Pharmacy Education, 2013; 13 (1): 162 - 164

International Pharmaceutical Students' Federation critical appraisal essay 2013- The challenge of individualised pharmaceutical care: the need for interprofessional education.

JIAYI GONG

Christchurch Public Hospital, Canterbury District Health Board, New Zealand.

Abstract

In this essay, I will be examining multiple areas of individualised pharmaceutical care via a needle-like model, starting at the bio -molecular spectrum looking at the likes of pharmacogenomics and nanotechnology, to that of social aspects such as patient education and communication. In the bio-molecular end we will examine the implications of how the human genome project has opened up the avenues of individualised pharmaceutical care. In nanotechnology we examine the diverse clinical applications of nanotechnology and implications of using such technology.

We will also look at the use of interprofessional education and how it may affect the future of health work forces and work standards. Finally we will examine the effects of increasing the channels of dialogue between different health professions in order to produce a patient based team approach.

Keywords: *Education, individualized, interprofessional, pharmacogenomics, pharmaceutical, telemedicine.*

This essay focuses on two aspects of patient care, individualisation and collaboration via a team-based approach. Individualisation of pharmaceutical care is an exciting area of development that has taken off in recent years since the unveiling of human genetics through the human genome project in 2003, which opened up whole new avenues of personalised medication at a genetic level (Ross *et al*., 2004). Parallel to the bio-molecular advancement of pharmaceutical care, there are also improving social factors such as adherence and education. In response to these recent developments, new questions arise: what are some new approaches to improve adherence? How are pharmacists trying to tailor medicines education to various patients? Visualising the areas of development in individualised care for a patient is much like that of a sewing needle; on the sharp -end is the precise and molecular involvement using pharmacogenomic medicines, nanotechnology and advancement in diagnostic assays. On the broader is a much wider scope encompassing that of telemedicine, patient counselling, and patient medicines' use review. However this is focusing mainly on the treatment whereby a patient's disease status has been determined. Taking a step back from treatment is where interdisciplinary care comes into play. The idea of working as a single unit sharing and transferring knowledge between different health professions: pharmacist, dentist, physiotherapist, nurses, occupational therapist, physicians etc. This team is then able to provide a wider scope on the care needed for the patient, not only in regards to their disease condition but other aspects such as medicines adherence, mobility, dental care and others.

Let us begin with the bio-molecular end of our needle model; firstly, the idea of the human genome project, which performed as a catalyst for the mapping of the human genotype. This translates to our various phenotypes, from gender, to what disease we may be more susceptible to. As a result, this then led to the development of pharmacogenetics, despite being an idea conceived well before genome project. The term was first defined by Vogel in 1959 as 'The study of the role of genetics in drug response' (Vogel, 1959). The first genetic deficiency identified was cholinesterase deficiency in 1955. Some newer examples of pharmacogenetics include abacavir, whereby 5-8% of patients will suffer abacavir hypersensitivity (GlaxosmithKlein, 2012). In New Zealand clinicians must screen for the carriage of the HLAB*5701 allele in any HIV-infected patient prior to the commencement of abacavir therapy (GlaxosmithKlein, 2012). Other examples such as trastuzumab in Her+ (human epidermal growth factor receptor) breast cancer and screening of thiopurine S-methyl transferase (TPMT) in azathioprine are well documented. However, what are the clinical practicalities of these biomarkers? Is it realistic for each patient to have their genome mapped just to see if they require a high or a low dose azathioprine? No, not in all cases, there are alternative therapies that are less affected by genetic polymorphism, but in cases such as Herceptin, the New Zealand medicines funding body Pharmac, explicitly states that only Her+ breast cancer would be funded (Pharmac, 2013).

Since 1995, the introduction of pegylated liposomal doxorubicin has brought about the significant presence of nanotechnology. However, nanotechnologies are not without

*Correspondence: Mr. Jiayi Gong, *Intern Pharmacist, Christchurch Hospital, Private Bag 4710, Christchurch 8140, New Zealand. Tel: +64 (3) 3640804. Email: jiayi.gong@cdhb.health.nz*

ISSN 1447-2701 online

faults as objects honing onto the atomic level of size, quantum mechanical effects begin to play a part, making the object less predictable in behaviour. Thus modelling and extensive investigation into safety and human bio-compatibility are required (Sakamoto *et al.,* 2010). There are other applications of nanotechnology that have the ability to give clinical advantages, such as medical imaging and diagnostic procedures via the use of iron oxide constructs and colloidal nano gold particles (Sakamoto *et al.,* 2010). Nanotechnology has also begun to play a role in diagnostic tools in predicting better prognosis. The development of new diagnostic tools are largely thanks to the human genome project which can account for a greater variation in heterogeneity in the population such as altered genes, proteins that may potentiate pathological conditions (Sakamoto *et al.,* 2010). Such is the case also for biomarkers whereby through unique altered processes of metabolism in a disease state, particular peptides and metabolites are produced that will indicate onset or presence of diseases (Sakamoto *et al.,* 2010).

Moving up the spine of the needle, the significance of the social aspects of individualised therapy is examined. We begin at the individualised dosing of medicines based on renal function through each patient's glomerulus filtration rate (GFR) and hepatic synthetic functions as indicated by albumin concentration and the amount of clotting factors produced as shown by the international normalised ratio (INR) (Huang *et al.,* 2007; Verbeek, 2008). These are the clinical manifestations from the patients' genetic predisposition and their phenotype. When making a clinical decision on appropriate dosing of medication, we have to take into account patients' co-morbidities, response level, metabolism, and adverse effects. The common rule in medicine is to start slow and titrate upwards till therapeutic response has been achieved, but it is up to the clinician to decide on how low a dose to start with and how slow to increase. These decisions have to be tailored to the patient, such examples include cilazapril, where if the patient has a eGFR of 10- 40ml/min/1.73m2 they should not be dosed at more than 0.5mg daily to start off with. Others that will need titration are the likes of allopurinol, whereby doses are low to start with around 50mg depending if eGFR is <30ml/ min/1.73m2, but doses can be titrated at upwards of 600mg depending on response based on serum urate levels and side-effects (Woods, 2013). These results display that patients have a huge spectrum of medicine responses and also dose requirements. Thus there's no one model that fits all but it is a process of careful titration and monitoring for response and side-effects. Of course there are cases when a medicine chosen is not working and there is therapeutic failure. In these instances we have to give the patient an informed choice on using alternatives that will also take into account the patient current state of metabolism, disease, co-morbidities and adherence.

We move further up the needle spine to shift focus from medicinal care to the role of education. No matter how well we tailor medicines to the patient, if he/she does not have the inclination to adhere to therapy, the likelihood of therapeutic failure as end-point increases. As such, it is paramount to educate our patient on the importance of adherence to medicine. This very much resembles a sales pitch whereby we, as the vendor in this case, must find the 'hook' for each patient in order to grab their attention and sell them the benefits of taking their medicines. The use of an analogy would give context and allows the patient to understand the importance of their therapy on their own terms (Teutsch, 2003); of course such analogies will be purely dependent on the patient and once again highlights the importance of individualised patient care. In order to be a good patient counsellor, there are skills needed that move past the general aptitudes of empathy, building rapport, actively listening, and reflection. One needs to be able to identify communication barriers and seek to overcome them. Barriers include cultural, gender, literacy, and disabilities (Teutsch, 2003).

Lastly at the other end of the needle, whereby both the health professional and medicine focus is dimmed; pharmaceutical care is taken into the patient's own environment such as telemedicine. The process may take place in real time (video conferencing) or asynchronously such as diabetes management (patient enters glucose results when prompted) (Wootton, 2012). Another approach would be the likes of a study conducted in hospitals in China, whereby text messages are sent to patient cell phones with regards to their medication (Mao *et al.,* 2008). Most patients enrolled in the study were satisfied by the service and had a positive attitude towards it (Mao *et al.,* 2008). A Mobile Pharmacy Service System (MPSS) was developed in this study whereby information such as a reminder to take the medication, practical information such as method of administration and adverse drug reactions were sent to the patient's mobile phones (Mao *et al.,* 2008). This does raise the possibility of care via correspondence for patients that may have difficulty in accessing health services due to their remote location, morbidity state and disabilities. However the method of text messaging will not be a solution to all, as the authors also acknowledge the fact that the elderly have trouble reading the small messages. While these developments are significant with their regard to our changing environment and roles of technology, mobile phones should have in the future adjustable font sizes that would overcome such issues. The key is again tailoring, the author also points out that using MPSS would lighten the workload of hospital pharmacists to ensure better use of their time and resource. This calls for a relationship between telecommunication industries and pharmacy to be explored.

A sewing needle's purpose is only fulfilled once the cord is threaded through. In this sense, the cord is the interdisciplinary team. Let's play the devil's advocate here, why do we need an interdisciplinary team? Is it 'the more the merrier' or that 'less is actually more?' The answer is interchangeably connected to patient needs. Each member of the team brings in a different area of expertise and perspective on patient needs, but if too many, it would become a redundant process swamped in opinions and arguments. The crux is early exposure in education. Learning to work together at early stages of education would mean that students of health discipline are exposed to various professions and understand the workings of each (Leïpzig *et al.,* 2002). In a case, such as musculoskeletal care, a multidisciplinary team approach was trialled in the South Devon health services involving orthopaedic surgery, rheumatology medicine, pain management and musculoskeletal physiotherapy. It was found that by opening up dialogues between different professions, it increased understanding and appreciation for the strength of various professions (Ainsworth *et al.,* 2004). It also helped to highlight the limitations within one's own discipline (Ainsworth *et al.,* 2004).

Pharmaceutical education needs to be ready to evolve and embrace the future of pharmaceutical and interdisciplinary care. Education needs will have to evolve beyond the traditional medicinal chemistry, pathology, physiology etc. A shift in paradigm from factual based learning to that of conceptual and application based learning will be required. The curriculum should be updated continuously to provide up -to-date clinical practice guidelines and be in line with the latest research and evidence-based care. It is imperative that students will be able to develop their ability to think critically and be given the freedom to make their own clinical decisions. The future of medicine will only grow exponentially and students must be equipped with the skills and knowledge to rationalise the optimal agent for each patient. There should be a greater extent of interprofessional learning to increase exposure of various health disciplines to each other at an earlier stage. So that when put into clinical practice, future health professionals are well equipped to work in a team-based situation.

Finally, I believe individualised pharmaceutical care will grow in the coming years as technology improves, de-limiting our abilities to find new biomarkers and drug targets, and the increase in information-sharing technology will promote integrated care. With these growth and changes, it is imperative that the education sector be able to pick up and equip students with the skills necessary to tackle new age problems with new age tactics.

Reference

Ainsworth, R., Conboy, V., Norman, J. & Viner, N. (2004) Towards Multidisiplinary teamworking in musculoskeletal care: evolution of service. *Musculoskeletal Care*, **2**(2), 113-119.

GlaxosmithKlein (2012) Medsafe data sheet (online). Available at: http://www.medsafe.govt.nz/profs/datasheet/k/Kivexatab.pdf. Accessed May 2013.

Huang, S., Temple, R., Throckmorton, D. & Lesko, L. (2007) Drug interaction studies: study design, data analysis, and implications for dosing and labelling public policy. *Clinical pharmacology and Therapeutics*, **81** (February), 298-304.

Leïpzig, R., Hyer, K., Ek, K., Wallenstein, S., Vezina, M., Fairchild, S., Cassel, C.K., Howe, J.L. (2002) Attitudes toward working on interdisciplinary Healthcare teams: A comparison by Discipline. *Journal of American Geriatric Society*, **50**, 1141-1148.

Mao, Y., Zhang, Y. & Zhai, S. (2008) Mobile phone text messaging for pharmaceutical care in a hospital in China. *Journal of Telemedicine and Telecare*, **14**, 410-414.

Pharmac (2013) Pharmac (online). Available at: www.pharmac.govt.nz/2013/05/01/SA1192.pdf. Accessed May, 2013.

Ross, J.S., Schenkein, D.P., Kashala, O., Linette, G.P., Stec, J., Symmans, W.F., Pusztai, L. & Hortobagyi, G.N. (2004) *Pharmacogenomics. Advances in Anatomy Pathology*, **11**(4), 211-220.

Sakamoto, J., Van de Ven, A.L., Godin, B., Blanco, E., Serda, R., Grattoni, A; Ziemys, A., Bouamrani, A., Hu, T., Ranganathan, S.I., De Rosa, E., Martinez, J.O., Smid, C.A., Buchanan, R.M., Lee, S., Srinivasan, S., Landry, M., Meyn, A., Taschiotti, E., Liu, X., Decuzzi, P. & Ferrari, M. (2010) Enabling individualised therapy through nanotechnology. *Pharmacological Research*, **62**, 57-89.

Teutsch, C., 2003. Patient-doctor communication. *Medical Clinics of North America*, **87**(5), 1115-1145.

Verbeek, R.K. (2008) Pharmacokinetics and dosage adjustment in patients with hepatic dysfunction. *European Journal of Pharmacology*, **64**, 1147-1161.

Vogel, F. (1959) Moderne Probleme der Humangenetik. *Ergeb Inn Med Kinderheikd*, **12**, 52-125.

Woods, D. (2013) New Zealand Formulary (online) Available at:www.nzf.org.nz. Accessed 1st May, 2013.

Wootton, R. (2012) Twenty years of Telemedicine in chronic disease management- an evidence synthesis. *Journal of Telemedicine and Telecare*, **18**, 211-220.