

*Review*

# Pharmaceutical Education in Northern Cyprus

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As in many developing countries, pharmacists have a distinct role in providing rational use of medicines, and also in patient education in the Turkish Republic of Northern Cyprus (TRNC). Since in the primary health system many patients apply to pharmacists and consult them, providing good pharmacy practice in community pharmacies is essential in promoting rational use of medicine. Thus, it became inevitable for the Near East University (NEU) Faculty of Pharmacy to prepare its curriculum to be competent with the changing role of the profession. Our aim was to provide an overview of the current status of pharmacy education at NEU Faculty of Pharmacy. Therefore, the current practice of pharmacy profession and the education of the school of pharmacy in NEU/ TRNC are reviewed.

**Keywords:** Pharmacy education, pharmacotherapy, rational drug use, pharmaceutical care, Cyprus.

## INTRODUCTION

Cyprus is the third biggest island (following Sicily and Sardinia) in the Mediterranean Sea. In Northern Cyprus, there are more than 40,000 university students in the six universities: Near East University, Girne American University, Middle East Technical University, European University of Lefke, Cyprus International University, Eastern Mediterranean University. These students represent 35 countries and 68 nationalities. The 6 universities have been approved by the Higher Education Council of Turkey. Near East University and Eastern Mediterranean University are full individual members of the European University Association. At present, pharmacy education is carried out only at Near East University.

### Pharmacy Education

Near East University Faculty of Pharmacy's academic programme is a 5 year Master of Pharmacy (MPharm) degree program and teaching is fully in English. Students from Turkey are chosen according to the Turkish Higher

Education Council [YÖK]– Student Selection Placement Center [ÖSYM] exam results. Students from Northern Cyprus take NEU entering exam. Those who are successful are admitted. Admission criterion for students from other countries is given in Appendix I.

The graduate gets a MPharm degree at the end of five years. The curriculum includes basic science courses and specialized coursework in pharmacy (Table 1).

The teaching methods used are based on active learning, that encourages students to take responsibility for their own education and the ability to adapt to changes and respond to challenges in health care in terms of professional development.

The majority of coursework of pharmacy programs consist of combinations of assignments, exercises, essays, and practical tasks followed by written, practical, and oral examinations. For the granting of a bachelor's degree in pharmaceutical sciences, the student must present a thesis based on scientific research, relevant to their future career choices such as community, hospital or industrial pharmacy. This student research project involves generation, analysis, and interpretation of new data, and optional in-depth study of selected topics.

Although the faculty prepares pharmacists for all areas of practice, special emphasis is placed on the community environment in which the majority of healthcare services will be provided in the future.

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**Table 1.** Bachelor of pharmacy curriculum in Near East University, Turkish Republic of Northern Cyprus

Semester	Name of the Course	T	P	C	ECTS
<b>Year 1</b>					
Fall	Anatomy	4	0	4	6
	General Chemistry	3	0	3	6
	Physics	2	0	2	4
	Mathematics	3	0	3	6
	Physiology	4	0	4	6
	Turkish Language I	2	0	2	-
	English Language I	2	0	2	-
Spring	Histology	1	2	1	2
	Biostatistics	2	2	3	5
	Organic Chemistry	3	0	3	6
	Analytical Chemistry I	3	0	3	6
	Analytical Chemistry I Laboratory	0	3	1	3
	Turkish Language II	2	0	2	-
	Pathology	3	0	3	5
	English Language II	2	0	2	-
	Medical and Molecular Biology	3	0	3	5
	<b>Year 2</b>				
Fall	Analytical Chemistry II	2	0	2	4
	Analytical Chemistry II Laboratory	0	3	1	3
	Biochemistry	3	0	3	5
	Biochemistry Laboratory	0	3	1	3
	Pharmacology/Toxicology I	4	0	4	6
	English Language III	2	0	2	-
	Pharmacy Practice I (annual)	0	4	2	4
	History I	2	0	2	-
	Pharmaceutical and Medicines Information Management -Computer Applications in Pharmacy	1	2	2	3
	Pharmacology/Toxicology I Laboratory	0	3	1	2
Spring	Pharmaceutical Botany	2	0	2	4
	Pharmaceutical Botany Lab	0	3	1	3
	Pharmacology/Toxicology II	3	0	3	6
	Clinical Biochemistry	2	0	2	4
	English Language IV	2	0	2	-
	History II	2	0	2	-
	Microbiology	3	0	3	5
	Communication Skills in Pharmacy	1	0	1	2
	Pharmacology/Toxicology II Laboratory	0	3	1	3
	Electives (Group I)	2	0	2	3
<b>Year 3</b>					
Fall	Pharmacognosy I	2	0	2	3
	Pharmacognosy I Laboratory	0	3	1	2
	Pharmaceutical Technology I	3	0	3	5
	Pharmaceutical Technology I Laboratory	0	3	1	2
	Pharmaceutical Chemistry I	2	0	2	4
	Pharmaceutical Chemistry I Laboratory	0	3	1	2
	Pharmacology/Toxicology III	4	0	4	5
	Pharmacy Regulations and Deontology	2	0	2	2
	Pharmacology/Toxicology III Laboratory	0	3	1	2
	Electives (Group I, II)	2	0	2	3

Table 1 continues

Spring	Pharmacognosy II	2	0	2	4
	Pharmacognosy II Laboratory	0	3	1	2
	Pharmaceutical Technology II	2	0	2	4
	Pharmaceutical Technology II Laboratory	0	3	1	2
	Pharmaceutical Chemistry II	2	0	2	4
	Pharmaceutical Chemistry II Laboratory	0	3	1	2
	Pharmacology/Toxicology IV	3	0	3	4
	Cosmetics	2	0	2	4
	Pharmacology/Toxicology IV Laboratory	0	3	1	2
	Electives (Group I, II)	2	0	2	2
	Summer	Pharmacy Practice II	0	35	15
Year 4					
Fall	Pharmaceutical Technology III	3	0	3	3
	Pharmaceutical Technology III Laboratory	0	3	1	2
	Pharmacokinetics and Biopharmaceutics	1	0	1	2
	Pharmacognosy III	2	0	2	3
	Pharmacognosy III Laboratory	0	3	1	2
	Phytotherapy	2	0	2	3
	Phytotherapy Practice	0	2	1	1
	Pharmaceutical Chemistry III	2	0	2	3
	Pharmaceutical Chemistry III Laboratory	0	3	1	2
	Clinical Pharmacy I	3	0	3	3
	Pharmacy Practice III (annual)	0	4	2	4
Electives (Group I, II)	2	0	2	2	
Spring	Pharmaceutical Technology IV	3	0	3	6
	Pharmaceutical Technology IV Laboratory	0	3	1	3
	Pharmacy Management and Accounting	2	0	2	3
	Clinical Pharmacokinetics	2	0	2	6
	Clinical Pharmacy II	4	0	4	6
	First Aid in the Pharmacy	2	0	2	4
	Electives (Group I, II)	2	0	2	2
	Summer	Pharmacy Practice IV	0	35	15
Year 5					
Fall	Graduation Project	0	4	2	14
	Electives (Group I, II)	4*4=16	0	24	24
		2*4=8			
Spring	Pharmacy Practice V	0	35	15	20
		2	0	0	10

### Pharmacy profession

For a working license, a Turkish Republic of Northern Cyprus (TRNC) citizen, having a BScPharm degree, over age 21 should be registered with the Cyprus Turkish Pharmacists Association (Azgin, 1986). Pharmacists are allowed to run and/or own a single pharmacy, work in hospitals, in public institutions or for government, but cannot practice any of the two at the same time.

### Community pharmacies

There are 140 community pharmacies in the whole country (TRNC) distributed in five regions [Lefkosa (Nicosia), Magusa (Famagusta), Girne (Kyrenia), Guzelyurt (Morphou), Iskele (Trikomo)]. Community pharmacies in TRNC are private enterprises. It is required to be managed and owned by pharmacists by law (Azgin, 1986). There is no concept as chain

Table 2. Elective courses

Electives (Group 1)	Electives (Group II)
Chemicals and Environment	Applications of Molecular Modeling in Pharmacy
Ethics in Pharmacy	Applied Pharmacology I
History of Drug Design	Applied Pharmacology II
History of Pharmacy	Bedside Teaching
Laboratory Safety	Bioactivity Screening Methods in Drug Discovery from Natural Compounds
Nutraceuticals	Biochemical Basis of Diseases
Public Health	Biochemistry Lab Report Evaluations
Research Methods and Methodologies	Case Studies in Clinical Biochemistry
Role of Pharmacist in Doping Control	Clinical Toxicology
Social Pharmacy	Dispensing and Product Information
	Drug Licensing
	Drug/ Poison Information
	Industrial Pharmacy
	Industrial Pharmacy I
	Industrial Pharmacy II
	Introduction to Analytics of Secondary Plant Metabolites
	Introduction to Pharmaceutical granulation –process validation
	Pharmacokinetics
	Modeling of Qualitative structure-activity relationships
	Modern Techniques in Drug Development
	Natural Drug Development
	Natural Products Isolation
	Nutritional Biochemistry
	OTC Drugs
	Patenting in Pharmacy
	Patient Leaflet Information
	Pharmaceutical dosage formulations and production methods
	Pharmaceutical Dosage Formulations
	Pharmacoeconomy
	Pharmacy/Hospital Pharmacy I
	Pharmacy/Hospital Pharmacy II
	Phytopharmaceuticals
	Plant Cell Culture in Pharmacy
	Rational Drug Use I
	Rational Drug Use II
	Rational Drug Use in Hospitals
	Registration Files Preparation
	Reporting on analytical data
	Research Methods in Social Pharmacy
	Special Topics in Plant Biotechnology
	Vitamins and Coenzymes

pharmacies in TRNC. Only medical doctors/dentists/vets can legally prescribe. Pharmacists should be present in their pharmacies during the working hours i.e. from 8 am

till 7 pm in summer period and 8 am till 6 pm in winter time. One thirty to 4 pm is the 'siesta period' in summers (Azgin, 1986).

As in many developing countries, in TRNC pharmacists have a distinct role in pharmaceutical care and patient education since many patients apply to pharmacies as a primary care in the health system (Gokcekus et al, 2011).

## DISCUSSION AND CONCLUSION

In the last century the pharmacy profession consisted of compounding and dispensing medicines. As the compounding functions were significantly reduced in the last decade, a new role had to be developed for the profession (Caamano et al, 2002; Toklu et al, 2011). The role of today's pharmacists needs to be expanded to include pharmaceutical care concepts, making the pharmacist into a healthcare professional rather than a shopkeeper in a commercial enterprise (Van Mil, 2002). The mission of the pharmacy practice is to provide medications as well as other health care products and services, and to help the people and the society to make the best use of them (Stone, 1998). It involves identifying, preventing, and resolving drug-related problems, as well as encouraging proper use of medications, and general health promotion and education, thus improving clinical outcome (Nkansah et al, 2010). A lack of integration of practice standards indicated a need to review the standards for relevance. Additionally, pharmacists need to re-evaluate workflow models and the delegation of tasks in the light of new roles and responsibilities (Hattingh et al, 2009).

On the other hand, the duration and content of pharmacy education differs among countries (Al-Wazaify et al, 2006; Kheir et al, 2008). Although the basic pharmaceutical courses are similar, the pharmaceutical care concept has variations in regard to the practice applied in the region/ country (Bourdon et al, 2008; Marriott et al, 2008; Sosabowski and Gard, 2008; Kehrer et al, 2010; Basak and Sathyanarayana, 2010; Sanchez, 2010).

Recently, it has been demonstrated that simulation centers for health professional schools may offer a novel method of teaching and evaluating health care processes at the microlevel (Nickman, 2010).

In TRNC we founded our curriculum on problem based practical teaching which will provide students to practice pharmaceutical care and promote rational use of medicine. Both "Clinical Pharmacy" and "Rational Drug Use" are mainly based on case discussions. However, "Rational Drug Use" courses are given by a method (based on simulated patients and dispensing score<sup>4</sup>) developed by the 'Turkish Pharmacological Society' (Toklu et al, 2010). The method enables problem based learning and it is also used in some of the pharmacy schools in Turkey (Toklu et al, 2009). The pharmacy schools should prepare a program that has competence with the changing role of the pharmacist. The education should provide ability for critical thinking, improve problem-solving skills and decision making during pharmacotherapy. The student should be trained to

create, transmit, and apply new knowledge based on cutting-edge research in the pharmaceutical, social, and clinical sciences; collaborate with other health professionals and to enhance the quality of life through improved health for the people of our society and as well as the global community.

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## Appendix I

### General Requirements for Admission

#### Minimum scores from any of the following Exam Results are required

##### - General Certificate of Education (GCE) Examination

- 3 A Level (A levels in 3 of the following subjects: Maths, Physics, Biology, and Chemistry)
- 2 A Level and 4 O Level (A levels in 2 of the following subjects: Maths, Physics, Chemistry and Biology)

##### - American College Testing (ACT) Examination

- A score of 22 or higher.

##### - Scholastic Aptitude Test (SAT) Examination

- A total score of 1100 out of 1600 or higher.

##### - Tawjihi Examination (for students from Jordan and Palestine)

- A score of 85 or higher in the Scientific Stream.

##### - International Baccalaureate Examination

A total score of 28 or higher on the condition that one of the four exam subjects should be directly related to the department applied.

- Baccalaureate Libanais (for students from Lebanon or Iraq)
- A score of 85 or higher in the Scientific Stream.
- "Diplome Debirestan" (for students from Iran)
- A score (GPA) of 16 or higher.
- Baccalaureate Examination (for students from Syria)
- A score of 240 or higher in the Scientific Stream.
- Higher Secondary Certificate Examination (for students from Pakistan, India, Bangladesh)
- A score of 80 or higher in the Scientific Stream.
- WAEC/NECO (for students from Nigeria)
- A minimum of 7 credits including Maths, Physics and Chemistry or Biology.