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Science-based pharmacy education: Towards better medicines and patient care

Abstracts for posters and short oral presentations

Abstracts are arranged according to the first author's surname

Improvement in general population knowledge about medicine labels and their consequences

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Key words: leaflet, poll, public investment, patient-pharmacist relationship.

Nowadays, access to medicines is easier than ever before, but there is still lack of knowledge about them. This, together with auto and poli-medication, has resulted in an increase in adverse reactions in patients, being the cause of 4-7% hospital emergencies[1].

Objective

- Raising people's knowledge about information given in the leaflet and packaging of medicines in order to avoid potential negative consequences and help reducing health expenditures.
- Promoting responsible usage of medicines and evaluate patients' actions in case of adverse drug reactions.
- Improving patient-pharmacist relationship.

Methods

- Non-probabilistic poll with adult target population and without discriminating between races, sexes or studies.
- Conferences imparted in schools, third-age centres and mass media.

Results

39% of polled patients assured to self-medicate and 33% ignored that these it can interact with their usual medication. Just 34% of polled people claimed reading leaflet information and only 44% assured knowing information given by package symbols. Overall, leaflet information seems to be easier to understand by patients than packaging information itself. Nevertheless, a high percentage assured that they found used language complex. As for treatment adhesion, it should be highlighted that when doubting about usual medication, only 25% would consult their pharmacist, while 56% would consult their doctor instead, what is quite worrying because the pharmacist is the drug specialist and a closer health professional.

Conclusions

It is important to strengthen the pharmaceutical role as the first step in a consultation chain; developing health education programs as well as personalizing information about the medicines contribution would be a good starting point to promote rational use of medicaments and to increase the patient's confidence in pharmacists. This would mean a decrease in the number of hospital admissions and consequently, a significant saving for public health system.

[1]Health Department, Madrid State Government,
https://seguridadmedicamento.sanidadmadrid.org/RAM/vol13n1_may2006.pdf

Evolution of Final Project in the Pharmacy Degree of University of Salamanca. New approach to make it closer to research groups and stakeholders

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Key words: Final Project; Research; Curricula

In this communication we show the evolution of Final Projects that have been performed at the Faculty of Pharmacy in Salamanca since the beginning in 2009 and the new approach that has been implemented during 2012/2013 academic course.

We aim the Final Projects to become the first researching work of future graduates, regardless whether the project is experimental or literature review. Our efforts have been focused on encouraging students to make experimental works and to propose their own topics.

So far, more than five hundred Final Projects have been presented and all areas taught throughout the Pharmacy Grade are represented. While literature-review Projects have decreased, experimental works and Projects carried out at pharmacies and hospitals have significantly increased. We have also found a progressive increase in the involvement of students, who show more interest in the research projects to be developed at laboratory departments and who have started to propose their own topics.

Since 2012/2013 academic course students are asked to present their Final Projects in a format similar to the publications of the corresponding areas, i.e. containing introduction, materials and methods, results and discussion, and conclusions sections, and not exceeding 2,000 words. An electronic poster similar to that employed in scientific symposia is required to expose the Final Project to the evaluating committee.

We are currently intend to develop a journal that collects the most outstanding works, thus bringing this new subject of Pharmacy Grade closer to researching groups in the University and to Stakeholders that could collaborate in the near future.

What actions should be taken against flu and cold in community pharmacy? A collaborative study approach using networking.

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Objective

Clinical research competences to reinforce the scientific abilities of pharmacy students are a main goal at Faculties of Pharmacy. Pharmacy students at Alcalá University have been encouraged to develop internal collaborative networks to facilitate sharing information obtained in activities conducted during the Pharmacy degree. Within this frame, 5th-year students registered in the professional training course carry out a collaborative research study in pharmaceutical care against flu and cold involving 7 community pharmacies.

Methods

Observational, longitudinal, cross-sectional study held in 7 pharmacies located in the south area of Madrid (Spain). Surveys were conducted between December 2013 and January 2014.
Target population: patients asking for advice in the treatment of flu or cold.

- Agreed Action protocol between pharmacists and general practitioners (GP).
- Questionnaire based on the Pharmaceutical Forums´ guideline.
- Clinical practice drugs guideline.
- Information leaflet.
- Patient referral criteria.
- Poster encouraging patients to ask for pharmaceutical advice.
- Statistical analysis.

Results

From the 116 survey forms submitted, 75% were aged 14-65 years. Symptoms showed by patients were nasal congestion 64.6%, dry cough 42.2%, wet cough 22.4%, headache 37.1%, muscular pain 33.6%, fever 31.9%, but 86.2% lasted less than 7 days.
Drug products dispensed were acetaminophen 44.8%, antihistamines 36.2%, systemic nasal decongestants 29.3%, antitussives 33.6%, herbal medicines 1.7% and homeopathy 1.7%.

Conclusions

All pharmacists followed the action protocol and all patients received adequate pharmaceutical advice. Visits to the doctor were avoided in 87.1% of the cases.
Pharmacy students have taken contact with protocols and established procedures in pharmaceutical care through the use of a virtual network.

A bibliometric analysis of the scientific output of EU Pharmacy Departments

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A bibliometric study of 25 EU pharmacy departments showed that the top two department members (in terms of the number of articles in which the two top staff members are author (or co-author) over a 14-year period from 1998 through 2012) had h-indices of 14 (mean) / 9 (median) and 12 (mean) / 8.5 (median). These were similar to values published for pharmacy department members in the USA. Global data for departments showed lower values as they were affected by the skewed nature of the distribution with 16% of department members accounting for 76% of the department's publications.

Development of a professional doctorate in Pharmacy

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Objective

Innovations in drug therapy and attempts to manage chronic and life threatening conditions, contributed to the need for pharmacists practising in clinical settings, in pharmaceutical regulatory and policy development units to develop advanced professional skills together with a research perspective. The objective was to develop a postgraduate programme that will lead to a professional doctorate in pharmacy.

Methods

An analysis to identify advanced skills and competences in professional practice required was undertaken by mapping skills attained in current curricula leading to a degree in pharmacy. Discussions with pharmacists and healthcare professionals in practice were undertaken. The proposed programme was discussed within the University research and education committees to ensure that the level provided by the programme was equivalent to a Level 8 doctoral degree according to the Framework for Higher Education Qualifications by the Quality Assurance Agency for Higher Education.

Results

The skills and competences identified included use of clinically relevant data to facilitate monitoring and management of drug therapy plans, managing challenges and priorities in clinical pharmacy service provision, and assessing impact of policy changes on economics and health outcomes. A three year full-time programme was developed that consists of 60 ECTS credits in the first year covering clinical rotations, research exercises and taught courses in Pharmacotherapy, Drug Information and Biostatistics, Principles of Pharmacoeconomics, and Health Systems in Europe and USA. In the second and third year, students follow advanced clinical experience in different pharmacy settings including hospital, ambulatory care and community pharmacy and work on a dissertation that reflects translational and applied research.

Conclusions

The programme has been approved and will start in October 2014. The programme was developed and is offered by the Department of Pharmacy of the University of Malta in collaboration with the College of Pharmacy of the University of Illinois at Chicago, USA.

Central European Exchange Program for University Studies (CEEPUS) – a joy of networking

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CEEPUS CIII-HR-0611 Network "Novel diagnostic and therapeutic approaches to complex genetic disorders" was established in 2011 by the Faculty of Pharmacy and Biochemistry, Zagreb; Faculty of Pharmacy, Ljubljana; Faculty of Pharmacy Belgrade; Faculty of Pharmacy, Sarajevo; Medical Faculty Hradec Kralove; Medical Faculty Prague, and Faculty of General Medicine; Pecz. Its aim is the enhancement and improvement of collaboration and activities focused on the studies in the field of diagnosis, prognosis, and therapy of the disorders with complex genetic background. In addition to the contribution to the scientific knowledge in this area, through the exchange of teaching and research experience in these fields by enhancing student and teacher mobility, participating units collaborate on harmonization of existing and development of new PhD curricula, prepare new joint PhD programs, and contribute to setting of uniform criteria for PhD degrees in Laboratory Biomedicine in Central European area.

During three years of the CEEPUS CIII-HR-0611 Network existence, 113 entitled months of mobility provided the opportunity to almost hundred students and teachers to acquire new knowledge, improve their skills, meet the new scientific and teaching approaches, and to exchange the experience and the ideas. Together with the European Society of Pharmacogenomics and Theranostics, our Network was co-organiser of the 1st ESPT Summer School on Pharmacogenomics and Theranostics, (Ljubljana, August 20-26, 2012). This year we are organising the CEEPUS Summer School in Portorož, Slovenia, August 23-29 which will gather up to 50 attendees and will be focused on the hottest topics in personalised medicine. Several joint master theses have been performed up today, while in the future we will put additional efforts into the implementation of joint PhD programs.

Through the mentioned activities the Network contributes to the benefit of academic community, to creating the Europe-wide higher education and scientific area, as well as the society and the economy of Europe.

National patient counceling competition in Turkey: The model of Ankara University, Faculty of Pharmacy

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Key words: pharmacy education, patient counseling competition, Ankara University

As known, the pharmacy education consists theoretical and practical courses and applications of internships. Students who earned knowledge in theoretical courses is reinforces by the practice of those in person in the laboratory courses. All obtained professional knowledge of students are also supported by internship and prepared them for their Professions.

First patient counseling competition in the world was organized by the Philadelphia University Faculty of Pharmacy in 1983. In Turkey, national patient counseling competition has been started by under the leadership of Ankara University Faculty of Pharmacy in 1999. Ankara University Faculty of Pharmacy Student Group (AUPSG) was founded in 1997 and has been shared many domestic and international activities with International Pharmaceutical Student's Federation (IPSF). National patient counseling competition has been considered as the most important activity among those which are organized by the attendance of last two year students.

Competition has been organized in the following format:

1- The application is taken by the announcement of the time and the day of the competition
2- To ensure that the last two grade students participate in the competition
3- Later than, the pharmacy environment is prepared
4- Five jury member is formed in order to evaluate the performance of students in the competition
5- 10-12 minutes before the competition, a prescription is given to each student in the role of pharmacist. The students can take the information from drug guidelines during this period of time.
6- Student who acts as pharmacist waits for the patients in previously prepared pharmacy store
7- Patients (the role is generally given to trained teaching assistants) meet with pharmacist with a prescription in hand
8- It is expected from student to warn patient who needs to know all necessary information about the prescription in a certain time (8-15 min), and serve patient in accordance with the legislation of pharmacy
9- Student in pharmacist role is evaluated by jury member according to specified format of assessment charts.

In this study, we will describe the activities of the patient counseling competition which was first organize by University of Ankara and started to spread among the other universities in Turkey and discuss some suggestions about this competition.

Academical staff en surance of pharmaceutical education in Faculty of Pharmacy – Sofia for the period of 2009 – 2014

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Key words: academic staff, pharmacy education, Sofia, Bulgaria

Objective

Statistical data and my analysis of the academical staff en surance of pharmacy education in Faculty of Pharmacy – Sofia for the last 5 years is presented.

Methods

Statistical analysis and inquiry data.

Results

The pharmaceutical education in Bulgaria begins in 1942 as a division in Sofia University and since 1951 as an independent Faculty in Medical University – Sofia. Faculty of Pharmacy – Sofia has been accredited with the highest mark from National evaluation and accreditation agency (NEAA). The accredited capacity, which in 2011 was 1000 students, has been increased consecutively to 1200 (2012) and 1300 (2013) students and PhD students. Now 1189 students, from which 662 in Bulgarian language, including 23 foreign citizens and 527 foreign students in English language education are thought. In 6 Departments in Faculty of Pharmacy and 12 in Faculty of Medicine both in Medical University – Sofia.

Some data on the academical staff en surance of the Departments in the Faculty of Pharmacy – Sofia is presented. The total number of lecturers in Faculty of pharmacy is 74, 39 of which are with academic rang and 35 – are assistants. From the academic professors 6 are rewarded with Doctor of science degree (DSci) and 33 are PhD. Most of the assistants are also with a PhD degree. 30 of our associated professors have graduated pharmacy, and 9 are with other specialties. The publication activity of the academical staff is very high – only for the last year over 350 scientific publications have been published.

Conclusions

The analysis of the data creates an impression of increased number of lecturers with academic rang and decreased number of assistants. A long standing tradition in Faculty of Pharmacy is preserved in gradual growth of the academical staff's qualification following the path: student – PhD student – assistant – professor. A register of the very good and excellent students is kept, with a view to invite them as PhD students and assistants. We consider this a correct way to provide a highly educated academical staff and to en sure a qualified and well organized education in Pharmacy.

The role of clinical pharmacist in clinical trials quality assurance

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Key words: clinical pharmacist, clinical trial, quality assurance, training

The aim of study is to analyse the role of clinical pharmacist in clinical trial quality assurance and to substantiate the role of educational process in this area.
The data were obtained during 2006 – 2012 years. The methods of formalization and system analysis were used in this study.

Nowadays clinical trials in Ukraine are the essential part of economic, industrial and educational process that defines the main direction of medical and pharmaceutical sector development and the new educational and scientific trends.

According to principles of Good Clinical Practice, each individual involved in trial should be qualified by education, training, and experience to perform his or her respective tasks. Moreover, they should have the appropriate educational degree. Nevertheless, in Ukraine there are no clear requirements to educational degree of these specialists.

The resolution of this issue is an involvement of clinical pharmacist in clinical trial conducting. Educational course of clinical pharmacist training in National University of Pharmacy contains disciplines that provide knowledge about modern regulatory requirements of trial conducting, stakeholders responsibilities, monitoring, audit, and makes available to learn the cases from teachers practical experience. During 2006 – 2012 years the amount of laboratory classes in discipline “Clinical drug research” has increased by 12.5%, and the total amount of class hours by 33%. It has extended the theoretical and practical training of clinical pharmacist regarding planning, organizing and conducting of clinical trials.

Systematic fundamental knowledge obtained at our University enables successful practical activities of clinical pharmacist in this field. As a sponsor’s employee clinical pharmacist can fulfil functions of monitor, auditor, pharmacovigilance specialist, perform data processing and interpretation, preparing publications etc. At a trial site clinical pharmacist can perform functions of co-investigator, authorized person on investigational medicinal product handling and storage, data management control, member of Ethics Committee.

Seminar on entrepreneurship as a tool to improve employability

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Objective

To present an activity designed to motivate students to improve employability, taking into account the present changing environment, especially for pharmacists[1].

Methods

The seminar was an optional activity for students of the last year of studies at the Faculty of Pharmacy in Valencia. It consisted of two independent sessions. The first one (23rd October 2013) was devoted to good practices in entrepreneurship for pharmacists and a workshop on innovation and creativity. This session was also a way to highlight teamwork, importance of innovation and feeling of professionalism. The second session was held on 4th December 2013 and was entitled "Our goal, your job". It focused on competences in order to find job opportunities and overcome the usual selection tests. A survey was conducted at the end of every session, about quality of the speakers; usefulness of content, adequacy of time spent and proposed improvements.

Results

A total of 160 students followed the sessions; 75 surveys were collected in the first session and 73 at the end of the second. 100% and 98.6% would recommend to other colleagues the first and the second session, respectively. They pointed as satisfactory or very satisfactory the quality of speakers (92.4%) and usefulness (89.40%). They considered the subject very interesting for their future and proposed to extend the seminar. They suggested making this type of activity as compulsory subject for the curricula.

Conclusions

The students consider the improvement of their competences of entrepreneurship and job search as a need.

[1]Libro verde de la empleabilidad de los titulados universitarios de la Comunitat Valenciana. [Internet]. [cited 2014 Mar 24thAvailable from: http://libroverdeempleabilidad.avap.es/

CEMDC - Cooperative European Medicines Development Course

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Objective

To address the global need for professionals with a broad education covering all aspects of medicine development.

Methods

Development of competence – based curricula and organization of interdisciplinary and multi-institutional consortia of experts in medicine development.

Results

CEMDC is a multinational postgraduate course in medicine development organized with participation of ten universities and strong participation of experts from the pharmaceutical industry. The aim of the course is to train experts who understand the complex process of medicines development from molecule to health care and who can apply this knowledge working in large or small, innovative or generic pharmaceutical companies, small and medium sized enterprises and regulatory agencies as well as in health care or health insurance management.

The CEMDC is based on the harmonized educational plan for post-graduate training built on Bologna principles, which was develop as the IMI-supported PharmaTrain (PhT) project. CEMDC education program is structured as the *Base Course*, which containing 6 modules that provide a complete overview of all drug development related topics. In addition, *Advanced Elective Modules* are available that provide with a more detailed knowledge and competences in various fields of medicines development.

The course also offers a *Master-level education*, which is completed after successfully finishing the Base Course, 6 additional advanced modules, that can be selected from a large pool of PharmaTrain certified elective modules, and defence of the thesis based on scientific work. The candidates receive a Master-Level Degree in Medicines Development scientifically accredited by PharmaTrain.

Conclusions

The need to provide high-quality and cost-effective medication for mankind living in various countries led to the intensive globalization of the research and manufacturing of medicines which consequently demands novel educational concepts. CEMDC is a holistic approach of education providing with experts who understand the complex process of medicines development from basic research to implementation in health care.

Project presentation: linking industry and academia in teaching pharmaceutical development and manufacture (liat-ph)

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Industrial pharmacists should be equipped to respond to the challenges of the rapidly changing environment in which they work. They should be capable of working as part of a multi-disciplinary team, as companies seek an increasingly more integrated approach to the product development cycle, from molecule to drug product. The need for involvement of professionals from pharmaceutical industry in the design and delivery of relevant curricula, as well as further training of academic staff in areas related to different advanced technologies has been identified as a prerequisite for ensuring high quality standards of academic programs at all levels.

The consortium, which brings together five higher education institutions and seven companies from different countries across Europe (Ireland, Serbia, Slovenia, Finland and United Kingdom), has been granted the EU funded Lifelong Learning Program Project, LIAT-Ph.

The objectives of the project are to:

(i) explore the learning needs of pharmacy students, at the undergraduate and postgraduate level, in relation to the competencies in industrial pharmacy;
(ii) work together on the development of curricula and
(iii) develop and deliver joint modules, as part of a structured PhD programme and/or CPD courses for industrial pharmacists and other professionals working in the bio/pharmaceutical industry.

The consortium has specific expertise in the area of bio/pharmaceutical product development and this is the part of the drug product life cycle on which we will focus. By considering the competencies required of the "Day 1" pharmacist, the PhD student and the pharmacist in practice we can identify and develop courses which are appropriate to the lifelong learning needs of the practicing pharmacist.
The current project will provide opportunities for further study program improvements, expanded competencies of the academic staff involved, improved academia-industry partnerships and the development of relevant educational materials.

Validation and adaptation of The Pharmaceutical Care Network Europe Classification V 6.2 for use in Slovenian community pharmacies

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Key words: drug related problems, classification, community pharmacy

Objective

To translate and validate The PCNE Classification V 6.2 for use in Slovenian community pharmacies.

Methods

Firstly, The PCNE classification v 6.2 was translated into the Slovenian language by a forward-backward procedure. The expert panel of nine community/hospital pharmacists and two researchers then discussed and adapted the translated classification. The adapted version was piloted and validated (VS1) by 31 community pharmacists based on the PCNE set of 20 scenarios. The expert panel discussed the coding inconsistencies and modified the classification accordingly. This version was used in a validation study (VS2), where 33 community pharmacists coded 40 DRP cases gathered during routine pharmacy practice in Slovenia. Coding inconsistencies were analysed and the perceived difficulties with the classification were discussed in the expert panel. A final adapted version of the DRP classification was formed.

Results

In VS1 the average coding consistency was 74% (±16%) for Problems, 75% (±20%) for Causes and 92% (±11%) for Interventions. In VS2 the average coding consistency was 83% (±16%) for Problems, 85% (±17%) for Causes and 80% (±20%) for Interventions. The following major adaptations of the classification were performed:

- A "potential problem" was added as a primary domain to The Problem section.
- The Causes section was renamed to Risk factors.
- The primary domains in The Risk factors section were organized into prescribing, dispensing and use of drugs.
- Use of drugs was organized into intentional and unintentional use of drugs.
- The primary domains in The Interventions section were divided according to the communication and agreement with the prescriber.

Conclusions

The upgraded version of the PCNE Classification V 6.2 reached a high consensus in the Problems and Causes section that also resulted in high coding consistency. The expert panel believed that the Intervention section should reflect the actual services run in practice.

EATRIS – European Advanced Translational Research Infrastructure in Medicine

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Objective

To develop new innovative technologies, products and treatment options for patients; in order to generate new solutions, basic research have to be translated into clinical applications.

Methods

EATRIS is staffed by a small team of professionals who run the core EATRIS function of Coordination and Support from Amsterdam. By defragmenting the biomedical expertise scattered across Europe, a new and powerful resource is made available to large and small companies, charities, research institutions and governments. EATRIS greatly improves the projects' scientific "firepower" by tailoring it very precisely to sources of expertise, technology, and patients.

Results

EATRIS, founded in 2008 by a number of European Union member countries and leading research centers, is the first research infrastructure in Biomedical Sciences to receive the »European Research Infrastructure Consortium« status. The Faculty of Pharmacy (University of Ljubljana) is the EATRIS representative of Slovenia, which currently holds an observer status. The aim is to optimize the route from discovery to proof-of-concept with a unique range of expertise in extensive partnership of academic translational centers which offer:

- Translational focus providing support from discovery to clinical trial (Phase I/IIa)
- Access to the latest discoveries and technologies
- Access to the highest quality facilities
- Access to large and diverse patient groups

EATRIS is focused on five product platforms: advanced therapy medicinal products; biomarkers; small molecules; molecular imaging and tracers; and vaccines.

Conclusions

Throughout Europe, there is an increasing incidence of cancer, cardiovascular and other diseases like Alzheimer due to higher life expectancy and changes in lifestyle. At the same time the cost for drug development has risen significantly, with declining innovation. EATRIS is facilitating the development process for drugs and diagnostics, helping raise the quality of life for Europeans, by providing access to over 60 academic institutions which offer the entire spectrum of research accessible through one portal.

Outcome-based approach to the curriculum reform – a case study in the Faculty of Pharmacy, University of Helsinki

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Key words: curriculum reform, learning outcomes, working life

Objective

In order to meet the expectations of the work life and to act as an expert in the health care profession, it is of utmost importance that the education creates such knowledge and skills which have relevance for the expert. Thus, the planning of the curriculum should be based on learning outcomes, which meet the needs in working life. The aim of this reform was to define learning outcomes for the pharmacy curriculum in the Faculty of Pharmacy, University of Helsinki.

Methods

During the years 2012-2014 we conducted a curriculum reform in the Faculty of Pharmacy, University of Helsinki. The construction and the content of the curriculum were based on the most relevant learning outcomes concerning the work life. The reform was kicked off by interviewing all the relevant stakeholders (students, teachers, all the work sectors pharmacists are involved). Exact memos of the interviews were written simultaneously and the interviewees had a possibility to comment and correct the memos during the interviews. Memos were afterwards analysed by content analysis method.

Results

Based on the interviews the learning outcomes of the Bachelor's and Master's degree were defined including both content and generic skills. These new learning outcomes led to the renovation of the strand structure within the curriculum to foster the constructive alignment and the designing of the courses. The learning outcomes were defined in more detail for the strands and individual courses within the strands.

Conclusions

During the process we understood the importance of listening carefully of all the stakeholders and their opinions. The process created an inspired atmosphere where everyone felt that their participation was valued. Although the background of the participants was quite different, the outcomes were surprisingly uniform. During the process many new ideas and practices were formed.

When reforming the curriculum it is absolutely necessary to involve all the stakeholders in order to fulfil the needs of the work life. Although the process was demanding and time-consuming, it was also inspiring, unpredicted and produced many good practices.

Methodology booklet student survey about teaching methods around faculties of pharmacy in Europe

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Key words: methodology, booklet, student, pharmacy, survey, teaching, methods, EPSA, EAFP

Objective

The aim of creating the Methodology Booklet Survey is to gather data from European Pharmacy students about the teaching methods that are currently used in Faculties of Pharmacy in Europe.

Methods

The survey consists of both closed and open question and is developed in collaboration with EAFP. Distribution will be managed through EPSA network which covers 35 countries through its 41 member associations. Each member association will provide 5-10 surveys filled in by the pharmacy students they represent. The target audience of the survey will encompass a wide range of students from all years of studies and the results will be gathered throughout four weeks.

Results

The results will present the students' assessment on their learning experience, constructive feedback on evaluation systems and suggestions for improvement in cooperation between students and teaching staff. The results will also compile successful teaching approaches from a student perspective and will enable comparisons between different countries on learning and teaching methods.

Conclusion

Creating a comprehensive Methodology Booklet with suggestions given by the pharmacy students on methods that can be easily incorporated into pharmacy teaching to improve the students understanding of the pharmacy subjects and prepare them better for their professional pharmaceutical life.

Teaching complementary and alternative medicine at pharmaceutical faculty - why and how?

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Complementary and alternative medicine (CAM) is gaining its popularity among patients and in academic discussions.

Despite a huge public interest, the regulatory organs and profession react and adapt only slowly. Council of Europe adopted a Resolution on a European approach to non-conventional medicines in 1999 (Resolution 1206). In 2003 the European directive on medicinal products was adopted which includes homeopathy and in 2004 it was amended in regard to traditional herbal medicinal products. In November 2008 WHO adopted a so-called "Beijing Declaration on Traditional Medicine". European regulatory and legal requirements for alternative medicinal products (where the efficacy is not proven by the standards of "Evidence based medicine") are incomplete. While they enable marketing of homeopathic and traditional herbal medicines, the marketing of animal products (propolis), chemically defined substances (camphor) and parenteral prodicts (in Antrophosofic medicine) is not regulated.

At the Faculty of pharmacy in Ljubljana we introduced an elective course on "Medicinal products in alternative medicine" in 2007 to fill the gap in the knowledge of future pharmacists. In scope of this course we inform the students about the possible benefits of CAM, as for example a power of placebo effect and improved compliance. On the other hand potential risks associated with CAM are also presented to the students such as indirect risks (delayed visit to physician) and direct risks (intoxication, injury). In the second part of the course we present major CAM systems and techniques. For the pharmacist it is particularly interesting to know the methods that include medicinal products, and not only mind, energy or physical intervention.

Impact of students' research projects on quality of pharmacy studies in Riga Stradins University

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Key words: Faculty of Pharmacy of Riga Stradins University, student research work

Objective

Pharmacists offer unique expertise in the health care setting – knowledge about pharmaceutical products. One of the key components of training pharmacy professionals at Riga Stradins University is a research project that each final year student is required to carry out independently. The project's workload is 15 ECTS and it is a part of the National Degree exams.

The topics of a research project include pharmacology, social pharmacy, pharmaceutical care, pharmaceutical chemistry, clinical pharmacy, history etc. To narrow the gap between theory and practice and to introduce students to potential employers, the faculty decided to investigate research topics that pharmacy employers would find applicable in their practice.

Methods

We conducted a survey among key employers and representatives of professional organizations; each participant was asked to propose research questions that are currently imperative to their organizations.

Results

In 2013 Pharmacists' Society of Latvia proposed five topics on social pharmacy and pharmaceutical care issues in Latvia. Three themes were chosen by students and the results will be presented in April, 2014. In 2014, a major pharmaceutical manufacturer "Grindeks" proposed 13 research topics related to industrial pharmaceutical technology and pharmaceutical formulations. Ten topics were chosen by students. Research results will be presented in April, 2015.

Conclusions

We plan to analyse the results of these collaborative research projects in order to understand weather the research projects' results were useful and applicable in their practice. This will allow us to refine research project requirements as well as expand collaboration with other employers. Additionally we will survey students to understand their experience with these collaborative projects.

Systematic promotion of pharmaceutical science among high school students

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Key words: promotion of science, high school population, workshops, research camps, round table discussions

Objective

As a partner in the project "New Generation of Life Science Researchers" co-financed by the European Union and Ministry of education, science and sport of Republic of Slovenia, our institution is involved in promotion of life sciences among high school students. Here we report our experience in communicating pharmaceutical and biotechnological topics to Slovenian high school population.

Methods

We offer a range of activities that high schools can choose from, such as practical workshops and interactive lectures organized at sites, guided excursions of research laboratories, research projects for individuals or small groups, summer research camps and round table discussions of current matters. Furthermore, a work party that includes high school educators and scientists was formed to convey the concepts established over the course of the project to curriculum. Cooperating with colleagues from the National Institute of Chemistry and Faculty of Arts, we are able to address topics from diverse perspectives, covering technical aspects as well as social interactions and ethics.

Results

Student participation in project activities is voluntary and free, ensuring that highly motivated students are reached and equal opportunities are provided for each individual, respectively. More than 3000 students have taken part in diverse events thus far and feedback (typically gathered by evaluation through anonymous surveys as well as face-to-face discussions) was extremely positive. Importantly, activities are continuously improved based on participations' suggestions and needs.

Conclusions

With the aim of educating young individuals to become responsible adults with keen interest in life sciences, we have built an interactive platform, allowing efficient communication between students, high school educators and scientists. Students are integrated in scientific environment early and critical thinking is highly promoted.

Translation of clinical pharmacy and pharmaceutical care research into practice: Slovenian case

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Clinical pharmacy is a health specialty, which describes the activities and services of the clinical pharmacists to develop and promote rational and appropriate use of medicinal products and devices. Clinical pharmacists in Slovenia are practising in all settings where medicines are prescribed and used, i.e. in clinics and hospitals, community pharmacies and nursing homes.
The aim of this contribution is to present recent achievements of clinical pharmacy in Slovenia in terms of research and education activities and their translation into practice.

Research activities:
- running outcomes research (investigating clinical, humanistic and economic outcomes),
- publishing original and review research articles in journals and monographs,
- organizing symposia with topics on clinical pharmacy on national and international level,
- collaborating in national and international projects with contents on clinical research.

Education activities:
- running specialistic course on clinical pharmacy (15 specializants yearly),
- running PhD course on clinical pharmacy (all together 15 doctorands),
- collaboration in under and postgraduate pharmacy courses,
- collaboration in courses for physicians and nurses,
- running pharmacokinetic courses in the wards for physicians and nurses.

Practice:
- clinical pharmacist at the patients in the wards: participating in medical rounds, performing medicines use reviews, taking medication history, running medication reconciliation, performing therapeutic drug monitoring, interchanging prescribed medicines, developing the systems for improving safety of procedures of preparation and administration of medicines,
- clinical pharmacist in the hospital system: preparing drug formularies, participating in hospital committees for drugs, antibiotics and hospital infections, giving advices concerning assurance and maintenance of proper storage conditions for medicines, collecting and assessing literature data about medicines and presenting his statements to medical staffs, taking an active part in creating of pharmacotherapeutic guidelines, formal establishing of clinical pharmacy departments within clinics,
- clinical pharmacist at the primary level of healthcare system: establishing the practice of pharmacist-adviser on ambulatory (outpatient) basis and in nursing homes.

Clinical pharmacy is implemented successfully in majority of Slovenian clinics and hospitals, and is on a good way to be recognized as an essential part of the Slovenian healthcare system. Moreover, it is our aim to create a strong team of academic and hospital pharmacists with specializations and doctorates in clinical pharmacy, able to run routine in- and outpatient clinical practice and advanced clinical research, both in favour of the patients.

A novel research initiation program for University of Salamanca pharmacy pre-graduate students helps identifying research vocations

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Key words: research initiation program; pre-graduate students

A considerable proportion of pharmacy graduate students of the University of Salamanca (Spain) opt to register in a doctoral program with the aim to perform a doctoral thesis. However, choosing the most appropriate research group that meets the graduate's preferences is, usually, a difficult task possibly due to the lack of a good knowledge of the research lines and technology offer within the Faculty of Pharmacy.

Accordingly, the objective of this study was to establish a coordinated activity aimed to initiate pre-graduate students in scientific research. To perform this, we implemented a novel research initiation program voluntarily assigned to pre-graduate Pharmacy students of the third and fourth academic courses. Fifteen research groups and twenty five students of the Faculty of Pharmacy (14 from the third, and 11 from the fourth course) participated in the program. Students were distributed in four teams of 5-7 students each, which visited all research group laboratories in a rotatory manner throughout the 2-years program length. To provide flexibility and coordination with the rest of the classes, each research group had allocated one calendar month (from October to April) to arrange, in coordination with the students, the precise dates of the laboratory visits. The duration of each visit by the teams ranged from 2-5 days (2-3 hours/day).

During the current 2013-2014 academic course we have reached the second year of implementation of this program. According to the inquiries performed to both students and professors, about 85% of the students attended all laboratories and served them to obtain a better knowledge of the specific research lines within the Faculty of Pharmacy.
Students also gained complementary formation in scientific research, and professors had the opportunity to closely follow the aptitudes of a few, selected group of students.
Thus, we believe that this research initiation program helps identifying research vocations.

Only the continuously educated expert and a qualified teacher is able to transmit knowledge and skills to the others

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Objective

At the Faculty of Pharmacy VFU, University of Veterinary and Pharmaceutical Sciences, we strive to ensure and to innovate the study program Pharmacy in accordance with the latest scientific trends and knowledge. We strive to increase the pedagogical, managerial, language, communication and last but not least, workforce skills.

Methods

The faculty supports training of staff and PhD students through successful implementation of the project entitled "Improving teaching, management and professional skills of personnel" funded from ESF. Vocational courses are aimed at numerous areas: Pharmaceutical qualitative and quantitative analysis; Pharmacovigilance and formulation of medicinal products; Molecular biology and pharmacogenomics; Clinical trials; Practical aspects of data analysis; courses focused on drugs of biogenic origin, and do not forget to also soft skills such as Ethics and assertiveness; Communication and rhetoric; Information technology course and courses of practical aspects of data analysis.

Results

18 courses were already held with focus on teaching skills (attended by 180 academics). Courses on computer skills were very well evaluated - a total of 15 courses with 75 participants were organised. Most frequent, however, were professional courses, attended by both academics and PhD students - a total of 120 people in 74 courses.

Conclusions

Only the continuously educated expert and a qualified teacher are able to transmit knowledge and skills to the others. Currently, the staffs of all faculties and institutes VFU is systematically trained in their area of specialization.

Recording of pharmacy activities – what do the students really do during the six-month practice?

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Objective:
Final year practice aims to bring students directly into the pharmacy where they can learn by doing and apply their theoretical knowledge in the real time environment. Aim of the project was to develop an evaluation and communication tool between the student and the faculty during the final year.

Methods:
E-learning platform Moodle was chosen as a communication tool and a course "Recorder of pharmacy activities" was created. During each week of practice students recorded 11 key activities regarding their practice in pharmacy (proportionality of dispensing Rx/OTC, preparation of individual medicines, supply, analysis, administration, communication with pharmacist/doctor/patients, specific tasks, etc.) and the location of the pharmacy.

Results:
Based on two-years running of the project (2011-2013) about 3700 weekly records were collected from the students. 5% of students reported dispensing for more than 30 hours per week compared to 30% of students dispensing only 10 hours per week. 45% of students dispensed the OTC medicines for maximum 5 hours per week which can be found insufficient. Only 17% of students consulted with doctors during the week.

Conclusions:
Recording of the real-time pharmacy activities carried by final-years students gives us a realistic overview of students' preparedness for the role of pharmacists. Limits in the activities should be reflected in the change of curricula, by e.g. increasing the content of curricula concerning OTC medication and communication skills.

Identifying trends of perceptions of professionalism in students of two pharmacy schools in the United States of America

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Key words: professionalism

In the United States of America, there are currently 130 accredited colleges and schools of pharmacy. Different schools have different expectations about professional behavior from pharmacy students. Pharmacy students may also have their own perceptions of what professionalism is. The goal of this study was to identify trends in student perceptions of professionalism in a newly accredited pharmacy school Chicago State University and in an established pharmacy school University of Connecticut and to examine how identified trends compare.

Students' perceptions of values and behaviors related to professionalism were assessed via a questionnaire. Questionnaire items were based on the values of professionalism identified in the literature and current trends in pharmacy field. Students of all four professional years from the two universities participated in the study. Factor and Cluster analyses were performed to identify trends of perceptions of professionalism.

A total of 266 CSU and 249 UConn students were included in the final analysis. CSU data revealed four cohorts of students and UConn data revealed three cohorts of students.
In both schools, there were students who understood professional values and behaviors; students who minimized the importance of professionalism; and students who identified graduating and making money as motivators. In both schools, students accepted informal communication with faculty and other health care providers as professional behavior.

Education on traits of professionalism needs to be infused in the curriculum, across all courses. Results indicate the necessity to emphasize the following professionalism traits: commitment to self-improvement and lifelong learning, service-minded orientation, pride in the profession and a dedication to advance its value to society, creating a covenantal relationship with those served, and accountability for performance. Students need to be continually reminded of the humane and societal value of the pharmacy profession beyond its lucrative value.

Linking education, science, innovator and generic companies: does bioequivalence imply therapeutic equivalence?

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Key words: bioequivalence, therapeutic equivalence, curricula gaps

Whatever their professional postgraduate evolution, all pharmacists meet very frequently questions concerning interchange of drugs provided by different manufacturers. Though definition of bioequivalence (BE), in USA being approved by Congress, problem concerning scientific bases of correlation of BE with therapeutic equivalence (TE) is usual neglected in pharmaceutical education.

Objective
This paper tries to establish and propose the main components of a systematic approach in European universitary curricula of the BE-TE correlations in context of UNESCO objectives concerning "drugs for all people" as a fundamental right of men.

Methods
It were applied pharmacological, biopharmaceutical, biostatistical and socio-political methods for revealing the essential aspects of definition and application of the concept.

Results
It was found that, a presentation to students in pharmacy and medicine of the TE implication by BE have to include a series of solid proofs in the following order.

1. Pharmacological point of view is that drugs achieving similar plasma levels of the active components have the same therapeutic effect.
2. Biopharmaceutical point of view is that similar in vivo release profiles imply similarity of plasma levels.
3. Correctness of clinical BE study and associated biostatistical proof assures that probability of differences in TE is very close to zero.
4. Generic drugs are cheaper and less biological variable than brand drugs.

Conclusion
Political aspects concern inducing the idea concerning possible differences in effect of BE drugs, by innovator companies, based on an willingness or unwillingness misunderstanding of the scientific bases, starting from the old definition of BE, based on 20 % difference between plasma levels as a clinical non-significant difference.
Another aspect is the lack of regulations preventing incomplete or even false information of medical doctors, pharmacists and patients concerning BE implications in therapy.

Evaluation of new pharmaceutical compounding practicals

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Objective

To evaluate the newly introduced compounding practicals developed for the first year students following the Bachelor of Science (Honours) in Pharmaceutical Technology course which was launched in 2011.

Methods

The practicals consist of 2 sessions of 2 hours each and are intended to complement the lectures given in the module. During each session, two different preparations, such as an ointment and paste, are compounded. A self-administered questionnaire was developed and distributed to all the 12 first year students. The questionnaire was divided into 3 parts. In the first part demographic data was collected. In the second part of the questionnaire the practical sessions were evaluated using a Likert scale (1 strongly disagree - 5 strongly agree) for clarity, ease to follow, skills developed, connection between practicals and material covered during lectures and allocated time. The third part consisted of open-ended questions assessing which practical was deemed to be the most and least interesting, whether there were any practicals which they would like to be implemented and whether they have any suggestions.

Results

Out of the 9 respondents, 5 strongly agreed and 3 agreed that the practicals were easy to understand. Five strongly agreed and 4 agreed that it was easy to follow the method stepwise and 2 strongly agreed and 5 agreed that the practicals improved their troubleshooting skills. All students stated that practicals reflect the material covered during lectures and helped them to better understand the techniques learned in class. Six students suggested the addition of other dosage form preparations with the preparation of an emulsion being the most requested (n=4).

Conclusions

Practical sessions stimulate students to learn more and understand better the theory learned during lectures. The developed practicals were positively evaluated by the students and the suggestions to include other dosage form preparations will be considered within the coordinating group.

Linking education, science and stakeholders: The Bioenterprise master experience

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Key words: molecular biology, biotechnology, enterprises, Masters

Molecular Biology Applied to Biotechnological Enterprises (BioEnterprise) is a masters' degree offered at the University of Granada, Spain.

Objective

It was design to fill the gap between the faculty and the biotechnological enterprises.

Methods

The design was done after consultation with the enterprises settled in the local surroundings and national associations of biotechnologists. An outside to inside approach was used. So, after defining the competences by the stakeholders, we elaborate the learning outcomes and then, according with the faculty resources, the program of activities for each year.

Results

One year course with combines applications of molecular biology, cell and animal assays and bioinformatics with entrepreneurial techniques focused in R&D project management. A major activity is the tutored internships in which the students have to carry out a mini project about one of the lines of development of the enterprise that are offered. To further prepare the student to the enterprises' necessities, a number of elective modules are offered by the enterprises. Almost all the enterprises in the surroundings plus others such as Promega France, and also several institutions as the Karolinska Institute are participating. Surveys among the participants have shown that they are satisfied with the knowledge and in particular with the internships experience. Furthermore, many of the works carried out have been used to further development inside the enterprises, and as a consequence some of the students got a position. The number of applicants have passed from 66 from 12 universities in the first year to 137 from 25 universities the second year.

Conclusion

It is successful the link between faculty and enterprises when using and outside to inside approach.

Development of pharmacogenetics skills for pharmacists from the Republic of Macedonia

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Key words: pharmacogenetic

The completion of the human genome project and the development of new technologies for high-throughput genetic analyses has allowed for establishment of the concept of personalized medicine, with special emphasis of individualized therapy. The view that genetic information transforms the utilization of medicinal drugs is getting a wider acceptance among medical community at large. However, despite this longstanding optimism, there have been remarkably few examples of practical implementation of pharmacogenetic discoveries in clinical practice. One of the obstacles has been the suboptimal education of medical genetics, pharmacogenetics in particular, among all fields of medical disciplines, including pharmacy.

In order to bridge this gap, the UKIM - Faculty of Pharmacy, Skopje, has introduced an optional subject "Pharmacogenetics" in the master curricula for pharmacists from our country. The course gives introduction into various genetic profiles of response to drug substances, with interaction on the level of drugs and genes, DNA polymorphism and molecular pharmacogenetics. The subject also encompasses specific examples of pharmacogenic interactions in cardiology, neurology, oncology and other medical disciplines. Students are also exposed to practical work within the Center for biomolecular pharmaceutical analysis which is a state of the art laboratory that is equipped with most advanced apparatuses obtained by funds from the Government of the Republic of Macedonia and from institutional funds. This laboratory is performing wide variety of contemporary pharmacogenetic analysis for the University Clinics in Macedonia and for implementation of various research projects.

"Pharmacogenetics" is also an optional subject, with more advanced curricula, in the PhD studies of the Faculty of Pharmacy and is offered not only to our students but also to other PhD students from our University. It is expected that the implementation of this knowledge will help in a wider acceptance of pharmacogenetics in medical practice and improved outcome of therapy in our country.

Nationwide collaborative development of learning outcomes and exemplar standards for Australian Pharmacy Programs

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Key words: learning outcomes

Objectives

Internationally, the preparation of pharmacy graduates for professional practice has evolved, from educating for capacities for practice, to a focus on competencies and most recently on assuring graduate outcomes. The objective of this paper is to describe a strategy which successfully harmonised the various expectations and regulatory requirements for Australian pharmacy education programs through the development of learning outcomes and exemplar standards for all pharmacy graduates.

Methods

Learning outcomes and exemplar standards were developed through a series of workshops — with academic staff representatives from pharmacy schools in Australia, pharmacy student representatives and the Australian Pharmacy Council (the accreditation body for Australian pharmacy programs) and through an iterative process of dissemination and seeking of feedback.

Results

The key result from the project was the formulation of national pharmacy learning outcomes and associated exemplar standards for all students graduating from pharmacy programs. These have been endorsed by both students and academics.

Conclusions

This project has demonstrated that the various expectations and regulatory requirements for pharmacy education programs can be successfully harmonised at a national level through adopting a highly collaborative iterative approach. The establishment of nationally agreed Pharmacy Learning Outcomes for graduating students, which reference the current and future needs for pharmacist services, has clarified expectations of both standards and levels of achievements for students, academics, employers and the professional body. Application of these learning outcomes and exemplar standards will ensure that all graduates of all pharmacy programs will have achieved at least the same threshold regardless of the university from which they graduate prior to entering their internship year.

Prevalence of potential drug-drug interactions for the 100 most often prescribed drugs in Slovenia

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Key words: potential drug-drug interactions, outpatient setting, prevalence

Objective

Studies on potential drug-drug interactions in the outpatient settings have focused on limited drug interacting pairs or limited number of patients. The aim of this study was to evaluate the prevalence of all potential drug-drug interactions (DDIs) in the outpatient setting for the 100 most often prescribed drugs in Slovenia.

Methods

In a retrospective cross-sectional study, all prescriptions dispensed in 2008 in Slovenia were analysed to determine the prevalence of potential DDIs. A potential DDI was defined as dispensing of two interacting drugs to one patient on the same day. The reference source for interacting drug pairs of the 100 most often prescribed drugs was the Lexi-comp interactions database.

Results

There were 14,915,889 prescriptions dispensed in 2008 to 1,355,184 persons receiving at least one prescription with the drug of interest. Among these, 513,331 (37.9%) persons were exposed to at least one potential DDI. Nearly 60% were female. Elderly represented 46.9% of all persons exposed to at least one potential DDI.

Among 4,676,545 identified cases of potential DDIs there were 368,879 (7.9%) cases of type D interactions and 26,869 (0.6%) cases of type X interactions. Number of persons exposed to type D and X interactions were 134,219 (26.1%) and 13,322 (2.6%), respectively.

Drugs most frequently involved in type X potential DDIs were alendronic acid and cholecalciferol combination, followed by escitalopram, carvedilol, quetiapine, and risperidone. Drugs most frequently involved in type D potential DDIs were zolpidem, calcium carbonate, allopurinol, doxazosin, and amlodipine.

Conclusions

Prevalence of potential DDIs in the outpatient setting is relatively high. Defining predictive factors and prevalence of clinical manifestation of potential DDIs is the next step in improving pharmaceutical care for Slovenian patients.

Evaluation of practical sessions for Pharmaceutical Technology course

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Objective

The Department of Pharmacy offers a three year full time programme towards a Bachelor degree in Pharmaceutical Technology. The course was launched in October 2011 and is intended to prepare graduates for pharmaceutical processes with a particular focus on quality control and quality assurance aspects. This study aims at evaluating perceptions of students of the newly developed practicals offered during the final year of the course.

Methods

The practicals consisted of 16 sessions of 2 hours each. They were presented with the intention of providing a comprehensive approach to skills of pharmaceutical compounding and testing, chemical synthesis and titrations. A questionnaire based on a Likert scale was distributed to all the three final year students. The students were asked whether the sessions were easy to understand and follow whether their skills were improved, whether there was a link with theoretical aspects learnt during lectures and whether enough time was allocated. The final part of the questionnaire consisted of 4 open- ended questions where students were asked which practical they found to be the most and the least interesting, whether they would suggest the implementation of any other practical and whether they had any further suggestions.

Results

All students (N=3) agreed that the practical sessions stimulated them to learn more about the subject tackled and reflected material that was covered during lectures. One student strongly agreed and 2 agreed that the practicals improved their troubleshooting skills. Two strongly agreed and one agreed that they were easy to understand. Two students suggested implementing practicals involving the use of High Performance Liquid Chromatography as they felt that such an analytical instrument is widely used in their field of study.

Conclusions

All students were satisfied with the types of practical sessions covered. The inclusion of practicals involving more the use of analytical instruments is being considered.

Science-based pharmacy education at the University of Tartu, Estonia: Experiences on the integration of research work in master curriculum

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Key words: pharmacy education, Research Work

Research Work (RW) was first introduced to the pharmacy master curriculum at the University of Tartu (UT) in 1996. Currently there are three obligatory subjects associated with RW: Design of the Research Work (1 ECSP), Research Seminars on the selected topic (7 ECTS) and Research Work (6 ECTS). Students give presentation on the results of their RW and perform research discussion with scientific reviewer on public defence.

Objective

To evaluate the subject areas and research networking in connection with RWs in 1996-2013 at the Department of Pharmacy, UT.

Methods

Retrospective analyse of the RW database at the Department of Pharmacy, UT. The categorization of subject areas of RWs was based on the subgroups developed for PHARMINE project[1] as follows: Chemical Sciences (CHEMSCI), Pharmaceutical Technology (PHARTECH); Medical Sciences (MEDSCI); law, ethics and social sciences (LAWSOC).

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Results

Overall 564 RWs were defended during 1996-2013. The number of defended RWs varied from 11 to 67 in one year. During the named period only staff members of the Department of Pharmacy were involved in supervising of 69 RWs in PHARTECH, 57 in CHEMSCI, 158 in LAWSOC and 6 in MEDSCI. In the research networking with other departments of the Faculty of Medicine, the other faculties at the UT and other universities and institutions, there have been completed RWs in PHARTECH 11, CHEMSCI 56, LAWSOC 54 and MEDSCI 153.

Conclusions

Within 1996-2013 LAWSOC and MEDSCI were the two most frequent subject areas for RWs. However, a high number of research cooperation in supervising of RWs within all selected subject areas serves as an excellent opportunity for development or continuing of research contacts.

[1]Atkinson J, Rombaut B. The 2011 PHARMINE report on pharmacy and pharmacy education in the European Union. Pharmacy Practice (Internet) 2011 Oct-Dec; 9(4):169-187.

Could pharmacy students identify risk for lactic acidosis after contrast dye administration in leukemia patients treated with metformin?

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Key words: metformin, lactic acidosis, contrast dye, leukemia

Objective

Computed tomography (CT) is common in patients with acute myelogenous leukemia (AML). Preceding CT, patients receiving metformin are directed to discontinue treatment as co-administration with contrast dye may lead to fatal lactic acidosis. Commonly insulin replaces metformin thereafter. We planned to assess the intra and inter-patient variability renal function and use this information to simulate metformin kinetics, then evaluate any lactic acidosis risk, should have metformin been reinitiated. The secondary goal was to develop a protocol allowing timely pharmacist intervention and meaningful experiential learning for students.

Methods

A cohort of all incident AML cases receiving metformin at diagnosis (01/01/2003-12/31/2010) was retrospectively analysed, n=39. The variance (SYSTAT13) of longitudinal renal function biomarkers abstracted from the medical records defined the error model for metformin clearance (CL) in a 2-compartment pharmacokinetic (PK) model used in Monte Carlo simulation (n=1000/dose/CL, Berkeley-Madonna) of metformin concentration profiles. Lactic acidosis risk was considered minimal if the 99th percentile's maximum concentration was below 5mg/L.

Results

The observed CrCl mean was 74.43mL/min. We found that 500mg metformin taken either once or twice daily posed minimal lactic acidosis risk regardless of renal impairment extent. 1000mg once daily only exceeded 5mg/L in 1.8% and 6.3% of mild and moderate renal impairment simulated subjects respectively. The highest percent exceeding 5mg/L (36%) were observed in the simulations with severe renal impairment (CrCl$\leq$30mL/min) receiving 1500mg once daily.

Conclusions

Only few simulations exceeded the proposed safe threshold in most modelled regimens. In the given population, reinitiation of metformin 500mg daily would have posed <1% risk of developing lactic acidosis. A new glucose management protocol has been proposed and is currently tested in our AML population. In the future, pharmacy students will be responsible to identify eligible cases, monitor renal function post-CT and present the case for pharmacist assessment and reinitiation of metformin.

Engineering design review of pharmaceutical companies' activities

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Key words: engineering, design review, GxP, pharmaceutical manufacturer, regulated company, project.

Objective

Project review is a cost-benefit analysis of the capital project. Otherwise speaking it is a cost comparison of the capital project and the benefits from the project execution.
A regulated company should have a formal design review system for design review execution to ensure that the quality of the project has been achieved cost-effectively. Design review contains of construction quality management, design review stages, design review tools, and the final result of design review.

Methods

In the process of design review I used: system review, comparative analysis, post evaluation, investment research, continuous sampling, expert evaluation, and decision theory. An additional point is that employees of the engineering and technical bureau "Pharm Design", Ltd. and the medicinal drugs industrial engineering division of St. Petersburg State Chemical-Pharmaceutical Academy.

Results

We defined design review as cost-benefit analysis of the capital project that is performed to control the construction quality, cost-benefit analysis contains of design review stages, design review tools, and the final result of design review. Apart from that it is necessary to take into account a management system and quality standards of regulated company construction activities. Commissioning in compliance with statutory and design qualification contains of system description, system risk assessment, commissioning, and qualification.

Conclusion

Therefore it is possible to provide maintenance of the new product creation using the project engineering instructions mentioned above.

Clinical pharmacy development in Ukraine

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Key words: clinical pharmacist, training, education, clinical pharmacy

In the early 70s of the 20th century the new specialty "Clinical Pharmacy" appeared on the labor market of Western Europe. The main background for its appearance was rapid increasing of knowledge in medicine area, accumulation of knowledge regarding existing and innovative drugs, implementing in medical and pharmaceutical practice the framework of evidence-based medicine and pharmacy.

Formation of clinical pharmacy in Ukraine started in the early 90s as a reflection of the world trend in enhancement of pharmaceutical specialist training system. The first step was the creation of the Department of Clinical Pharmacy (since 2013 – Department of Clinical Pharmacology and Clinical Pharmacy) on the base of Ukrainian Pharmaceutical Academy (Kharkov). It has initiated a new stage in pharmaceutical specialists training at university level in Ukraine. In 1999 specialty "Clinical Pharmacy" was firstly licensed and clinical pharmacist training started in our University.
Nowadays there was created the educational and methodological complex that includes textbooks, study manuals, guidelines regarding seminars, practical and laboratory classes, students' self-guided work in order to provide an appropriate clinical pharmacist's training at the Department of Clinical Pharmacology and Clinical Pharmacy of National University of Pharmacy.

Training and providing labor market with clinical pharmacy specialists is only a little part of variety of issues that clinical pharmacy should resolve. Its main goal is to enhance the quality of pharmaceutical help via rational pharmacological therapy of each patient and development of the responsible self-medication concept.
Nowadays clinical pharmacy is a settled branch of medicine and pharmacy that has own scientific and practical traditions, appropriate legal base. Clinical pharmacists are highly demanded specialists in most medical and pharmaceutical areas: pharmaceutical industry, private medicine, insurance companies, state hospitals, medicine use control authorities, non-governmental and research organizations etc. Clinical pharmacist actively participates in clinical trials, preclinical studies, bioequivalence studies, planning, monitoring and assessment of clinical trials.

20th Annual EAFP Conference

Ljubljana, Slovenia, May 22 – 24, 2014

Science-based pharmacy education: Towards better medicines and patient care

Abstracts of invited speakers

Pharmacy education supporting pharmaceutical healthcare delivery settings

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Pharmacy graduates are practicing in different pharmaceutical healthcare delivery settings including community pharmacies, hospital pharmacies, clinical pharmacy services, long-term care facilities, home services. Focal contributions of the pharmacists in these healthcare delivery settings are ensuring access to medicinal products, collaboration with other healthcare professionals in disease management to ensure rational, safe and effective use of medications, risk management with pharmacotherapy, and patient advocacy.

How can pharmacy curricula be developed to ensure pharmacy graduate achieve baseline competencies required from health care delivery settings? Examples of activities that support the development of skills required in these practice settings are reviewed. How can pharmacy educators support the delivery of new pharmaceutical services in health care delivery settings? The concept of integrating pharmaceutical sciences to the application of pharmaceutical processes in pharmacy education and research is presented.

Laboratory medicine as one of the pharmacists' competences

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Key words: laboratory medicine, specialization, clinical laboratory, laboratory testing, pharmacists, competences

Examinations of the body fluids in order to recognize the state of health of the individual have roots centuries ago. The early contributions to the evolution of laboratory examination of bodily excrement cannot be neglected even considering modern criteria for such work (standard ISO15.189) with pre-analytical and analytical factors.

More scientific approaches were applied in 19th century especially after works of Pasteur and Koch, and after setting up the clinical laboratory by Scherer in Wurzburg. The first clinical laboratory scientists of the new era began working in clinical laboratories in the early 1900s. During and after the 1st world war, clinical laboratories became established in hospitals, and the clinical utility of laboratory tests became more widely recognized by physicians. After 2nd world war, the demand for educated medical laboratory technologists grew as a result of public demand for more health services, including laboratory testing. The field was developing much dispersed and different terms were used indicating the general field of the clinical or medical laboratory profession: klinische chemie, biopathology, analisis clinicos, biologie clinique, medical biopathology … In the second half of the 20th century clinical laboratory scientists began to assume greater responsibilities for analyzing and interpreting test results, evaluating and implementing quality assurance programs and new methodologies. In the 90s of the last century, the term **laboratory medicine** was widely introduced for all work and services performed by clinical laboratories of all types as "branch of medicine providing the health care system with laboratory results and related information and advice pertaining to the clinical state and treatment of health care recipients". Laboratory medicine is a multidisciplinary medical and scientific specialty with several interacting sub disciplines. It represents a major component of healthcare and is involved in more than seventy per cent of medical decisions. According to the ISO 15.189 "Medical laboratories perform examinations for the biological, microbiological, immunological, chemical, immuno-hematological, hematological, biophysical, cytological, pathological or other investigation of materials derived from the human body, for the purpose of providing information for the diagnosis, prevention and treatment of disease in (or assessment of the health of) human beings".

Where pharmacists are in this story?
European experts in clinical laboratory sciences have different backgrounds. From the survey 20 years ago among 30.000 members of European societies for laboratory medicine fields, 40% studied medicine, 27% chemistry and 21% pharmacy, with great national variability: with the majority of pharmacists in France, Spain, Poland, Slovenia, biochemistry background in UK, Finland, Sweden, Romania, Netherlands, Slovak, Greece, and with medical backgrounds in Austria, Italy, Switzerland, Norway, Portugal, Hungary. The

percentages have been changed through time, but this profession has strong interdisciplinary character in all countries.

In 2/3 of mentioned experts post graduate education were provided. PhD scientists played a role in developing new methods and algorithms in large, primarily academic, clinical laboratories and in the *in vitro* diagnostics industry. The clinical laboratory plays an important part in the development of new medicines as well.

Important scientific disciplines that may be professionally applied in a medical laboratory are: physics, chemistry, biology, anatomy, histology, cytology, physiology, biochemistry, immunology, genetics, molecular biology, microbiology, parasitology, endocrinology, hematology, pharmacology, toxicology, pathology, pathophysiology, metrology, statistics, information technology, ethics. Comparing with EU Directive for pharmaceutical education program much overlapping can be found.

From the pharmacy point of view only small part of pharmacists are involved directly in laboratory medicine, but they represent important part of medicine laboratory scientists, especially when basic education in pharmacy continue with specialization or PhD on the laboratory medicine field. But even for pharmacists working in public or hospital pharmacies, in clinical pharmacy or in drug development, at least basic knowledge about production and utilization of laboratory testing results is essential.

The challenges to put in practice the needs for a better patients care

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Key words: Clinical Pharmacy; pharmaceutical care; patients' outcomes; pharmaceutical services.

Since the idea of challenges and opportunities are in our mind to follow the future vision of our professional we believe that the schools of pharmacy jointly with the professionals are the main force to strongly support our duties in front of the patients. "Sciences-based pharmacy education towards better medicines and patients care" or "Access to medicines and pharmacists today, better outcomes tomorrow" are not only singles phrases but a real opportunity to change and improve the practice of the pharmacists.

While new more potent and complex pharmaceutical agents are becoming available, increasing demands on doctors and the health care system, the increase of drug related morbidity and mortality throughout the world and rising costs related with the use of medicines it is clear that the identification of a practitioner who is available to focus on the management of all of patient´s medicines would be an important asset to the future of Human Health.

Medicines are precious goods, but patients need to learn how to use them. It is possible that this will be one of the advantages that the pharmacist, as a specialist in the medicines use, will bring to the health system, in other words, the promotion of the rational use of medicines as laid out in legislation. The correct use of medicines will significantly decrease the poor outcomes of pharmacotherapy, namely untreated health problems and the ineffective and unsafe treatments.

It was in 1979, that a group of pharmacists working in the pharmacy hospital near the patient and having the pharmacy and the ward as their place of work have experienced the benefit of being in the health team. They organize a scientific and professional society for pharmacists, named European Society of Clinical Pharmacy (ESCP) and for promote the profession of Clinical Pharmacy. ESCP represents clinical pharmacists or others pharmacists who are interested in clinical pharmacy and in developing clinical pharmacy approach throughout Europe. Clinical pharmacy could be defined as a tool for better use of medicines, better health outcomes and a better use of health care resources. The pharmacists with this work thoughts and orientation could exchange knowledge, take skills and promote attitudes in order to increase the benefit in the treatment of the patients.

Also with a long period of reflection and with near 25 years of existence Pharmaceutical Care is a patient-centred philosophy of assisting practice in which the pharmacist, as a health care team member, has the responsibilities in patient medication and also in the prevention of the disease. Quoting Hepler and Strand´s and using the definition purpose by them in 1990 "Pharmaceutical Care is the responsible provision of drug therapy for the purpose of

achieving definitive outcomes that improve a patient´s quality of life[1]. To do this there are pharmaceutical services that monitor the process of the use of medicines from a preventive attitude, identifying the risk factors in the medicine use process, acting within the dispensing, in the analysis of the morbidity indicators and in the medication review – and there are other services that monitor the outcomes from a reactive attitude identifying the negatives outcomes, their reasons or acting in their causes, like pharmacotherapy follow-up and disease management.

The pharmacists that have these tasks need to develop some specific competencies that the acquire knowledge in the university and in practice for support them. They will have to develop new competences in communication skills, update information for scientific-based decision, critical analysis, ethical behavior, teamwork and leadership. And, more than, ever, the clinical pharmacists will have to be technically competent, which requires solid training in pharmaceutical sciences but mainly in pathophysiology, pharmacology and pharmacotherapy. The assisting pharmacists will have also to learn to systematize and register its action in each type of service carried out. The main barrier that he will have to overcome will be his own mind and beliefs[2].

This will not only provide new ways of boosting the professional satisfaction of clinical pharmacists but also provide concrete answers to the real situations of patients who will ultimately receive better care.
To put an end to this abstract a brief mention of paper from Foppe van Mill & F. Llimos[3] "What is pharmaceutical Care in 2013?" and which we recommend. We believe that news flowing winds are coming in the pharmacist direction and we need be ready.

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Scenario analyses

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Times change and are we changing with them? How will the European schools of pharmacy, where we now educate pharmacists for the next 40 years, adjust to challenges from the 'outside world'? And are we doing enough in life-long learning programs to keep practicing pharmacists up to date with new developments? Will there be different types of schools of pharmacy in the future, pharmaceutical care and pharmaceutical manufacturing oriented?

These questions were raised at the FIP in 2010 and we decided to develop a set of scenarios for 'the pharmaceutical world in 2020'. We questioned a global panel of experts with different backgrounds, varying from venture capitalists and patients to WHO officers in a F2F meeting. They came from all (?) parts of the world. By analysing the output of this meeting a set of scenarios was developed and published for further discussion (Pharmaceutical Sciences in 2020, Nature Reviews Drug Discovery, vol. 9, 2010).

A fundamental problem that came up in the discussions was that academic staff is not encouraged (and maybe not able) to respond timely to fundamental changes in science and society. Curricula development is therefore lagging behind and stakeholders become dissatisfied. If this analysis is correct, what can we do to bring the pharmaceutical academic education up to date and make sure that it stays abreast? The Association of Universities in the Netherlands (VSNU) just published a scenario analysis with as one of the issues 'mobility' of researchers (Future knowledge; 4 scenarios for the future of Dutch universities). Food for thought.

Pharmaceutical science and business – fostering talent development

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Key words: pharmaceutical industry, science, academia, cooperation, Biocamp

Pharmaceutical industry and profession carry a very noble mission and great responsibility to care and cure, to provide high quality medical treatments, affordable to the widest range of patients. Ageing population and unhealthy lifestyle are profoundly increasing the medical needs and the budget of healthcare funds. To successfully manage the demands of highly complex social and economic environment, the pharmaceutical students and professionals need excellent education, solid scientific base and practical experience, supported by competent mentoring.

To fully foster expertize and competence development of young professionals, academia, industry and health care sector must cooperate at all levels, connecting the science and practice. Already during the pregraduate training the students should recognise the importance of combining the analytical and business conceptual thinking, based on open communication, collaboration and team work.

Lek, nowadays a Sandoz company and Faculty of Pharmacy Ljubljana have been growing together for more than 50 years, co-creating the profession and the community of professionals. A significant number of leading scientists and top managers in Lek have started their education here and continue to build and share the knowledge, skills and best practises. Lek leaders contribute in bringing industrial prospective into pharmaceutical education by lecturing at scientific and business subjects.
During last few years we have added a new dimension to our cooperation, an interactive forum for top talents in the region – Biocamp.
Biocamp facilitates cooperation between industry and academia, innovation, scientific and business awareness. It attracts most talented students of natural sciences and gives them the opportunity to explore career opportunities in the pharmaceutical industry. The students, from pre graduate to post doctorial, get first-hand experience in starting-up a company, prepare and present their business plan. Participants interact with key experts and leaders from Sandoz, Novartis and network with talented students from other countries.

Future renewals of academic curricula should introduce more industrially relevant subjects, among which strengthening regulatory knowledge, quality expertizes and project management awareness seems to be important opportunities. Closer academia – industry cooperation should also enable students to experiment more and get first experience with scale-up laboratories, equipment and processes. Apprenticeships, research projects, master and doctorial theses under industrial mentorship could contribute significantly. Direct involvement and exchange between academic and industrial experts would additionally broaden the awareness of knowledge needs for students and professionals.

Eagerness to develop professionally and personally, always after improvements and growth, are the driving forces, creating the state of mind, where learning agility, cooperation and innovation are our common values and mode of operation.

University undergraduate study of Cosmetology at Faculty of Pharmacy: why and how?

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Key words: cosmetology, study program, interdisciplinary, faculty of pharmacy

Background

Faculty of Pharmacy, University of Ljubljana introduced 1st level undergraduate study programme of Cosmetology in the academic year of 2010/2011. It was and still is the only university study of such kind in Slovenia and neighbourhood countries. During its 50-ih years tradition Faculty has developed all required infrastructure for such study; we have habilitated teachers, appropriate laboratories and research equipment. The paper presents our experiences in the organisation and quality control management of this new programme over the last four years.

Objectives

Cosmetology as markedly interdisciplinary scientific discipline requires knowledge from different areas such as chemistry, biology, pharmacy, medicine, bio- and nanotechnology, engineering, analysis, economy, marketing, etc. to be able to support cosmetic industry effectively. The need for a highly qualified and up-to date study is therefore dictated by rapid and extensive development in this field. Some of the basic cosmetology issues are partly covered in our pharmacy curriculum, but the pharmacy graduates are not competitive for cosmetics job market, because their knowledge is primarily oriented towards pharmaceuticals and consequently they do not have enough specialized cosmetic knowledge and secondly, they are sometimes even overeducated to apply in this profession. So, the main objective of the new study program introduction was to train skilled professionals for conducting business in cosmetic industry, working in regulation and inspection services, research institutions, cosmetic product consultation and marketing.

Results

The duration of the Cosmetology study program is 3 years (6 semesters) and it comprises180 ECTS. The academic title awarded is Bachelor of Cosmetology. Based on 21 obligatory and a variety of elective subjects the program provides knowledge about biological bases of the human body - especially skin, mucosa, hair, nails and teeth; types, composition and production of various cosmetic products; their effects on physiological surfaces; control of their quality, safety and efficiency as well as the regulations relating to the cosmetic product supervision. The obligatory part of the study is also research work for diploma project which is performed in 6th semester under supervision of a mentor. The designed study enables the graduates to independently follow scientific achievements in the field of cosmetology and adapt them to the needs in their professional and research areas. The current number of students is 156, representing the 10,3 % of the student population of FFA.

Future plans

Taking in consideration the actual situation and the globalization needs in cosmetics, an upgrade of this course to offer a master's degree program is considered.

Evidence based clinical pharmacy and pharmaceutical care

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Key words: evidence based practice, systematic review, pharmaceutical care, clinical pharmacy, benefits

Objective

A systematic review of studies evaluating benefits of clinical pharmacy and pharmaceutical care services.

Methods

The Medline database was searched using a pre-defined search profile, limited to clinical trials and meta-analysis. We included studies in English published before 25.11.2011. Studies were excluded if the role of a pharmacist in an intervention was not clearly defined and if the intervention was described, but did not report any outcomes.

Results

A total of 266 studies were included, 253 clinical trials and 13 meta-analysis. The number corresponds to the uptake of pharmaceutical care concept in the nineties and amounts to 20 studies per year after 2009.

Studies most often evaluated services for the patients with hypertension, asthma, diabetes, heart failure and depression. As per location, services in primary care clinics were researched the most, followed by community pharmacies, hospitals and nursing homes.

Pharmacists were most frequently educating patients about their disease, medication and the importance of treatment. Patient's education resulted in improved medication adherence and clinical outcomes. Pharmacist activities reduced risk factors for cardiovascular diseases and control of asthma was improved by correcting inhalation technique.

The cooperation between pharmacists and physicians in prescribing and optimizing the therapy led to more appropriate prescribing, a positive impact on reducing the number of prescribed medication was indicated. Personal communication played an important role in this matter.

Detecting, preventing and solving drug related problems resulted in better clinical outcomes and decreased use of health care services (e.g. hospitalizations). Cost effectiveness of services was indicated in hospitals and to a much lesser extent in other locations.

Conclusions

The majority of detected studies showed at least some benefit of pharmaceutical care and clinical pharmacy services. Future development and implementation of services in practice can base on the established evidence.

Personalized medicines

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Contemporary drug discovery and development process follows the objective to deliver efficient and safe medicines. To facilitate achievement of this objective, advanced knowledge and understanding of human genome function and diversity and its relation to individual's responses to medicines, has been integrated in all phases of drug discovery, development and utilization of medicines. Such refined process allowed the emergence and implementation of personalized medicines.

Personalization of medicines and medicine is a task of interdisciplinary team of experts of diverse disciplines, while pharmacists as prime drug experts should be at the forefront of development of emerging novel concept and practice of personalized medicine.

Pharmaceutical profession faces diverse challenges and needs to set highly ambitious goals to provide future pharmacists along with currently practicing professionals with key competences both to govern the concept development as well as implement the practice of personalized medicine in terms of tailoring therapeutics to individual patients.
The curricula of pharmaceutical education have been adapting to these changes both at the undergraduate as well as at lifelong learning level. Numerous initiatives have been established as independent entities or within existing pharmaceutical associations.

The Faculty of Pharmacy at the University of Ljubljana sets a good example of integration of Pharmacogenomics into curricula. Advances in field of genomics, emergence of targeted medicines along with periodical development of Pharmacy curricula allowed the integration of advanced knowledge and technologies into existing subject. Pharmacogenomics have also been introduced as an elective subject ten years ago to pharmacy students in their last year. The major advantage of teaching pharmacogenomics in an independent subject is the ability to indeed develop a concept of pharmacogenomics immersed into entire process of drug discovery, development and delivery. The major objective here is to comprehend the interdependence and connectedness of diverse stages of drug's life cycle to individual genetic makeup. Furthermore, to understand how advances in genomics impact the process of drug discovery, and consequently impact the biomarkers co-development. Hence, how the target holds the potential to become the biomarker. Despite great advances in the field of pharmacogenomics, only a handful of pharmacogenetics tests are currently in use in the clinical setting. The following are the examples of FDA and EMA approved drugs which include pharmacogenetic information in the labeling to assist dosing; mercaptopurine, irinotecan, cetuximab, trastuzumab, abacavir, clopidogrel and warfarin.

Pharmacogenomics holds a great potential in therapeutics, the major challenge is to translate this knowledge and incorporate it into current pharmacy practice to enable personalized therapy and medicine. Personalized medicine is novel concept and will likely generate

fundamental changes in the future of health care and health systems. The key role of pharmacists in this process in unavoidable.

Pillars and Foundations of Quality: how to meet our goals for pharmacy education

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Key words: quality, pharmacy education, needs-based, competency-based

Many countries have made - or are undergoing - major changes in the way health professionals, including pharmacists, are educated and trained before entering service. The need to expand and equip the health workforce to meet societal needs has resulted in increased capacity in education and training. In some countries expansion has been achieved, but not always in a quality way. Quality assurance systems must ensure that educational programs – whether new or well-established - are competency-based, reflect a vision for pharmacy practice, education, and science developed through broad-based stakeholder consensus, are of high quality and appropriate, and meet the needs of the country and its people.

But how is quality measured and assured? Traditional approaches to quality and associated standards have focused on *Structure*, *Process* and *Outcomes*. Contemporary approaches, however, must go beyond these three "pillars" to include *Context* and *Impact*, reflecting social accountability. These new approaches - based on a competency foundation addressing *Science*, *Practice* and *Ethics* - must reflect real health and science-related needs and priorities, and should be adopted at the individual, organizational, and national levels. The International Pharmaceutical Federation's (FIP's) Global Quality Assurance Framework, currently under revision, will incorporate these expanded concepts. Additionally, FIP's Global Competency Framework stresses the need for competency-based education and identifies the four competency domains needed for the provision of pharmaceutical services and generally applicable to the pharmacy workforce worldwide.

The workshop will first introduce the "pillars and foundations" of quality for pharmacy education and describe how they align with quality criteria for academic institutions and address all mission-related areas including education, research, and societal engagement. Workshop participants will consider and discuss which are the most important pillars and foundations and why. Using a provided framework, participants will then assess and rate their own academic institutions and educational programs to identify opportunities for quality improvement. Finally, participants will consider areas or ways they can be committed to making changes at a personal and/or institutional level.

Learning objectives:

- Apply the "Pillars and Foundation of Quality" model to identify and assess quality of educational and training programs in pharmacy
- Adopt reflection strategies to determine the appropriate context for education and learning

- Connect educational outcomes with competency development
- Identify areas for improvement using principle “commitment to change”
- Apply appropriate strategies to evaluate the outcomes and impact of education and learning

Value of industrial experience transfer into pharmacy curriculum

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Key words: industrial experience, curriculum, transfer

Successful integration of pharmaceutical graduates into working environment in different fields of pharmaceutical profession relies to a large extent on to their broad professional knowledge obtained during their curriculum on one side and their capability of having critical attitude towards the obtained knowledge. This critical attitude is important in solving the daily professional challenges at work in all fields pharmaceutical graduates are working.
Lecturing pedagogical stuff on faculties of pharmacy rarely have real and up to date experience in working areas in organizations where graduates from faculties of pharmacy find employment in majority cases such as pharmacies (community, private or hospital), regulatory agencies, analytical laboratories and pharmaceutical industry. In order to broaden students and later graduates skills and enable them critical attitude to challenges on the job in various fields of pharmaceutical profession it is important that they are confronted to knowledge and experience of senior (experienced) professionals working in professional organizations.

The mentioned senior professionals should enable students getting more familiar on key areas in above mentioned working fields, giving them another i.e. practical point of view on key topics and add additional knowledge on topics which are not present in standard pharmacy curricula. Another important contribution of participation of external experts in curriculum is by verifying key theoretical topics through real life practical case studies or examples, which helps students to adopt at least partial impression of complexity of daily work in profession and the need for team and multi professional solution of job challenges.
There are several areas of knowledge needed for successful work of graduates in pharmaceutical industry where contributions of experts from industry are highly appreciated to expand the students' knowledge horizon. One of such important areas is field of quality assurance which is in a broader meaning important not only for work in pharmaceutical industry but also in other segments of pharmaceutical profession where graduated pharmacists are employed such as pharmacies, governmental agencies and laboratories. Other important knowledge areas for pharmaceutical industry are engineering including process engineering such as scale up knowledge and formulation engineering such as e.g. particle engineering.

The modern curriculum of pharmacy studies should be based on the expectations and the needs for the future graduates from their employers which would enable them to successfully manage the working challenges in the profession throughout their job's career. Modern pharmacist irrespectively where she or he is working, should have solid basic and broad interdisciplinary knowledge, be innovative, poses the ability of critical evaluation of the professional data, have an ability of team work and be highly ethical. Experience of senior

experts from various segments of pharmaceutical profession obtained by students during their pharmacy curriculum can help them to be better prepared for requirements and professional challenges of present and future jobs.

Embracing new technologies and delivery systems into the pharmacist curriculum of the Semmelweis University

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Key words: pharmacist curriculum, new technologies, novel dosage forms design, drug delivery systems

Background

The EU directive on sectoral professions 2005/36/EC deals with the management (5-year course duration with 6-month training period during or at the end of the course), and knowledge and skills required in pharmacy education and training. A shift can be observed from the course subject list (Annex V.6, 5.61) to the list of knowledge and skills (Article 44.3 of the directive).”*Adequate knowledge of pharmaceutical technology and the physical, chemical, biological and microbiological testing of medicinal products*” can be found among the list of skills. In order to gain such skills, the curricula should comprise the pharmaceutical industry related technology development.

The pharmaceutical industry had undergone changes in its science (switch to biotechnology and nanotechnology, development of therapies for unfulfilled needs like Alzheimer’s disease) and in its economic structure (interactions between universities and start-ups, development of global multinationals) in the recent years.

Objectives

The present lecture gives an overview about the curriculum of the Faculty of Pharmacy of the Semmelweis University with special focus on the teaching of new technologies including the development of drug delivery systems.

Conclusions

The successful contribution of the Faculty in the drug research and development provides an established theoretical and practical background for the teaching of modern dosage form design comprising new technologies and characterization techniques of various drug delivery systems.