IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Review Article
September 2019 Vol.:16, Issue:2

Clinical Pharmacy Education and Examples on Its Implementation from Some Western European Countries

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Nazlı TURAN YÜCEL

Anadolu University, Faculty of Pharmacy, Department of Pharmacology, Eskişehir, TURKEY

Submission: 23 August 2019
Accepted: 28 August 2019
Published: 30 September 2019

www.ijppr.humanjournals.com

Keywords: Clinical pharmacy; European countries; Pharmaceutical care; Pharmacy education

ABSTRACT

Clinical pharmacy is a health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention. Despite being a novel field, clinical pharmacy plays an important part in the historical evolution of pharmacy profession. The role of clinical pharmacists went through important changes as their involvement in direct patient care increased. Clinical pharmacy encourages pharmacists to shift their attention from a drug-oriented approach to a more patient-oriented approach. This movement has first started in the United States of America and significant improvements in this area have been achieved since then. Due to these advancements in American system, European pharmacy education institutions have followed the trend and adopted this innovative education concept. In this review, different aspects and overall evaluation of clinical pharmacy training in some Western European countries were discussed highlighting duration, content and assessment of the clinical courses and position of clinical practices within pharmaceutical programs in their national education systems.

INTRODUCTION

The pharmacy profession has evolved over the years from the traditional drug-oriented basis to an advanced patient-oriented basis. Pharmacists have become more involved in direct engagement with patients and the problems they encounter with drugs; rather than only manufacturing and having medicines for commercial purposes. As a part of a broader health care team, in addition, being a drug provider, today pharmacists' role expanded to adopt pharmaceutical care concepts to provide better health care for the patients. This brings out the importance of the practice of clinical pharmacy, an essential component of pharmaceutical care, and the education of pharmacists in this field [1-3].

DEFINITION AND HISTORICAL EVOLUTION OF CLINICAL PHARMACY

American College of Clinical Pharmacy (ACCP) defines clinical pharmacy as "a health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention" [4]. Organizations such as The European Society of Clinical Pharmacy (ESCP), The United Kingdom Clinical Pharmacy Association (UKCPA), United States Department of Health and Human Services made some other definitions. According to them, clinical pharmacy is a health discipline functions of which performed by clinical pharmacists on behalf of the patient; involves activities like identifying, solving and preventing drug-related problems, developing proper use of medicinal products and devices and gaining required knowledge and skills for patient care. It includes visiting patients, examining and following prescriptions, therapeutic drug monitoring, making alternative suggestions for the present treatment [5-7]. It is a science related to pharmacodynamics and pharmacokinetics of drugs [8]; an essential component for providing pharmaceutical care [6]. ACCP listed six competencies required for a clinical pharmacist as follows: pharmacotherapy knowledge, communication, direct patient care, system-based care and population health, professionalism and continuing professional development [9].

The first pharmacy educational program was initiated in North America in 1821 with a 2-year proficiency course-the Bachelor of Pharmacy (B. Pharm) [10]. The 4-year Bachelor of Science (BSc) degree in pharmacy became a standard in the United States of America (USA) beginning in year 1932. In the 1950s and 1960s, many colleges of pharmacy extended their program to 5 years expanding their curricula having courses involving communication-based

patient counseling and drug therapy in the medical aspect. In mid-1960s, education period became 6 years in many schools and at the end of this period, students graduated with a Pharm. D. degree. In the 6th year, students attended a clinical internship [7, 10]. Since 2000, all pharmacy colleges in the USA have graduated students with a Pharm. D. degree which is based on clinical pharmacy. Following this, many countries all over the world adapted this system into their own national programs [11]. In 2017, there were 128 Pharm. D. programs accredited by the Accreditation Council for Pharmacy Education (ACPE) [12].

Clinical pharmacy has been first mentioned and taken its current shape in the USA. Despite the fact that it has been accepted in 1960s, theory and examples of clinical pharmacy has been dated further back. Whitney from University of Nebraska in 1930 and Clark from University of New York in 1940 have been the first examples in this field [13]. Reformists like Harvey A. K. Whitney, Paul Parker and Eugene White made a significant effort to make pharmacy practice more patient-oriented by taking it out from its classical pattern thus made great contributions for the rising of the clinical pharmacy [14]. In 1960, Eugene White introduced the first office-based pharmacy practice and created patient medication profiles [15]. Drug information centers were established by the universities of Kentucky and Iowa [14].

Though clinical pharmacy movement started at the University of Michigan in the early 1960s, actual leading work was carried out in the latter part of the 1960s by David Burkholder, Paul Parker and Charles Walton from the University of Kentucky [16]. In the 1970s, developments have been witnessed in terms of the progression of the clinical pharmacists. Along with pharmacokinetic monitoring and collaborative drug therapy management services, pharmacists began to improve in clinical pharmacy practice and gained power [14, 17]. In the Hilton Head Conference in 1985, pharmacy was thought to be approached as a fundamentally clinical profession, and following this, several other conferences began to affirm this assessment [18].

In European countries, clinical pharmacy movement has not been started until 1980s. The pioneering improvement was the establishment of European Society of Clinical Pharmacy in 1979 (ESCP) [19, 20]. ESCP is an international association founded by clinical practitioners, researchers and education providers from so many European countries and has a mission of promoting, supporting, implementing education, practice and research in clinical pharmacy, and developing and promoting appropriate and rational use of drugs, medical products and

devices. Pharmacists, pharmacy students or other healthcare professionals who work in the community, academy, hospital, industry or any other healthcare environments are among the members of ESCP [21].

Implementations of clinical pharmacy in Europe are similar to the USA, however, they are less widespread; most likely for the reason that Europe owns a classical education model. However some universities started to have some beneficial courses in clinical pharmacy practices such as epidemiology, pharmaco-economy, clinical sciences, communication skills [19, 20]. In these institutions, even though the basic pharmaceutical courses are similar; pharmaceutical care concept shows variations depending on the region and also could differ in duration and content of pharmacy education among the countries [2].

CLINICAL PHARMACY EDUCATION IN SOME WESTERN EUROPEAN COUNTRIES

United Kingdom

Establishment of clinical pharmacy in the United Kingdom (UK) dates back to early 1980s [1, 22]. In 1981, UK Clinical Pharmacy Association (UKCPA) was founded by the early pioneers of this field. Due to the fact that undergraduate programs were not sufficient enough to prepare the students to practice clinical pharmacy at that time, Pharmacy National Health Service (NHS) leaders co-operated with universities and developed postgraduate degrees in this area. In the late 1980s, graduates from these programs became gaining competency in planning, management and implementation of clinical pharmacy services [22].

Until 1997, the pharmacy education program had a 3-year period leading to a Bachelor of Pharmacy (B. Pharm) or a Bachelor of Science in Pharmacy (BSc) degree in the UK. This was followed by a 1-year pre-registration training and after achieving national registration exam, pharmacists were granted registration by Royal Pharmaceutical Society of Great Britain. In 1997, the undergraduate pharmacy education program has changed and been extended to 4 years which results in a Master of Pharmacy (M. Pharm) degree and the first students with a M. Pharm degree graduated in 2001 [23, 24]. Recently, a 5-year M. Pharm degree has started to be offered in some schools [24, 25].

Title ‘undergraduate master’s program’ means that there is no necessity to have a bachelor’s degree to attend this program [26, 27]. M. Pharm graduates have mutual recognition of

qualifications across European Union thus could apply for registration in the member states upon acknowledgment of their license [26]. In 2008, there were 22 pharmacy colleges providing M. Pharm degree in the UK and this number has been increasing constantly since then [27]. Admission requirements vary amongst schools; however, the main acceptance factor is the performance of students in the national school-leaving examinations (Advanced Levels/A-Levels) [27, 28].

When compared to 5 to 6-year education period of most European countries, UK's is the shortest among the pharmacy programs in Europe. Although pharmacy students are not obliged to complete clinical duties or practical studies beside the theoretical courses, it is been expected to achieve some clinical experiment. These clinical recruitments could take place anytime in 4-year program from 1 week to 4 weeks [25].

Graduates in the UK have to complete a 1-year working period to register as a pharmacist. There is no time limit to complete this 1-year training; it could be completed months or years later after graduation and then pharmacists apply for registration. Regarding this situation 'currency of knowledge' issue is still under debate in the UK. It has been advised that in 3 years after graduation this training should be completed; however, no policy has been implemented about it.

Pharmacists in the UK can have a right to write "supplementary" and "independent" prescriptions after receiving appropriate training. While complementary prescribing allows pharmacists to write repeat or modified prescriptions after clinicians diagnose patients; independent prescribing enables pharmacists to diagnose patients and make the drug decision. Currently, pharmacists have to obtain accredited specialty training to be a prescriber. UK is in an integrating training process which will provide pharmacists to become accredited prescribers without having additional postgraduate training [27].

Experimental Education

Experimental education becomes an expectation in M. Pharm program although there is no mandatory implementation. Most colleges provide at least 1-week training during 4 years while some schools offer up to 4 weeks. Before allowing the entrance to the hospitals, students need to be screened by United Kingdom Criminal Records Bureau in detail and also have to fulfill some health criteria. In addition, many health authorities demand fee to provide clinical experience to students. In order to ease these financial problems, universities are

hiring teacher-practitioners for 1 or more days per week who share current clinical examples and case reports with students [27].

Assessments in pharmacy programs in all UK pharmacy colleges are generally performed as written and theoretical examination. Furthermore, there are coursework exercises which require report writing and data interpretation. Research projects are one of them and contribute to 15-20% of the final grade.

To perform a competency-based assessment, exams are conducted on students' logbook or portfolio which contains patients' drug history and/or test results of blood pressure, glucose, gas measurements *etc*. Most pharmacy colleges use Objective Structured Clinical Examination (OSCE) system in which students visit different stations and take part in scenarios completing tasks in a time limit (lasting for 5-10 minutes). Schools generally find actors or volunteers to act as a patient. These exams are basically assessed as "pass" or "fail"; however a quantitative grade is given to the student in order to affect his/her final award. Despite not being graded, sufficient effort has to be observed in the logbook, too, to proceed in the program or graduate.

When compared to other European countries, UK provides students experimental and clinical knowledge as well as fundamental and theoretical courses; as a consequence, in the end of 4th year students have become completely ready for practice field. In addition, European model focuses on natural sciences in 1st-3rd years and on clinical subjects in 4th-5th years. However, in the UK model, theoretical and practical information are presented altogether through all 4 years [25, 27, 28].

France

Pharmacy education in France offers two options which take 6 or 9 years. In the end of the 1st year, students are subjected to an exam in order to advance into the pharmacy program. In the first 4 years, they should complete their courses and begin their clinical education. In their 5th year, they continue a part-time clinical internship that lasts 12 months. It is followed by a 6 month-fulltime internship in a community pharmacy or industry according to their area of interest [25].

After 6 years of education in classrooms and clinics, and thesis defence, students are awarded with Pharm. D. degree and by achieving this, they can work in community pharmacies or

industry. As an alternative, in the 5th year they may apply for Internat, a 4-year stipendiary internship, and go further for a specialized education. In addition, after these 9 years, they have to present a dissertation which gain them a special degree named "*the Diplome d'Etudes Spécialisées* (DES)" along with Pharm. D. [24, 25, 29].

After the 5th year in hospital, students are obliged to pass the "Major Diseases" exam which includes an oral exam on a case study. Similarly, evaluation of 6th year is performed with a role play in which student dispense prescriptions, commenting on the prescriptions in front of the jury and provides counseling to patients.

Internat consists of five components;

1. Mathematical sciences, physics, chemistry,

2. Healthcare sciences,

3. Public and environmental health,

4. Clinical pharmacy, bacterial and viral infections, hematology and pathology and biology adopted to clinical pharmacy for other infections and

5. Therapeutics [29, 30].

Specialization

With Internat exam (in the 5th or 6th year), chosen candidates can decide on one of the 4 specialization areas:

- DES in hospital or institutional pharmacy

- DES in industrial or biomedical pharmacy

- DES in specialized pharmacy

- DES in medical biology [24, 29].

Clinical Internship and Practical Experiences

Objectives of different pharmacy internships are planned throughout the education program according to the internship type. These aims are to familiarize students to applications in

professional life such as drug monitorization and patient counseling and to make them competent in these areas.

6-week internships before the 3rd year aim to provide students a general aspect for pharmacist's roles on drugs and public health. At the end of it, they become sufficient at dose schemes and herbal and chemical compounds [29, 31].

In both the 3rd and 4th years, students are deployed twice in a community pharmacy for a week. Thus, they can encounter real situations and practice their knowledge about major diseases, therapeutic strategies, therapeutic drug groups, drug optimization, patient monitoring, patient education and compliance which they have learned during their coordinated education. With these internships, pharmacist candidates get the opportunity to communicate with patients [25, 29, 31].

5th year internships include 12-month education of at least 6-month compulsory clinical internship and preferably 3-month biological test department study and 3-month hospital pharmacy work.

6-month vocational internships in the 6th year are for the students who desire to make their carrier as community pharmacist. With this internship, students are trained to have a full competency in dose schemes, plant, fungi, and special preparations, and common diseases, therapeutic and prophylactic counseling, and coordination of home-care services. In addition, students are expected to know drug and medical device assessment and patient tracing from medical records and pharmaceutical approach development [29, 31].

Germany

The pharmacy education in German universities generally focused on drugs rather than on their clinical use and direct patient care. This has changed in 2001 when "Clinical Pharmacy" was officially implemented into the pharmacy curriculum of the country in order to adapt the educational content to the patient-orientated clinical skills which are required in practice [32].

Pharmacy education in Germany consists of various stages which are primarily theoretical courses, clinical experiences, a practical year of 12 months and a 3-stage state exam containing written and oral sections. First years of colloquium rely heavily on medicinal chemistry, pharmaceutical biology and pharmaceutical technology. Even after the main

subjects begin to take place like pharmacology and clinical pharmacy, they still occupy an important place [25].

In the first 2 years of education, teaching method is mainly theoretical in Germany. An 8-week clinical internship called Famulatur take place in this period during school holidays. 4 weeks of Famulatur should be done in a community pharmacy. The rest may be completed in a hospital, military pharmacy, pharmaceutical industry or drug control center [25, 33-35].

After the 2nd year, students can take the first part of the 3-stage pharmaceutical exam. In order to advance in their studies, students should pass all parts of the exam. After a study period of 2 years covering herbal drugs, they complete the second part of the exam. To qualify to enter the last part of the exam, they must finish first half of their practical education year in a pharmacy. However, students may also prefer to complete the second half by doing research work at university instead of a pharmacy. Only then they are considered eligible to take the third part which would allow them to obtain their authorization document or working license. Finally, students are expected to submit a dissertation and deserve to earn a degree similar to master's degree. In Germany, there is also a voluntary system for the continuing education of pharmacists. Pharmacists are awarded a completion certificate for 150 credits in every 3 years [25].

Although block seminars, case study discussions and consultation in pharmacies have been performed by the introduction of clinical pharmacy in German universities in 2001, clinical pharmacy is usually applied in classrooms rather than in a clinical area [36, 37]. For example, in the Friedrich-Alexander University, the proportion of patient-orientated learning subjects represents only 15% of the entire curriculum, which involves clinical pharmacy, pharmacology, toxicology, physiology, pathophysiology, pathobiochemistry and anatomy [38]. Considering these, it can be suggested that in German universities students attending clinical pharmacy courses are not fully able to experience the communication with other healthcare professionals and patients, examine patient records and have consultation practice [32].

Yet, some universities as in Bonn, provide students to participate in OSCE trainings which can be helpful in the practical year [36, 37]. In a 2-year pilot project conducted at the University of Bonn, roles and acceptance of a teacher-practitioner in the health care system of Germany have been investigated and found that students had the opportunity of interacting

with patients and healthcare providers and applying their knowledge on the ward [39]. Nevertheless; despite the great value of these efforts clinical-based approach is very limited within the German pharmacy education due to monetary and time restrictions and clinical pharmacy education could not be exactly said to have been regularly implemented [32].

Belgium

Hospital pharmacy practice in Belgium has gone forward with the increasing roles of clinical pharmacists in society.

The development of clinical pharmacy started mainly in university hospitals. Rudy Demotte, the Minister of Social Affairs and Public Health, made a call for clinical pharmacy projects from Belgium hospitals in 2007. 27 out of 80 proposals were selected for funding which included staff posts in clinical pharmacy in the pain treatment, nutrition and seamless medication care in oncology, cardiology, intensive care units and geriatrics areas. These projects indicated the positive impact of clinical pharmacists in the medical arena. In 2010, 26% of hospitals in Belgium had a clinical pharmacy project [40].

Much limited time is spared to clinical practice in Belgian hospitals due to manpower and competency shortage. In a survey study among 4 Belgian universities, hours spared for clinical pharmacy education within colloquium have been found to be only %10 of the total hours. In addition, students are usually educated to know what the drugs are and how they work but they do not have enough knowledge about which conditions they can be used in. In the same study, it is suggested that the reason behind issues regarding problem solving, critical thinking and patient communication could be the time limitation in the hospitals. Thus, clinical pharmacy practices in Belgium need new strategies to realize the necessity of patient-oriented approach [41].

Clinical pharmacy education in Belgium is not limited within universities. There are some programs aiming to train hospital pharmacists which also include clinical pharmacy as a part of the program. Such new program with 4 modules began to provide continuing education for 65 students across the country in 2010 (which was adjusted to 50 candidates in year 2013). Taught by professional lecturers, third module is about clinical pharmacy and comprehends subjects like geriatrics, cardiology, psychiatry *etc.* The module lasts 6 months and it takes more than 3 years for all modules. Attendants are also invited to join relevant activities in hospitals in Belgium and abroad [40].

CONCLUSION

As a result of the increase of their involvement in direct patient care, the role of clinical pharmacists went through important changes from the 1960s through 1990s [17]. Pharmacists have become a substantial part of the healthcare team on drug-related decisions and patient management, and thus, it has brought the necessity that schools of pharmacy should prepare an adapted education program which has competence with these changing roles of the pharmacists [1].

Among the subject countries of this review, as an advantage of early introduction, UK has the most settled clinical pharmacy program; while France appears to have its own interpretations such as Internat system which consists of five components including clinical pharmacy. Germany has been going through an adaptation process and beside conventional practices (*i.e.* Famulatur), clinical pharmacy tools in training like OSCE are also available in some pharmacy schools; however, not as common as in the UK. Different from most European countries, UK offers theoretical knowledge combined with practical knowledge (both natural sciences and clinical subjects) through the entire educational terms. As for Belgium, though some attempts have been made in this field, more efforts should be done in order to provide a fully competent education in the means of clinical pharmacy.

The monetary and time restrictions, lack of facilities during the course of studies, unavailability of qualified academicians prevent the clinical pharmacy education being implemented as it is expected to be and could cause these variations between the different countries. Although major developments have been achieved in this area until today, there are still more things to do to establish a pharmacy education system based on improving critical thinking, decision making, problem-solving, communication skills of students and applying new knowledge in both the pharmaceutical and also social and clinical sciences in all countries.

Conflicts of Interest: The author declare no conflict of interest.

REFERENCES

1. Webb DG, Davies JG, McRobbie D. Clinical pharmacy and therapeutics: Clinical pharmacy process. 5th ed. Walker R, Whittlesea C (eds). China: Elsevier; 2012; 2-13.
2. Toklu HZ, Hussain A. The changing face of pharmacy practice and the need for a new model of pharmacy education. J Young Pharm. 2013; 5(2): 38-40.

3. Faller EM, Dela Cruz-Bacayo MF, Abustan AB. Competency assessment of clinical pharmacy education in the Philippines: a basis for curriculum framework. WJPPS 2016; 5(3): 215.
4. American College of Clinical Pharmacy. The definition of clinical pharmacy. Pharmacotherapy 2008; 28(6): 816-817.
5. Franklin BD, van Mil JWF. Defining clinical pharmacy and pharmaceutical care, Pharm World Sci. 2005; 27:137.
6. Hepler CD. Clinical pharmacy, pharmaceutical care and the quality of drug therapy. Pharmacotherapy 2004; 24(11): 1491-1498.
7. Kusserow RP. U.S. Department of Health and Human Services, Office of the Inspector General. The clinical role of the community pharmacist. November 1990. Available from: https://oig.hhs.gov/oei/reports/oei-01-89-89160.pdf (Accessed on 10.06.2019).
8. Van Mil JWF. Concise history of community pharmacy and pharmaceutical care in the Netherlands, Pharmaceutical Care the Future of Pharmacy, 1999; 31-45. Available from: http://www.rug.nl/research/portal/files/14524939/titlecon.pdf (Accessed on 10.06.2019).
9. Thomas D, Marriott J, Vadlamudi R, Efendie B, Maine LL. Clinical pharmacy education, practice and research: clinical pharmacy, drug information, pharmacovigilance, pharmacoeconomics and clinical research: Introduction to clinical practice, research, and pharmacy education. Thomas D (ed). Elsevier; 2018; 1-9.
10. Hussain A, Malik M, Abdullah S. Review of evolving trends in clinical pharmacy curriculum around the globe. American Journal of Pharmacological Sciences 2017; 5(1): 1-7.
11. İzzettin FV. Eczacının klinik rolleri (klinik eczacı). IV. Türkiye Eczacılık Kongresi, 10-12 May 1991; 32-39.
12. Bureau of Labor Statistics. U.S. Department of Labor, Occupational Outlook Handbook. How to become a pharmacist. 2019. Available from: http://www.bls.gov/ooh/healthcare/pharmacists.htm#tab-4 (Accessed on 01.08.2019).
13. İzzettin FV. Eczacının gelişen dünyadaki yeni rolleri (klinik eczacılık). Havan 1992; 12: 43-44.
14. Gubbins PO, Micek ST, Badowski M, Cheng J, Gallagher J, Johnson SG, Karnes JH, Lyons K, Moore KG, Strnad K. Innovation in clinical pharmacy practice and opportunities for academic–practice partnership. Pharmacotherapy 2014; 34(5): e45-54.
15. White EV, Latif DA. Office-based pharmacy practice: past, present, and future. Ann Pharmacother. 2006; 40(7-8): 1409-1414.
16. Miller RR. History of Clinical Pharmacy and Clinical Pharmacology. J Clin Pharmacol. 1981; 21(4): 195-197.
17. Carter BL. Evolution of clinical pharmacy in the US and future directions for patient care Drugs Aging 2016; 33(3): 169-177.
18. Elenbaas RM, Worthen DB. Clinical pharmacy in the United States: transformation of a profession. J Hist Med Allied Sci. 2010; doi: 10.1093/jhmas/jrq029.
19. Sancar M, İzzettin F. Avrupa'da klinik eczacılık ve farmasötik bakım. Hedef Sağlık 2006; 1(27): 24-26.
20. Aypar E, Sancar M, İzzettin FV. Eczacılıkta yeni dönem: Klinik eczacılık ve sağlık sistemindeki yeri, Sağlık Düşüncesi ve Tıp Kültürü Dergisi 2014; 30: 48-51.
21. European Society of Clinical Pharmacy. ESCP Mission & Vision. 2019. Available from: https://www.escpweb.org/content/escp-mission-vision (Accessed on 24.05.2019).
22. Kinnear M. Development of clinical pharmacy education in UK. Newsletter-European Society of Clinical Pharmacy 2012; 155: 5.
23. Sie D, Bates I, Aggarwal R, Borja-Lopetegi A. An Analysis of the new UK Master of Pharmacy degree programme: rhetoric and reality 2003; 3: 1-7.
24. Alrasheeddy AA, Hassali MA. Pharmacy education in the twenty first century and beyond: global achievements and challenges: Professional degrees and postgraduate qualifications in pharmacy: a global overview. Fathelrahman A, Ibrahim MIM, Alrasheedy AA, Wertheimer A (eds). Academic Press; 2018; 101-124.
25. Sekhon BS, Kamboj SR. Pharmaceutical education and careerñan overview. J Pharm Educ Res. 2011; 2(1): 73-86.

26. Sosabowski MH, Ingram MJ. 21st century issues in pharmacy education in the United Kingdom. Am J Pharm Educ. 2003; 67(4): 122.
27. Sosabowski MH, Gard PR. Pharmacy education in the United Kingdom. Am J Pharm Educ. 2008; 72(6): 130.
28. Royal Pharmaceutical Society of Great Britain. Making pharmacy education fit for the future. Report of the Pharmacy Education R&D Reference Group. London; 2004.
29. Bourdon, O, Ekeland C, Brion F. Pharmacy education in France. Am J Pharm Educ. 2008; 72(6): 132.
30. CNCI. Conseil Scientifique de Pharmacie du CNCI Programme de l'Internat en Pharmacie. 2009. Available from: http://www.cnci.univ-paris5.fr/pharmacie/programme_juillet2009.pdf (Accessed on 12.06.2019).
31. Campus France Agency. Pharmacy. 2016. Available from: https://ressources.campusfrance.org/catalogues_recherche/domaines/en/pharmacie_en.pdf (Accessed on 10.05.2019).
32. Dircks M, Mayr A, Freidank A, Kornhuber J, Dörje F, Friedland K. Advances in clinical pharmacy education in Germany: a quasi-experimental single blinded study to evaluate a patient-centred clinical pharmacy course in psychiatry. BMC Med Educ. 2017; 17: 251.
33. Pharmazeutische Zeitung. Famulatur. Was gibt es zu bedenken? 2009. Available from: http://www.pharmazeutische-zeitung.de/index.php?id=31952 (Accessed on 21.06.2019).
34. Fachschaft der Pharmazie. Universität Greifswald Institut für Pharmazie. Famulatur. 2019. Available from: http:// pharmazie.uni-greifswald.de/studierende/fachschaft-der-pharmazie/homepage-des-fsr/studium/famulatur/(Accessed on 21.05.2019).
35. Universitätsmedizin Greifswald. Famulatur (Humanmedizin). 2019. Available from: https://ecampus2.medizin.uni-greifswald.de/org/hm/famulatur/ (Accessed on 15.07.2019).
36. Unidaz. Das pharmaziestudium – ein internationaler vergleich. 2014. Available from: https://www.deutsche-apotheker-zeitung.de/daz-az/2014/daz-29-2014/pharmazie-studieren-in-deutschland-und-anderswo (Accessed on 20.05.2019).
37. Pharmazeutische Zeitung. Klinische Pharmazie: Wie alles began. 2015. Available from: http://www.pharmazeutische-zeitung.de/index.php?id=58197 (Accessed on 21.06.2019).
38. FAU. Studienordnung für den Studiengang Pharmazie der Universität Erlangen-Nürnberg. 2013. Available from: https://www.zuv.fau.de/universitaet/organisation/recht/studiensatzungen/NAT2/StO_Pharmazie_August2013.pdf (Accessed on 03.06 2019).
39. Eckhardt M, Snyder A, Backes N, Homann J, Jaehde U. Teacher-practitioners as bridge between university and patient: Patient-oriented pharmacy in the education of pharmacists. Krankenhauspharmazie 2007; 28(1): 5-10.
40. Hecq JD. A short history of the development of hospital pharmacy in Belgium. Pharmacy 2016; 4(3): 25.
41. Spinewine A, Dhillon S. Clinical pharmacy practice: implications for pharmacy education in Belgium. Pharm Educ. 2002; 2(2): 75-81.