Habits

Ramona Cini

Background: There are over 30,000 people[1] who suffer from diabetes in Malta. Nutrition plays a key role in the management of diabetes.

Objectives: To evaluate diabetic patients' perception about nutrition, changes in perception about nutrition in diabetes by restaurant owners from previous studies[2] and to evaluate a set of specialised recipes by diabetic patients and community pharmacists.

Design: Seventy-five diabetic patients and 100 restaurant owners were interviewed using two different questionnaires. A set of specialised recipes were compiled in a booklet and evaluated by the 75 diabetic patients and 25 community pharmacists, by means of a questionnaire, one for each group. SPSS® was used to analyse all questionnaires.

Setting: Community pharmacies and restaurants in Malta and Gozo

Main Outcome Measures: Diabetic patients' and restaurant owners' perception about nutrition in diabetes and a set of specialised recipes by diabetic patients and community pharmacists.

Results: Out of 100 restaurant owners, 89 offer specialised menus and 18 offer diabetic menus. Out of 75 patients, only 1 is diet controlled. Sixty-seven patients claim that the pharmacist helps them mostly by giving treatment advice. Out of 75 patients, 54 completed the booklet questionnaire (72% response rate). Forty-nine stated that they have found them useful whilst 46 had tried them. Out of the 25 community pharmacists, 20 stated that they meet diabetic patients who ask for a dietary advice, out of which 18 stated that the booklet is relevant in answering such queries.

Conclusion: There is a 17.6% increase in restaurants who offer specialised diabetic menus and a 55.3% increase in pharmacists who provide advice to the patients, when compared to the study carried out in 2008.[2]

Reference:

1. Malta Diabetes Association [Online]. 2010 [cited 2011 Dec 16]; Available from URL: http://www.diabetesmalta.org/index.html
2. Degiorgio Y. Nutrition in diabetic patients [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2008.

Regulatory Affairs and Industrial Pharmacy

Proposal for Setting a Mini-Scale Solid Oral Dosage Form Production Facility
Ruth Zerafa

Development of a Quality System for Pharmacy Teaching Laboratories
Corinne Muscat Terribile

Development of a Quality System Template for Partial Manufacturing of Pharmaceuticals
Aaron Demanuele

Quality Systems in Good Distribution Practice
Suzanne Buttigieg

Proposal for Setting a Mini-Scale Solid Oral Dosage Form Production Facility

Ruth Zerafa

Background: Malta's legal and regulatory framework and its membership in the European Union have led to an increase in pharmaceutical activities. New initiatives to enhance and compliment the current pharmaceutical base are currently being sought.

Objectives: To study the current local scenario with respect to the generic oral solid dosage (OSD) facilities, to determine the potential deliverables of and assess the local needs for a mini-scale OSD facility, to plan and design such a facility as part of a pre-design study and to draw up estimates of the fixed capital investment (FCI) involved.

Design: Interviews with the major pharmaceutical stakeholders and questionnaires amongst the local generic OSD facilities were conducted. A literature review was carried out and a multi-disciplinary panel of experts assembled. Special focus was given to facility layout, flow of personnel and material, process flow diagrams, main process equipment and utilities. Based on the method of percentage of purchased equipment cost[1] the FCI was estimated.

Setting: Local generic OSD facilities; Malta Medicines Authority; Malta Enterprise

Main Outcome Measures: Identification of the need for such a facility amongst local OSD facilities and major pharmaceutical stakeholders; Estimation of the FCI based on a standard, non-specific template designed to explore the potentials identified for the facility under study.

Results: The 2647m^2 facility is to be a standalone, multi-purpose, non-sterile facility, accredited to current Good Manufacturing Practice. It is to cater for research and development, manufacturing and quality control, repackaging, micronisation, training and education. Taking into account governmental incentives, the FCI estimated is approximately €8,402,944.29 (±30%).

Conclusion: From local feedback obtained from generic OSD facilities and pharmaceutical stakeholders, the project is feasible for Malta.

Reference:

1. Peters MS, Timmerhaus KD, West RE. Plant design and economics for chemical engineers. 5th ed. Singapore: McGraw-Hill; 2004.

Development of a Quality System for Pharmacy Teaching Laboratories

Corinne Muscat Terribile

Background: The implementation of a quality system in University-based laboratories gives significant value to the institution by introducing the concept of quality awareness among students.[1]

Objectives: To develop, monitor and evaluate a laboratory quality system.

Design: Previously implemented high level Standard Operating Procedures (SOPs) were evaluated using questionnaires by pharmacy students participating in laboratory practical sessions, laboratory demonstrators and subject coordinators (N=98). Subsequently the new SOP versions were implemented and re-evaluated by the same participants during the following academic year and the One-Way ANOVA test was used to determine any significant improvement. SOPs for laboratory equipment and point-of-care testing devices were developed, tested and implemented. Equipment laboratory logbooks were issued. The implemented quality system was then evaluated by students and laboratory demonstrators (N=94). SPSS® version 17 was used to manipulate the data.

Setting: The 4 laboratories of the Department of Pharmacy, University of Malta

Main Outcome Measures: SOP library and assessing the application and relevance of the developed quality system to teaching laboratories.

Results: Forty two SOPs were developed and 53 laboratory logbooks were issued. A significant improvement was recorded for most of the questionnaire statements used to evaluate the new versions of the high level SOPs. The introduction of flow charts to the SOPs was positively rated. The majority of participants agreed that the overall implemented quality system is important to carry out procedures correctly and safely within the laboratory (n=91) and also felt that it is a helpful educational tool for students to appreciate quality processes in pharmacy (n=84).

Conclusion: The majority of participants had a positive overall perception of the implemented quality system, accepting its importance as an educational tool within the laboratory and its relevance to support them to carry out procedures correctly and safely.

Reference:

1. Rodima A. ISO 17025 quality system in a university environment. Accred Qual Assur 2005; 10:369-72.

Development of a Quality System Template for Partial Manufacturing of Pharmaceuticals

Aaron Demanuele

Background: Medicinal products imported from outside the European Union (EU) or brought into a country through parallel importation may require partial manufacturing which must be carried out in a Good Manufacturing Practice (GMP) certified partial manufacturing facility.[1]

Objectives: To develop Standard Operating Procedure (SOP) templates that facilitate the application of GMP in partial manufacturing plants.

Design: The SOPs were written based on data triangulated from semi-structured interviews, participant observation and non-participant observation. These templates were validated through a gap analysis with the 'EU Guide to Good Manufacturing Practice'[2] and through expert review by 5 professionals.

Setting: Two partial manufacturing facilities selected through purposive sampling.

Main Outcome Measures: The templates' comprehensiveness with respect to the 'EU Guide to Good Manufacturing Practice' and their applicability to a diverse range of quality systems.

Results: Twenty-seven SOP templates that can serve as a backbone for the establishment of a quality system for a specific partial manufacturing facility were developed. The GMP topics covered in the templates are exhaustive and well described.

Conclusion: The templates facilitate the application of GMP principles in partial manufacturing plants by serving as a starting point and comprehensive guide for the quality systems in such facilities.

References:

1. Bird R, Chaudhry P. Pharmaceuticals and the European Union: Managing gray markets in an uncertain legal environment. Virginia Journal of International Law 2010;50(3):719-56.

2. The European Commission. Guidelines for good manufacturing practices for medicinal products for human and veterinary use. Eudralex [Online]. 2011 [cited 2011 Feb 8]. Available from: URL: http://ec.europa.eu/health/documents/eudralex/vol-4/index_en.htm

Quality Systems in Good Distribution Practice

Suzanne Buttigieg

Background: The pharmaceutical field is a highly regulated area. Correct regulation ensures safety and quality.

Objective: To address potential quality improvements within the pharmaceutical chain of Good Distribution Practice (GDP). The top three deficiencies were reported to be temperature control, monitoring and inadequate written procedures.[1]

Setting: Three wholesale dealers participated in the study. These wholesale dealers shared standard operating procedures (SOPs) related to GDP and allowed observation of activities that they carried out.

Design: Following extensive documentation, analysis of SOPs found at these wholesalers, GDP guidelines (94/C 63/03), the Medicines Act III of 2003 (as amended) and Legal Notices was carried out. Training was conducted at wholesaler A followed by assessment. Nine temperature loggers were chosen and suitably spaced at wholesaler B. The actual, minimum and maximum temperatures were recorded daily at 8am for five successive days in two extreme seasons.

Main Outcome Measures: Awareness of personnel of roles and responsibilities; identification of warmer areas in the store.

Results: After training, the personnel achieved a mean mark of 97%, indicating that they understood their roles and responsibilities well. When comparing the mean temperatures obtained in December 2010 with those obtained in August 2011, a p-value less than 0.05 was obtained indicating a statistically significant difference.

Conclusion: Training of personnel is an important contributor to GDP. Changes need to be implemented in the cooling system as the maximum temperatures in August 2011 reached 25°C.

Reference:

1. Orme T. The Top 10 deficiencies and counterfeit awareness [Online]. UK: MHRA; 2008. [cited 2010 Jan 3]. Available from URL: http://www.mhra.gov.uk/home/idcplg?IdcService=GET_FILE&dDocName=CON028447&RevisionSelectionMethod=Latest

Drug Design

Framework for the Compilation of a Two/Three-Dimensional Molecular Database
Luke Doublet Meagher

Dissemination of Two/Three-Dimensional Molecular Database
Michael Miller

Optimisation of Lead Molecules based on the Structure of Maltanedienol
Maria Cassar

Optimisation of Tyrosine-Based Lead Molecules Capable of Modulation of the Peroxisome Proliferator-Activated Receptor
Julienne Ciantar

Optimisation of Betag-Amyrin and Lisinopril-Based Lead Molecules Capable of Modulating Angiotensin Converting Enzyme
Deborah-Louise Farrugia

Optimisation of Abiraterone and MDV3100-Based Lead Molecules
Alexandra Grima

Optimisation of Lopinavir-Based Lead Molecule Capable of Modulation of the HIV-1 Protease Enzyme
Chantelle Micallef

Framework for the Compilation of a Two/ Three-Dimensional Molecular Database

Luke Doublet Meagher

Background: The provision of effective tuition is a challenging notion to educators in all disciplines. This is particularly true when trying to transmit abstract concepts.

Objectives: To create a datasheet of drugs derived from 'Chapter 2: Cardiovascular System' in the British National Formulary[1] and draw Two / Three-dimensional structures of these drugs. This will be done using computer programs SYMYX and SYBYL.[2] These structures will then be included into a molecular database which will be made available online.

Design: The validity of the database was tested using questionnaires distributed to pharmacy students during lectures and during special sessions in the computer laboratory before and after using the database. Scores from the questionnaires were calculated and descriptive statistics were undertaken using the paired sample t-test and one-way ANOVA.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: Development and evaluation of a molecular database of cardiovascular drugs.

Results: The paired sample t-test proved an overall statistically significant improvement in score values after using the database (p=0.000). The one-way ANOVA test also proved statistical significance in mean score values obtained from students in different course years (p=0.000).

Conclusion: The results obtained prove that the database improved the students' knowledge. The results also showed that the conventional learning methods are effective since there is a marked improvement in knowledge between students in different course years.

References:

1. British Medical Association/Royal Pharmaceutical Association of Great Britain. BNF 52. UK (London): BMJ Publishing Group Ltd/RPS Publishing; 2006.
2. Ash S, Cline MA, Homer WR, Hurst T, Smith GB. SYBYL Line Notation (SLN): A versatile language for chemical structure representation. J Chem Inf Mod 1997;37(1):71-9.

Dissemination of Two/Three-Dimensional Molecular Database

Michael Miller

Background: Knowledge of the molecular structure of a drug is important to understand the fundamental principles of medicinal chemistry.[1] A database provides a convenient means of accessing such structures.

Objectives: To compile and disseminate a database of molecular structures of drugs affecting the central nervous system (CNS).

Design: Both Two / Three-dimensional (2D/3D) depictions of drug molecules affecting the CNS were generated using computer software and were compiled into a database and made available online. A questionnaire was distributed to undergraduate pharmacy students (N=107) to evaluate their knowledge of molecular structures. Data was analysed using Microsoft® Office® Excel 2007 and SPSS® version 17.

Setting: Department of Pharmacy, University of Malta.

Main Outcome Measures: Compilation and dissemination of a database.

Results: One hundred and eighty two 2D/3D structures were drawn and compiled into a database. Mean scores obtained for first (n=46), second (n=35) and third (n=26) year students are 3.43, 7.11 and 16.04 respectively out of a total maximum score of 24. Student knowledge was distributed as follows: Basic principles of medicinal chemistry (55.4%), drugs acting on anxiety and depression (35.9%), drugs used in Parkinson's disease (19.1%), drugs used in psychosis (29.5%) and analgesics (42.3%).

Conclusion: Data from the questionnaire showed that compared to first and second year students, third years also showed a greater appreciation of the chemical structures of drugs acting on the CNS.

Reference:

1. Allen FH, Battle GM, Ferrence GM. Teaching three-dimensional structural chemistry using crystal structure databases: 1. An interactive web-accessible teaching subset of the Cambridge structural database. J Chem Educ 2010;87(8):809–12.

Optimisation of Lead Molecules based on the Structure of Maltanedienol

Maria Cassar

Background: Maltanedienol is a novel phytoestrogen exhibiting selective oestrogen receptor modulating (SERMs)–like properties.[1]

Objectives: To determine and assess oestrogen receptor (ER) modulation by maltanedienol using in silico techniques.

Design: Having the 3D cystallographic structures of the ER bound to 17-β oestradiol (EST), raloxifene (RAL) and tamoxifen (OHT) from the PDB, molecular modification of the receptor was carried out. Maltanedienol was used to generate a number of conformers (n=21) within the respective ER ligand binding pocket (LBP) and the best conformer in each case was identified. The chosen conformer was then edited to produce seeds that would be further optimised into lead compounds.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: Symyx® Draw-drawing structures in 2D, Sybyl-X-molecular modelling and calculating LBE, LigBuilder-LPB elucidation and seed generation, XSCORE-calculating Ligand Binding Affinity (LBA), VMD-visualising molecules.

Results: The LBA of EST, RAL and OHT to their cognate receptor were 7.22 pKd, 8.41 pKd and 7.76 pKd respectively. These are baseline measures against which all other successive results were compared. The LBA of the best maltanedienol conformer for the ER when bound to EST, RAL and OHT were 7.29 pKd, 7.23 pKd and 7.41 pKd. From these, the second conformer was chosen for further development.

Conclusion: The binding affinity of maltanedienol for the ER is comparable to that of EST. This may indicate that in vivo maltanedienol would bind to the ER. The best maltanedienol conformation for the ER chosen (7.23pKd) is also comparable to that for RAL when bound to the ER. Further seed generation and lead optimisation may lead to the identification of novel therapeutic targets.

Reference:

1. Galea R, Attard Montalto S, Brincat M, Saliba C, Serrar M, Gutierrez G, Salles JP. Phytoestrogen/SERMs like activity from a marine alga derived molecule on bone density and collagen markers in postmenopausal women. International Journal of Gynecology and Obstetrics 2000;70(1)Suppl 1:31-31.

Optimisation of Tyrosine-Based Lead Molecules Capable of Modulation of the Peroxisome Proliferator-Activated Receptor

Julienne Ciantar

Background: The ADOPT trial has shown that Peroxisome Proliferator-Activator Receptor γ (PPARγ) agonists, effective in the management of diabetes mellitus, are associated with an increased incidence of fractures. Literature indicates that there are two agonist bound conformations of the PPARγ as exemplified by its binding to rosiglitazone and that to farglitazar.[1]

Objectives: To prove or otherwise this hypothesis and design a series of molecules with the potential to act as leads in a drug design process, ultimately producing drug-like molecules capable of agonist activity at the PPARγ.

Design: Ligand binding affinity (LBA) of rosiglitazone and farglitazar within their cognate receptors was measured. The ligands were switched and LBA re-determined. The second part of the study aimed at designing non-thazolidinedione L-tyrosine based PPARγ agonists.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: Symyx®; drawing 2D structures, Sybyl®; modelling, LigBuilder®; LBP elucidation, XScore®; LBA calculation, VMD® and Molsoft®; displaying and animating molecules.

Results: Binding affinities of rosiglitazone and farglitazar within their cognate receptors were 6.62 and 9.70 respectively. After swapping ligands, the best binding pose of farglitazar was pose 17 having a binding affinity of 8.12 and of rosiglitazone was pose 19 having an affinity of 6.16. Multiple families of compounds were generated for each of the seeds and 30 ligands have been selected for suggestion as potential ligands for a novel drug design project.

Conclusion: Farglitazar has access to more parts of the receptor than does rosiglitazone. This implies that the two PPARγ conformations are different.

Reference:

1. Gampe RT, Montana VG, Lambert MH, Miller AB, Bledsoe RK, Milburn MV et al. Asymmetry in the PPARγ/RXRα crystal structure reveals the molecular basis of heterodimerization among nuclear receptors. Mol Cell 2000;5:545-5.

Optimisation of Beta-Amyrin and Lisinopril-Based Lead Molecules Capable of Modulating Angiotensin Converting Enzyme

Deborah-Louise Farrugia

Background: In vitro and clinical studies indicate that the hydroethanolic extract of Crataegus monogyna has ACE inhibitory activity.[1]

Objectives: To establish whether the nature of the bound template ligand, in this case enalaprilat and lisinopril, yields new and alternative information regarding the possible binding modalities of the active principles of the triterpene extract of Crataegus monogyna.

Design: The X-ray crystallographic depositions 1UZE and 1O86 describing the bound coordinates of enalaprilat and lisinopril with ACE respectively were used. Bioactive conformations of enalaprilat and lisinopril were extracted. Binding conformers using the extracts as templates were generated. The Ligand Binding Affinity (LBA) of each was calculated and the best binding pose of each tripene was established. De novo design based on the triterpene scaffold and lisinopril was attempted.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: LigBuilder®-LBP elucidation and de novo design; Sybyl®- modeling; VMD- molecule display and animation; XSCORE- LBA calculation.

Results: The LBA of enalaprilat and lisinopril for the ACE (pKd 6.44 and 6.53 respectively) were established. Binding modality and three-dimensional volume occupied by enalaprilat and lisinopril were used to predict 21 best possible binding conformers for each triterpene. The best binding conformation for each was identified and compared to that resolved in the study by Mifsud.[2]

Conclusion: The in vitro hypothesis was further validated.

References:

1. Attard E, Attard H. The potential angiotensin-converting enzyme inhibitory activity of oleanolic acid in the hydroethanolic extract of Crataegus monogyna Jacq. Nat Prod Commun 2006;1(5):381-5.
2. Mifsud S. Investigating the angiotensin converting enzyme inhibiting properties of naturally occuring terpenes using in silico models [project]. Msida (Malta): Department of Pharmacy, University of Malta; 2011.

Optimisation of Abiraterone and MDV3100-Based Lead Molecules

Alexandra Grima

Background: Castration-resistant prostate cancer (CRPC) initially responds to medical or surgical castration only to result in androgen receptor (AR) reactivation. Two novel chemical entities, abiraterone and MDV3100, target the specific alterations present in the AR signalling pathway in CRPC.[1]

Objectives: To understand the binding modality of metribolone and bicalutamide for the AR ligand binding pocket (AR_LBPandto establish the ligand binding affinity (LBA) for the AR and to propose novel lead molecules.

Design: The X-ray crystallographic deposition 1E3G and 1Z95 describing the bound coordinates of metribolone and bicalutamide with the AR respectively were used. Abiraterone and MDV3100 were constructed and the LBA for each structure was calculated. The best binding pose for abiraterone and MDV3100 were resolved.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: Symyx®: Drawing two-dimensional structures, Sybyl®: Modelling, LigBuilder®: LBP elucidation, XScore®: LBA calculation, VMD® and Molsoft®: Displaying and animating molecules.

Results: The LBA of metribolone (pKd 7.44) and bicalutamide (pKd 7.38) for the AR were used as a baseline against which the affinities of abiraterone and MDV3100 could be compared. Binding modality and 3D volume occupied by the ligands within the AR_LBP were used to predict the best possible binding conformation for abiraterone (pKd 7.23) and MDV3100 (pKd 7.15).

Conclusion: There is sufficient evidence to suggest that continued modification of abiraterone and MDV3100 could yield innovative anti-prostate cancer agents with better efficacy and side-effect profile.

Reference:

1. Eichholz A, Ferraldeschi R, Attard G, De Bono JS. Putting the brakes on continued androgen receptor signalling in castration-resistant prostate cancer. Molecular and Cellular Endocrinology [Online] 2011 [cited 2012 Jan 25]. Available from: URL: http://dx.doi.org/10.1016/j.mce.2011.09.038

Optimisation of Lopinavir-Based Lead Molecule Capable of Modulation of the HIV-1 Protease Enzyme

Chantelle Micallef

Background: Several novel molecules have been found to show in vitro affinity in the picomolar range for the HIV-1 Protease (HIV-1 PR) implying an inhibitory capability.[1]

Objective: To evaluate *in silico* Ligand Binding Affinity (LBA_*in silico*) of the selected PDB depositions in an attempt to propose linearity between *in vitro* Ligand Binding Affinity (LBA_*in vitro*) and LBA_*in silico* and to propose *de novo* lead molecules.

Design: The apo form of X-ray crystallographic deposition 1EC0 was selected. Several other ligands were extracted from their respective Ligand Binding Pockets (LBP) and all possible high affinity conformations were docked into the apo 1EC0. The LBA_*in silico* of each conformation was calculated. The study then proceeded with the design of *de novo* lead molecules.

Setting: Department of Pharmacy, University of Malta

Main Outcome Measures: VMD-display and animation of the molecules, Symyx®-drawing of the two-dimensional structures, Sybyl®-modelling of molecules, XSCORE–LBA estimation, LigBuilder®-elucidation of the LBP.

Results: The LBA_*in silico* of the ligand bound to 1EC0 was the highest when compared to the other depositions (pKd 9.46) and thus the apo receptor was used. The selected LBA_*in silico* were 7.23 (BEJ), 7.37 (BEC), 7.63 (BEI), 7.64 (MS3), 7.90 (BEE), 8.93 (BED), 9.03 (BE6) and 9.18 (BE5) respectively. The R2 value for the plotted values of Ki (*in vitro*) versus pKd (*in silico*) was 0.9919 which was considered as a satisfactory hypothesis. Design of *de novo* ligands was carried out using Lopinavir. Two hundred ligands were proposed and the respective LBA_*in silico* ranged from 9.80–10.

Conclusion: Further structural optimisation of these molecules could be an alternative way of predicting the respective LBA_*in vitro* which could lead to the identification of *de novo* HIV-1 PR inhibitors.

Reference:

1. Andersson HO, Fridborg K, Löwgren S, Alterman M, Mühlman A, Björsne M et al. Optimisation of P1-P3 groups in symmetric and asymmetric HIV-1 protease inhibitors. Eur J Biochem 2003;270(8):1746-58.

M.Sc. Pharmacy
Project Descriptions

Guidelines Comparison and Assessment of Prescribing Trends in Parkinson's Disease
Asmaa Abdul-Aziz

Drug Information Bulletin
Alison Brincat

Critical Analysis of the Dispensing System at Mater Dei Hospital
Kathlene Cassar

Pharmacy Of Your Choice Scheme and Management of Hypertension
Judith Fenech

Cost Analysis of Standard Operating Procedures in Community Pharmacies
Caroline Grima

Pharmacist-Led Diabetic Patient Monitoring
Jasmine Vella

Guidelines Comparison and Assessment of Prescribing Trends in Parkinson's Disease
Asmaa Abdul-Aziz
Assessment of adherence of Parkinson's Disease (PD) treatment decisions to guidelines was undertaken. Data was collected from 91 patient medication profiles in a rehabilitation hospital setting. Results showed that in patients taking no medications for PD (n=25), initiation of treatment adhered to guidelines. Out of the remaining 66 patients admitted with a history of PD treatment, 13 patients were kept on same treatment, 45 patients had amendments which adhered to guidelines and only 8 patients were prescribed treatment which did not adhere to guidelines. Risk of adverse events, co-morbid conditions and patient non-compliance contributed to treatment decisions which did not adhere to guidelines.

Drug Information Bulletin
Alison Brincat
An online issue of a 'Drug Information Bulletin' was compiled to reflect updates in information for medicinal products available locally particularly variations in the Summary of Product Characteristics and inclusions of new medicinal products in the Government Formulary List. The bulletin was evaluated by pharmacists, other health care professionals and students. Ninety-six percent (n=120) of participants claimed that the information presented was new to them. The requirement of a similar bulletin was requested by 97% (n=121) of the respondents.

Critical Analysis of the Dispensing System at Mater Dei Hospital
Kathlene Cassar
A critical analysis to identify strengths and weaknesses within the present dispensing system at Mater Dei Hospital was carried out. Areas for improvement were evaluated through discussions with pharmacists and pharmacy technicians. It emerged that whilst trying to encourage the rational and safe use of medicines, the current system has an overload of burocratic procedures to the extent that these are perceived to restrict the pharmacists' professional desicions when dealing with individual patients. Alternative processes are recommended for a more patient-friendly system.

Pharmacy Of Your Choice Scheme and Management of Hypertension
Judith Fenech
Hypertensive patients (N=35) who were receiving their medications from a community pharmacy through the Pharmacy Of Your Choice (POYC) scheme participated in the study where they completed two different questionnaires on three occasions over six months. Patients' risk factors, body mass index, treatment, blood pressure and pulse monitoring by the pharmacist were recorded. Patients received individualised advice by the pharmacist. By the end of the study, 54% of the blood pressure and pulse readings fell in the normal range from an initial 37%, referral to the general practitioner decreased from 69% to 49% and patients had rationalised treatment.

Cost Analysis of Standard Operating Procedures in Community Pharmacies
Caroline Grima
Four standard operating procedures (SOPs) for two registered community pharmacies were developed and psychometrically evaluated. The SOPs compiled were: 'Inward orders: Narcotic and Psychotropic Drugs', 'Inward orders: Cold Chain Products', 'Temperature Monitoring and Control', 'Pest Control and Housekeeping'. The capital and recurrent costs involved for implementing each SOP in the two pharmacies were calculated and compared. No significant difference in cost was observed between the two pharmacies.

Pharmacist-Led Diabetic Patient Monitoring
Jasmine Vella
Information from thirty type 2 diabetic patients was collected by patient interview and analysis of patient files. Compliance to medication and frequency of glucose testing were noted before and after pharmacist intervention, which included an educational session and the handing out of a diabetes patient information leaflet. Patient compliance and frequency of glucose testing increased following pharmacist intervention. Ten of the patients were tested for HbA1c. Two of these patients obtained HbA1c values of 7% or higher and were referred since these results were out-of-range and not indicative of good blood glucose control.

Fourth Year Students
Project Descriptions

Quality Management System for the Non-Clinical Pharmacy Services at Rehabilitation Hospital Karin Grech

John Agius

Standard operating procedures (SOPs) for the non-clinical pharmacy services at Rehabilitation Hospital Karin Grech (RHKG) were developed. The services for which SOPs were to be developed were identified through observation of current practice. The SOPs were written and validated twice by a panel consisting of pharmacy staff. These SOPs will complete the quality management system at RHKG where SOPs for the clinical pharmacy services have already been implemented.

Auditing of the Standard Operating Procedures for Clinical Pharmacy Services at Rehabilitation Hospital Karin Grech

Jonathan Agius

Five standard operating procedures (SOPs) for the clinical pharmacy services implemented at Rehabilitation Hospital Karin Grech (RHKG) are being audited. The implemented SOPs are used as the set standards and the audit is being undertaken by observation and documentation. The procedures to be audited are 'patient admission', 'patient profiling', 'prescription monitoring', 'patient discharge' and 'patient medication trolley check'. An audit tool for each SOP was created. The 'patient admission' and 'patient profiling' SOPs were audited during a three-month period observing six pharmacists.

Post-Operative Analgesic Management in Patients undergoing Open Heart Surgery

Danika Agius Decelis

Patients undergoing open heart surgery were divided into an intervention and a control group. A pilot study comprising fourteen patients was carried out. The intervention group was given extra information on pain relief. Two questionnaires, a diary and a pain score chart given to all patients were analysed. Four and six patients were in the intervention and control group respectively. Four patients were eliminated. The intervention group showed a statistically significant reduction in pain compared to the control group.

Point-of-Care Testing: *Helicobacter pylori*

Daniel Attard

Two serological point-of-care tests detecting *Helicobacter pylori* (*H. pylori*) were chosen to determine their practicality, feasibility and patient acceptance in a community setting. Forty patients recruited from a hospital and community setting which fitted the required inclusion criteria were tested for *H. pylori* using these kits and were asked to complete a questionnaire about their characteristics, history and perception of the tests. Nine patients tested positive to *H. pylori*, of which five had false positive and/or false negative results. Thirty-one patients tested negative for *H. pylori*.

Pharmacovigilance

Elise Axiak

The design and implementation of a training program for a pharmacovigilance system present at a local medical gases production company was attained. Training includes an introduction to pharmacovigilance, the reception of reports, their significance and the appropriate actions to be taken subsequently. Training ensures personnel working at the company are made aware and knowledgeable of the relevant standard operating procedures depending on their job description. Training was prepared through the use of audio-visual aids, which was subsequently disseminated for validation by an expert group.

An English-Maltese Dictionary of Pharmaceutical and Medical Terms

Ruth Bonnici

The compilation of a dictionary of pharmaceutical and medical terms from English to Maltese from letters 'L' to 'M' was carried out to follow previous compilations from letters 'A' to 'K'. Translated terms published in the 'Medicines Authority Glossary of Terms' and in 'Aquilina's Dictionary' are used as reference sources. Terms (N=1,706) starting with letters 'L' and 'M' listed in 'Mosby's Medical, Nursing and Allied Health Dictionary' were translated and validated with a linguist. Of these terms, 1,599 are newly translated. Validation with laymen and healthcare professionals is undertaken.

Creation of a Two / Three-Dimensional Molecular Database of Drugs used to Target the Endocrine System

Denise Borg

Development of an instructional database using drugs enlisted under the 'Endocrine system' in the British National Formulary was undertaken. Eighty two drugs were drawn in their two-dimensional structure using Symyx® Draw 3.2 and their physico-chemical properties were generated. The three-dimensional structures were drawn using Sybyl-X® 1.1 and for seventeen of these drugs, a complex-drug receptor image was drawn with VMD® 1.9 by using Protein Data Bank entries. All images are currently being collated into an online searchable database for students to use as an adjunct to their studies.

Prescribing of Analgesics in Community Pharmacy

Christina Cachia

A questionnaire to evaluate the use and self-medication of non-prescription analgesics for different types of pain was administered to 444 students (154 male, 290 female) aged between 14 and 19 years. Results show that the type of pain which most frequently required medication is head pain and that the most common non-prescription analgesic used is paracetamol. Results also indicate that the most frequent source of medication and information are parents or guardians.

Creation of a Two / Three-Dimensional Molecular Database: Drugs used in Malignant Disease and Immunosuppression

Ryan Camilleri

This project takes advantage of computational graphics including cue depth imaging and lighting effects to depict two / three-dimensional (2/3D) images of drug molecules and their recepting molecules. A searchable 2/3D database of molecules and their receptors is constructed. Cytotoxic drugs, drugs affecting the immune system, sex hormones and hormone antagonists in malignant disease are considered. Two-dimensional images were created using Symyx® and three-dimensional images were created using VMD® and Sybyl®.

Comparative Costs of Cardiovascular Drugs

Mark-George Cardona

The cost of all the cardiovascular drugs found in the community setting was obtained. A price comparison was carried out between originator products and their generic counterparts. Furthermore fluctuation in prices over the past 10 years was assessed. This project will provide healthcare professionals with useful knowledge of the cardiovascular drugs available in the community setting along with an insight on the range of price differences between generic and originator products.

Drug Administration Systems in Elderly Patients

Angela Cassar

The drug administration systems used at Karin Grech Rehabilitation Hospital and St Vincent de Paul residence were assessed and compared. Following an observation of two weeks at the institutions, a medication observation sheet developed in an earlier local study was re-evaluated and re-validated for applicability and practicality. The observation sheet was found to be applicable for the detection of errors, the commonest error being 'drug left next to the patient'. A prescription error sheet was developed to review treatment charts to detect any errors. The prescription error sheet was validated.

Creation of Two / Three-Dimensional Molecular Database: Drugs used to Target the Respiratory System

Sara Jo Cassar

Visual aids are invaluable tools to learn medicinal chemistry. An understanding of the intricacies of torsion and conformation of complex molecules found in contemporary therapeutic armamentaria will be attained through the construction of a searchable two / three-dimensional molecular database. Drugs targeting the respiratory system were used as case studies. Software packages were used to highlight key drug interactions occurring with their endogenous cognate receptors.

Access to Pharmacy Services

Simon Corrieri

Pharmacy services in Malta are only available to consumers during the pharmacy opening hours. To accommodate house bound consumers and provide advice during pharmacies closing time, a consumer helpline for pharmacy services was established and a detailed study about the system was performed. An agreement has been reached with a service provider to host a "5 Range" premium number and authorisation from the Malta Communications Authority has been obtained. Sponsorship for the helpline has been provided by the pharmacist who was appointed as the helpline operator.

Formulary for Non-British National Formulary Cited Items

Daniel Corso

The 'Maltese Medicines Handbook', a publication which contains information about medicinal products not listed in the British National Formulary (BNF) was updated. The list of medicinal products published by the Medicines Authority was used to identify products to be included. Information on these products was obtained from the summary of product characteristics, while prices were identified from community pharmacies. Currently 474 products have been identified and included in the handbook. These include 49 products which are currently not present in the BNF.

Metabolic Syndrome and Patient Management

Leanne Cutajar

Hundred patients have been recruited from the Endocrine and Diabetes Clinic at Mater Dei Hospital (MDH). Of these, thirty-three were confirmed fit to participate in weight management and aerobics programs organised by the Health Promotion Department. Leaflets about healthy eating and exercise were sent by post to this intervention group. Currently thirteen patients applied to participate. All volunteers will be followed at MDH where patient interviews and biological markers (weight, waist circumference, blood pressure and blood tests) are used as outcome measures.

Creation of a Two / Three-Dimensional Molecular Database: Drugs used in Obstetrics, Gynaecology and Urinary Tract Disorders

Mariana Ellul

Methodologies that help render abstract concepts more tangible are recognised as being invaluable tools in teaching. Using SYMYX® software, two-dimensional structures for drugs used in gynaecology, obstetrics and urinary disorders were generated. The focus was shifted to the creation of their respective three-dimensional structures using SYBYL® software. Interactions with receptors of interest were highlighted using VMD®, yielding pictures of ligand-protein complexes.

Preparing a Course for Pharmacist Prescribing

Andrew Fenech

A set of tools on pharmacist prescribing were created according to the results obtained in a previous local study. The tools were prepared using Microsoft® PowerPoint for ease of presentation. The modules convey information on practical aspects of prescribing, pharmacology and therapeutics, prescribing in a multidisciplinary team, prescribing by means of therapeutic plans and electronic prescribing. Validation was carried out by a panel of experts consisting of two academic pharmacists, two community pharmacists, a clinical pharmacist and a consultant.

Design of Novel 3-Hydroxy-3-Methyl-Glutaryl-CoA Reductase Inhibitors

Denise Formosa

This project targets the 3-hydroxy-3-methyl-glutaryl-CoA (HMG-CoA) reductase enzyme in an *in silico* study. *in silico* binding affinity and binding energy for HMG-CoA reductase inhibitors (rosuvastatin, atorvastatin, simvastatin, fluvastatin and cerivastatin) was measured against the co-ordinates of the HMG-CoA reductase molecule, originally bound to rosuvastatin. Results obtained are to be used in the creation of a tool to predict *in vitro* binding affinity of *de novo* ligands for the HMG-CoA reductase enzyme.

Gastric Amylase Activity and Use of Proton Pump Inhibitors

Charlene Galea

Different proton pump inhibitors (PPIs) may affect gastric amylase activity to varying degrees. Twenty five gastric juice samples were collected. Out of the 25 samples, 12 patients were taking PPIs. The 13 patients which were not on PPIs were used as the control group. Five of the patients on PPIs had finished their treatment course a few days before the samples were collected. The samples analysed had pH values ranging between 1.23 and 8.38 and were tested for both salivary and pancreatic α-amylase, using the Reflotron® analyser.

Investigating the Anti-Oestrogenic Effects of Ephedrine

Kathryn Galea

This *in silico* project seeks to evaluate the hypothesis that ephedrine possesses anti-oestrogenic effects. The X-ray crystallographic model of oestrogen bound to the oestrogen receptor (1ERE) was chosen from the protein data bank as a template for this study. Ephedrine isomers were constructed *de novo* in SYBYL and conformers were generated. Binding affinities of each conformer were compared to that of oestrogen using SCORE.

Pharmacist Recommended Non-Prescription Medicines

Sephora Galea

Procedures followed when pharmacists recommend non-prescription medication were assessed. A list of locally available non-prescription medications was compiled and is being updated. A questionnaire was developed and validated by a panel of experts. The final modified version was distributed to managing pharmacists in all the community pharmacies around Malta and Gozo (N=213). Pharmacist recommendations will be identified.

Chronic Renal Failure and Bone Density

Daniela Ghio

Seventeen postmenopausal women having estimated Glomerular Filtration Rate (eGFR) values less than 60ml/min/1.73m^2 were selectively recruited at Mater Dei Hospital (MDH) during their regular renal care outpatient visit. Ten of these volunteers accepted to undergo a bone density test for the first time, whilst the other 7 had already done the test recently. A control group of 18 volunteers were recruited during bone density scanning sessions from the Gynaecology Clinic at MDH. Bone density test results were used to statistically estimate the prevalence of low bone mineral density and bone density regression in chronic renal failure patients.

INR Testing and Anticoagulation Drug Therapy Monitoring

Elena Marie Mifsud

The study investigates the acceptability and feasibility of pharmacist-led anticoagulation monitoring using point-of-care testing (POCT) on patients registered with the Pharmacy-Of-Your-Choice (POYC) scheme. During the pilot study, 10 POYC patients on warfarin were recruited by convenience sampling and had their International Normalised Ratio (INR) measured with the CoaguChek®XS POCT device. Linear regression analysis showed significant correlation between the POCT and laboratory issued INR values ($r=0.848$, $p=0.002$). All participants had an overall good perception of the proposed framework.

Penetration of Clindamcyin in the Peripheries

Martina Mifsud

Identification of methods of analysis of clindamycin was carried out. An innovative method for the analysis of clindamycin in human peripheral tissue of patients suffering from peripheral arterial disease is developed. The set-up includes a high performance liquid chromatography unit coupled with an ultraviolet-visible detector. A reversed-phase C18 column is used through which a mobile phase consisting of disodium hydrogen phosphate and acetonitrile will be passed.

Development of Computational Chemistry Practicals

Noel Pace

An evaluation of the impact of introducing medicinal chemistry practicals to a selected student cohort was performed. Practical sessions were piloted during the first phase and necessary amendments done during the second phase. The third phase of the study consisted of repeating the amended practical sessions. One hundred students were selected to participate in these sessions. Practicals were divided into three sections. Section A evaluated competence in the subject, Section B described the use of ICM Pro® and Section C consisted of a non-guided procedure similar to that in Section B.

Investigating the Anti-Oestrogenic Effects of Synephrine

Christina Pace Bardon

Investigation of the hypothesised anti-oestrogenic activity of synephrine one of the components of *Citrus aurantium* which is found in dietary supplements. Molecular modelling and docking techniques were used to quantify and explain this effect. The outcome of this study will prove whether the various conformations of synephrine could be ligands for the oestrogen receptor.

Drug Design at the Peroxisome Proliferator-Activated Receptor

Stephanie Portelli

A predictive tool for the estimation of ligand binding affinity (LBA) of small molecules for the peroxisome proliferator-activated (PPARγ) receptor was developed. Using receptor-based modelling techniques, preliminary estimates of the LBA of rosiglitazone, farglitazar and the experimental agonist INT131 for PPARγ were performed, while further estimates were performed on the experimental Selective PPAR Modulator S-26948. This represents the first step in a process comparing *in silico* with *in vitro* estimates of LBA.

Preparing Continuing Professional Development Resources for Pharmacists

Jessica Spiteri

The American Society of Health-System Pharmacists (ASHP), American Pharmacists Association (APhA) and The Pharmaceutical Journal (PJ) Online were reviewed. Venous thromboembolism, diabetes mellitus and coronary disease are the most frequently cited chronic disease states for which updates were reported. Comprehensive updates on these conditions drawing on the local scenario were developed and are currently being validated by an expert panel.

Using Quality of Life Tools in English and Maltese

Caroline Maria Vella

A disease specific tool for diabetes, D-39 was translated to Maltese and a non-disease specific tool, SF-36, for which a Maltese translation already exists have been chosen to assess the use of quality of life research instruments in the local scenario. Draft copies of the questionnaires were evaluated by health care professionals and lay persons to ensure content and face validity. Amendments to the questionnaires were made and a back translation for D-39 was carried out.

Directory of Pharmacists

Marcus Zarb Cousin

A questionnaire was compiled and distributed by post, electronic mail or by hand to all pharmacists in Malta to identify professional practice areas of the pharmacists. Forty-three percent of the pharmacists are satisfied with their current area of employment. The published directory will provide an update of the 'Directory of Pharmacists'.

Third Year Students
Project Descriptions

Blood Dyscrasias due to Chemotherapy

Bernardette Blundell

Prophylactic Granulocyte Colony Stimulating Factors (G-CSF) effectiveness in reducing hospitalisation due to neutropenia amongst patients who are being treated for Non-Hodgkin's Lymphoma (NHL) will be assessed. The patients' database will be used to collect information after each chemotherapy cycle to identify any difference between patients who are being treated with prophylactic G-CSF and those who are not.

Creation of a Two / Three-Dimensional Molecular Database of Drugs Used in Ophthalmology

Sarah-Anne Briffa

This project seeks to aid the understanding of abstract concepts through the use of visualisation techniques. Using two/three-dimensional modelling, drug structures relevant to the field of ophthalmology will be constructed and collected in a database. The two-dimensional structures have been generated while three-dimensional structures are being compiled, drug-receptor interactions will also be highlighted.

Use of Liquid Capsules

Lara Brincat Ruffini

A comparison between liquid hard capsules and soft gel capsules and other oral solid dosage forms in terms of appearance, patient compliance, quality and effectiveness will be undertaken. The perception of patients, pharmacists and physicians on liquid hard capsules will be evaluated using questionnaires and individual interviews.

Pharmaceutical Care in the Management of Psychiatric Disorders

Ann Bugeja

'On-leave' patients at Mount Carmel Hospital will be divided into a control and an experimental group. Pharmacist intervention will be conducted through the distribution of medication charts to patients in the experimental group at ward level. A questionnaire evaluating aspects of usefulness of the medication chart, patient compliance and satisfaction of the pharmaceutical care system will be completed.

Evidence-Based Pharmaceutical Care in Psychiatric Disorders

Claire Bugeja

The health care scheme practiced at Karen Grech Rehabilitation Hospital is being evaluated. Attempts to improve the current medication dispensary system used at Mount Carmel Hospital are being made. A pilot study to assess and determine the improvements in operational efficiency is being conducted.

Distribution of Ciprofloxacin in the Peripheries

Francesca Busuttil

A high-performance liquid chromatographic method for the analysis and determination of ciprofloxacin concentrations in peripheral skeletal muscle (or subcutaneous tissue) and serum in patients suffering from peripheral arterial disease is being developed. This method will then be validated.

History of Pharmacy in Malta

Angelique Camilleri

The actual processes of historical productions of different dosage forms is being studied. Different instrumentations used to produce such dosage forms will be observed to trace their development.

An English-Maltese Dictionary of Pharmaceutical and Medical Terms

Kirsty Camilleri

The first complete 'English-Maltese Dictionary of Pharmaceutical and Medical Terms' will be published. Current translations of terms starting with the letters 'W', 'X', 'Y' and 'Z' are finalised. Progressive translations are being amalgamated with Bonnici's in-progress work and with previous works by Camilleri (2007) and Spiteri (2010). All translated terms are being validated by linguists, healthcare professionals and laymen.

A Rational Drug Design Approach for the Identification of Novel Selective Cyclooxygenase-2 Inhibitors

Clarissa Caruana

The X-ray crystallographic model of celecoxib bound to cyclooxygenase-2 (3LN1) was identified from the Protein Data Bank. Using SYBYL®, a molecular model of cyclooxygenase-2 will be built to prepare it for *de novo* drug design and to quantify the affinity of other drugs to its active site. *In silico* techniques will be used for the design of high affinity ligands which are selective to cyclooxygenase-2.

Creation of Two / Three-Dimensional Molecular Database Using Anaesthetic Drugs as Case Studies

Jonathan Cefai

A Two / Three-dimensional structures database of drugs used in anaesthesia is being developed using Symyx® and Sybyl® software respectively. Resulting structural information will be compiled into a Microsoft Excel® sheet. The validity and relevance of the database will be tested using questionnaires.

Drug Design of Three High Affinity Ligands Obtained from the Common Hawthorne Plant for the Angiotensin-Converting Enzyme

Justine Chetcuti

Studies have shown that the extract of the Common Hawthorne plant Crataegus monogyna, comprises three high affinity ligands for the Angiotensin-Converting Enzyme (ACE). With the help of bioisosteric libraries available, these three ligands (Beta Amyrin, Oleanolic acid and Ursolic acid) will be structurally optimised to obtain novel drug molecules with better ACE inhibiting properties.

Point-of-Care-Testing: Hypercholesterolaemia

Rodianne Conti

Reliability of two point-of-care devices (Accutrend® Plus and GIMA Multi Care-in®) will be tested using triglyceride and total cholesterol parameters. Results will be compared with the results obtained from the laboratory at Mater Dei Hospital. The point-of-care-testing service in the management of hypercholesterolaemia will be evaluated in community pharmacies and a protocol will be proposed.

De Novo Drug Design for the Acetylcholinesterase Receptor

Michelle Cutajar

Acetylcholinesterase is an enzyme that breaks down acetylcholine. The X-Ray Crystallographic model of acetylcholinesterase bound to tabun was identified from the protein data bank. The ligand was extracted from the receptor using SYBYL. *In silico* techniques will be used to design novel high affinity ligands which are sufficiently bioavailable and non-toxic to make them suitable candidates for further studies.

Patient Access to Medications

Attilio Antonio Degiorgio

Maltese patients' access to medications is considered together with web systems, media and free medication schemes. The views and insights of patients, pharmacists, doctors, politicians and local distributors regarding patients' access to medications is being assessed. Data of systems implemented abroad is being compared with the local scenario and proposals for improved systems are being put forward.

Laboratory Set- Up for Bioavailability and Bioequivalence Studies

Nathaniel Farrugia

Equipment and protocols required to establish and accredit a laboratory to carry out bioavailability and bioequivalence studies are identified. Tolterodine and sildenafil are the drugs of choice which will be used to test the developed procedures.

Creation of a Two / Three-Dimensional Molecular Database of Drugs Used to Treat Skin Conditions

Monique Fava

An educational tool comprising two / three- dimensional renderings of drug molecules used in the management of skin conditions using Symyx® and Sybyl® software is developed. The binding modality of these drugs with their allied receptors will be depicted, where possible. The utility of this tool will be evaluated by a representative user cohort.

Haemoglobin Levels in Chronic Drug Use

Rebecca Joslin

The effects of drugs on haemoglobin levels in chronic drug users will be investigated. Studies on a number of patients suffering from anaemia are being undertaken whereby the key drug classes which cause this drug-related effect are highlighted.

Diabetes Treatment: Insulin and Incretins - Proposal of Novel Lead Molecules for Further Development

Miguel Manara

Incretins and amylin analogues are being used as case studies to demonstrate the efficiency of computational drug design methods in the rapid proposal of novel lead molecules for further development as key agents working at the insulin receptor.

Pharmaceutical Care in Benign Prostatic Hyperplasia

Janica Mizzi

Pharmacists' intervention in the management of benign prostatic hyperplasia will be evaluated using interviews based on open- and closed-ended questionnaires directed to urologists and pharmacists. Treatment guidelines will be developed and disseminated to community pharmacists and a random sample of general practitioners to evaluate their perception on the guidelines.

Molecular Database for Drugs Acting in the Gastro-Intestinal Tract

Katya Sacco

Drugs used in the management of gastro-intestinal tract conditions will be drawn and collated in a Two / Three-dimensional molecular database using SYMYX, SYBYL and VMD. The relationship between the drug molecule and its endogenous receptors will be highlighted where applicable. A pilot study will be conducted among students to evaluate the implementation of the database as an educational tool.

Chronopharmacology in Diabetes

Francesca Sammut

The monitoring of type 1 diabetics by a continuous blood glucose monitoring system over a 72-hour period will be undertaken to assess the relationship between the timed administration of insulin and blood glucose control. A questionnaire, information leaflet and diary for the patients have been completed. Patients attending the Diabetes Clinic will be included in the study.

The Pharmacy Department Newsletter and Activities Website

Marion Sammut

The Pharmacy Department newsletter is a bimonthly publication reporting activities related to the Department with a section reserved for reviewing previous projects. The newsletter will be disseminated as a hard copy, via electronic mail and uploaded on the website of the Department. Questionnaires will be distributed with the newsletter issues for readers to evaluate the newsletter and the website.

Drug Design of Molecules Binding to the 5-HT Receptor Using a Bioisosteric and *de novo* Approach

Maria Schembri

A bioisosteric approach in the design of novel drug molecules is undertaken. Using the specialised software BROOD, ligands will be rationally designed to possess similar biological activity to three chosen reference drugs of tricyclic antidepressants. Standard Operating Procedures on the operation of BROOD will be developed. *De novo* drug design approach will be used to compare whether both approaches provide the same result.

Developing a Drug Information Bulletin

John Scicluna

A drug information bulletin providing new information on medicines available on the local market will be developed. The bulletin will be made available as a hard copy and through the Pharmacy Department's website. The study will evaluate which version of the bulletin is perceived to be more useful, the frequency of publishing required and the financial viability of publishing the bulletin.

Point-Of-Care Testing: Infectious Diseases

Laura Scicluna

Point-of-care testing enables evidence-based prescribing and reduces the misuse of antibiotics which could result in bacterial resistance. The sensitivity and specificity of the GIMA Strep-A Rapid Tests will be studied. Two throat swabs will be taken from each subject; one will be tested with the point-of-care tests and the other will be sent to the laboratory. The results will be compared.

Creation of a Two / Three-Dimensional Molecular Database of Drugs Used in the Management of Conditions related to the Ear, Nose and Oropharynx

Abigail Spiteri

Software packages are used to create Two / Three-dimensional images of the drugs used in ear, nose and oropharynx conditions and to highlight their conformations when bound to their endogenous receptors. These images will be incorporated in a structural database providing practical scientific data and the impact of this database will be evaluated.

Pharmaceutical Care in Dialysis Patients

Christopher Tate

A set of protocols containing a list of medicines with dose information when administered to patients who are on dialysis treatment will be developed to be used by healthcare professionals. The protocols will be presented according to pharmacological action and evaluated using an expert panel. The resulting protocols will be presented in booklet format and evaluated.

Cardiac Markers in Pharmacy Practice

Rebecca Theuma

GIMA Cardiac Marker Tests will be used to test for the presence of the cardiac markers CK-MB, myoglobin and troponin in 20 post-myocardial infarction patients. These results will be compared to the laboratory results to test for reliability. The practicality and applicability of using such a point-of-care approach in the monitoring of cardiac markers will be evaluated.

Pharmacy Museum

Rebecca Tonna

A pharmacy museum will be set up to describe the history of pharmacy in Malta throughout the years by compiling and restoring various items and collections of pharmaceutical interest found at the Department of Pharmacy. A space to house and preserve these collections and items was identified.

Point-of-Care Testing: Urine Analysis and Microalbuminuria

Shaun Ungaro

Implementation of point-of-care testing in the primary care setting for the urine analysis of microalbuminuria using the Siemens Clintek Status® Analyzer will be undertaken. Twenty-five diabetic patients will be tested for microalbuminuria and patient characteristics will be used to identify factors that increase risk of microalbuminuria. Practicality of the service will also be evaluated.

Perception of the Pharmacist Prescriber

Elena Maria Vella

A locally developed draft document on the implementation of pharmacist prescribing in Malta is being updated and will be evaluated. A focus group will be developed to evaluate the perception of general practitioners and pharmacists on pharmacist prescribing and to obtain information on pharmacists' expectations. The outcome of this qualitative study will be used to evaluate the practical implementation of pharmacist prescribing.

Monitoring of Rheumatoid Arthritis Patients

Jessica Vella

Screening procedures before initiation of drug therapy, drug therapy monitoring and laboratory parameters monitored in patients with rheumatoid arthritis is being evaluated. Evidence-based algorithms intended to be used as guidelines for monitoring of rheumatoid arthritis patients will be developed. Patient information leaflets on rheumatoid arthritis and use of medicines will be compiled.

Evolvement of the Pharmacy Of Your Choice Scheme

Marjean Xuereb

Problems related to the Pharmacy Of Your Choice (POYC) scheme, including the problem of out of stock medicines, are being investigated and ways to improve the scheme will be proposed. A time and motion study technique will be used. Interviews to both patients and pharmacists will be performed to obtain their perception regarding these issues, the costs of the POYC system and the applicability and practicality of introducing point-of-care testing to the scheme.

Drug Design of Beta-Blocker Ligands Using a Bioisosteric and a *de novo* Approach

Ryan Zahra

With the aid of specialised software, specifically BROOD, novel small molecules will be rationally designed with similar biological activity to three chosen reference beta-blockers. *De novo* drug design will then be used to compare whether both approaches provide the same results. Standard Operating Procedures describing the use of BROOD will be compiled.

Second Year Students
Project Descriptions

Medicine Use in *in vitro* Fertilisation
Christina Noella Abela
In vitro fertilisation (IVF) is a treatment used to overcome infertility. A pharmacoeconomical investigation on the high cost associated with the medications used in IVF will be carried out. The current treatment possibilities available in Malta will also be investigated.

Journal of EuroMed Pharmacy
Joseph Christian Abela
Editing and publishing the Journal of EuroMed Pharmacy will be undertaken. The journal contains articles of interest to the pharmacy profession on topics related to pharmaceutical care, clinical pharmacy and the pharmaceutical industry. The journal will be evaluated and a European and international perception will be sought.

Veterinary Medicine
Annalise Attard
A guidebook for pharmacists and pet owners containing information about the appropriate treatment for the animal diseases commonly encountered will be developed.

Chronopharmacology and Pain
Christine Attard
Knowledge of the influence of the circadian rhythm on analgesics could help to increase their safety and efficacy. The response to drugs used in pain management in relation to their time of administration will be investigated.

Evidence-Base for Clinical Pharmacy
Jessica Attard
The services provided in a clinical pharmacy setting will be assessed by collecting evidence on outcomes achieved. Data collected will be analysed to identify areas which can be improved to enhance patient management. Pharmacist prescribing and reduction in medicine risk will be reviewed.

Dietary Practices at Mater Dei Hospital
Francesca Attard Baldacchino
During hospitalisation patients should be educated on the relevant behavioural changes related to diet. Dietary practices for inpatients at Mater Dei Hospital will be observed and proposals for improved dietary practices will be put forward.

Storage Temperature Control: Economical and Environmental Considerations
Kristina Baron
The costs and energy consumption for the maintenance of a suitable temperature for medicine storage will be estimated. An investigation into the need to abide by statutory requirements and methods of decreasing costs and energy consumption will be carried out.

Guidelines for Wholesaling and Product Distribution
Stephen Charles Bartolo
Standard Operating Procedures for product storage and distribution with emphasis on recent updates required for wholesale distribution of medicines will be analysed. The guidelines will be evaluated and improvements recommended.

Diabetic Patient Risks: Outcome Indices
Leanne Bason
The current knowledge of the risks which may be encountered by patients suffering from type 2 diabetes will be evaluated. The data collected will be used to compile guidelines to reduce these risks and improve the knowledge and quality of life of these patients.

Optimisation of Anti-Androgenic Molecules
Marie Claire Bonanno
Androgen receptor antagonists are used to manage prostate cancer. A series of novel non-steroidal lead antagonists will be optimised from affinity and property perspectives and recommended for deeper evaluation in the context of iterative rounds of rational drug design.

Designing Analogues of the Naturally Occurring Alkaloid Huperzine A
Sara Bonavia
Huperzine A is an acetylcholinesterase. The structure of the huperzine A:acetylcholinesterase complex has been determined (PDB ID 1VOT) and will be used as a template in the *de novo* design of agents with clinical potential in the management of Alzheimer's disease.

Drug Design of Pilocarpine Allotropes in the Management of Alzheimer's Disease
Neil Bugeja
Pilocarpine is a non-selective muscarinic receptor agonist used to manage conditions such as glaucoma and xerostomia. Pilocarpine will be used as a lead to design muscarinic M1 receptor subtype agonists with the potential for use in Alzheimer's disease.

Argotti Gardens and the Use of Herbal Products
Alexandra Cachia
The historical aspect of Argotti Gardens will be elaborated by conducting research to discover the different plants available and their therapeutic applications. Ways of how society could benefit from visits to the garden will be investigated.

Pharmaceutical Care in Psychiatry
Deborah Camilleri
The present situation regarding pharmaceutical care in psychiatry at Mount Carmel Hospital will be investigated through an extensive analysis of current procedures in use and the major parameters surrounding drug therapy.

Compilation of a Two / Three-Dimensional Molecular Database of Drugs used in the Management of Nutrition and Blood Disorders
Kenneth Camilleri
Two / three-dimensional structures of all the drugs and any of their target receptors that are included in the 'Nutrition and blood' chapter of the British National Formulary will be constructed and integrated in the current database.

Patient Expectations of Medicines Use Review
Matthew Camilleri
Medicine use reviews will be conducted on patients with chronic diseases. These reviews will aid patients to acquire knowledge about their medications and enable pharmacists to identify and intervene when drug-related problems are identified.

Design of Novel Antihistaminic Agents Based on the Molecular Structure of Diphenhydramine
Rachel Camilleri
H1-receptor antagonists modify the activity of histamine. Diphenhydramine will be used to map the H1 receptor's active site and to design antagonists with reduced lipophilicity. This will decrease the penetration of the drug through the blood brain barrier consequently reducing the side-effect of sedation.

Management of Side-Effects of Chemotherapy
Danika Caruana
Side-effects experienced by patients receiving specific chemotherapy regimens will be identified and categorised according to their nature and impact on quality of life. Protocols containing information about the management of these side-effects for pharmacists will be developed.

Pharmacist Prescribing and Use of Antibacterials
Gianella Casha
Prescribing of antibacterial agents by pharmacists in particular settings may improve the rational use of these products, limiting overuse and antibiotic resistance. Scenarios where this process can be adapted and which antibacterials to consider will be identified.

Synthesis of Active Pharmaceutical Ingredients: Case Studies
Conrad Cassar
The local production of Active Pharmaceutical Ingredients and the improvement of such process by the implementation of new techniques will be analysed with special reference to steroids.

Standard Operating Procedures in Community Pharmacy
Michelle Marie Cassar
Standard Operating Procedures (SOPs) for community pharmacy practice will be developed. The SOPs will be implemented in a sample of community pharmacies and their impact on patient management will be evaluated.

Further Studies on Amylase and Other Enzymes on Gastro-Intestinal Disorders
Ritianne Cassar
The activity of amylase, protease and lipase in patients with gastro-intestinal disorders who are refractory to therapy will be analysed. Comparative studies in the impact of different proton pump inhibitors will be undertaken.

Chronopharmacology in Hypertension
Sephorah Falzon
Blood pressure levels vary during the day. The effect and ideal time of dosing of two antihypertensive drugs will be monitored using an ambulatory blood pressure monitor.

Design of Epidermal Growth Factor Inhibitors
Marie Claire Farrugia
The study of mediators of cell signalling pathways is important when treating malignant disease. Novel structures which are capable of inhibiting the Epidermal Growth Factor Receptor (EGFR), a tyrosine kinase, will be designed *in silico*.

Pharmacoeconomics of Vaccination in Paediatrics
Maria Galea
Parents' knowledge and perception on vaccinations will be assessed. The pharmacoeconomic implications in the vaccination program for paediatrics will be evaluated.

Pharmaceutical Care in Venous Thromboembolism
Jeanine Grech
Venous thromboembolism (VTE) accounts for substantial mortality. The impact of pharmacist intervention on the prophylaxis and management of VTE will be investigated to optimise therapeutic outcomes, improve adherence and ensure patient safety.

Risk Management in Pharmacy
Matthew Manfre
Risk management and its relevance to pharmacy will be investigated. The use of risk management in areas of pharmacy practice will be explored and documented.

Pain Management in Post-Caesarian Section
Debbie Mangion
Pain management in post-caesarian section will be assessed. Analgesia and its mode of administration will be reviewed and patient outcomes studied.

Mini-Scale Production Facility
Maria Mercieca
A mini-scale production allows investigation of pharmaceutical formulations prior to investing more money in full-scale production. Studies on the feasibility of setting up a mini scale production facility will be carried out.

Medicines Authority: A Policing Authority or Collaboration for Patient Benefit?
Benjamin Micallef
The role of the Medicines Authority, including historical aspects and activities with special attention to the dual role of enforcement of legislation and provision of service to the patient and industry will be investigated. Public opinion will also be evaluated.

Design of Novel Carbonic Anhydrase Inhibitors
Jessica Marie Muscat
To design novel potent antagonists of the carbonic anhydrase enzyme in the context of their touted ability to inhibit the growth of several tumour cell lines *in vitro* and in vivo are designed.

Pharmacoeconomics in the Management of Drug Abuse
Maria Pace
A pilot study to determine the pharmacoeconomics and quality of life in patients on buprenorphine/naloxone maintenance therapy when compared to methadone in opioid dependence will be conducted.

Novel Drug Design at the Dihydrofolate Reductase Enzyme
Graziella Portelli
Dihydrofolate reductase inhibitors inhibit the synthesis of folate which is needed by rapidly dividing cells. The bound co-ordinates of methotrexate will be used as templates in the design of molecules with potential for treatment of neoplastic disease.

Use of Medication in Paediatric and Elderly Persons
Clarissa Rizzo
The use of medications and formulation aspects in pediatrics and geriatrics will be reviewed. Guidelines on the choice of formulations and on extemporaneous preparation of medicines for this intended use will be proposed.

Impact of Technology on Shared Care
Analise Said
Patient information is often acquired from non-health care professionals and this can lead to problems. Information Technology systems which deliver this data will be reviewed to be able to harmonise sharing of data between health care professionals.

Centralised Preparation of Intravenous Admixtures
Diane Saliba
The preparation of centralised intravenous admixtures will be analysed. The pharmacist preparing these sterile mixtures is responsible for their correct preparation, storage and dispensing. System analysis will be carried out taking into consideration pharmacoeconomic aspects.

Drug Design of Novel Beta-2 Adrenoceptor Blockers
Astrid Marie Sant
Novel modulators of the beta-adrenergic receptor, giving special consideration to the asymmetry that is inherent to members of this class of drugs will be designed. The potential rigidification that could permanently lock designed molecules into a bioactive conformation will be studied.

Drug Design at the κ Sub-Type Opioid Receptor
Caroline Spiteri
κ-Opioid agonists have been investigated for their potential in the treatment of addiction. Dynorphin, the endogenous κ-agonist, is responsible for the body's natural addiction control mechanism and will be used as a lead for the design of novel structures capable of treating addiction and dependence.

Impact on Kidney Function and use of Drugs in Patients in Intensive and Critical Care
Annalisa Thake
The impact of drugs on the renal function of patients in the Intensive Care Unit and Critial Care will be studied with emphasis on the antibacterial agent gentamicin which has a narrow therapeutic index and requires dose adjustments in renal impairment. Dosing requirements and drug blood levels will be studied.

Evaluating Impact of Advice from Community Pharmacies
Lisa Warrington
The advice provided by community pharmacists to patients about the various diseases and medications will be noted. The impact of the advice given will be assessed to establish the extent to which it helps individuals in the management of medicine use and response to symptoms.

Patient Education on Women's Health
Nicola Warrington
Pharmacists offer advice and educate the public on various issues related to women's health. Information on some of these conditions will be prepared and assessed.