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Inês Isabel Lopes Nunes da Cunha

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Estudio y análisis de la formación en farmacia para una práctica centrada en el paciente

Study and analysis of pharmacy education for a patient-centered practice

Tesis presentada por INÊS ISABEL LOPES NUNES DA CUNHA, Master Oficial, Licenciada en Farmacia, para aspirar al Grado de DOCTOR.

Thesis submitted by INÊS ISABEL LOPES NUNES DA CUNHA, MSc (Pharm), PharmD, for the degree of DOCTOR of Philosophy.

Fdo.: Inês Isabel Lopes Nunes da Cunha

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“The whole purpose of education is to turn mirrors into windows”

Sydney J. Harris

RESUMEN

Tras las recomendaciones de 1993 de la Organización Mundial de la Salud (OMS) sobre el papel del farmacéutico en el sistema de atención de salud, el enfoque de la profesión farmacéutica pasó del producto para una práctica centrada en el paciente. En 2001, la resolución del Comité de Ministros del Consejo de Europa, también subrayó la necesidad de la participación de los farmacéuticos en la evaluación de los resultados obtenidos con el uso de medicamentos. Con estos cambios en la profesión, la educación farmacéutica tuvo también que adaptarse con vistas a preparar profesionales capaces de aceptar la práctica de los nuevos servicios clínicos farmacéuticos. Las facultades de farmacia, guiadas por las recomendaciones emitidas por la OMS y por la Federación Internacional de Farmacia (FIP), han tomado medidas para proporcionar a los alumnos la educación y formación necesarias con el fin de capacitarlos para la prestación de atención farmacéutica a los pacientes. Con este propósito, se propusieron cambios en los contenidos de los currículos del grado para un equilibrio adecuado de los siguientes componentes del plan de estudios: ciencias básicas, ciencias farmacéuticas, ciencias biomédicas y clínicas, ciencias socioeconómicas y del comportamiento, y experiencia práctica. Además, se recomendó la introducción de asignaturas relacionadas con la implementación de la atención centrada en el paciente (como por ejemplo, las técnicas de comunicación).

A nivel mundial, la educación farmacéutica enfrentó algunos cambios relacionados con la evolución de la profesión, con especial relevancia en países como Australia, Canadá, Estados Unidos y Nueva Zelanda. Con el fin de preparar adecuadamente los alumnos para mejorar las habilidades de comunicación y proporcionarles conocimientos sobre una farmacoterapia eficaz y segura, se han integrado en los planes de estudio de farmacia asignaturas relacionadas con las ciencias clínicas y las ciencias sociales, administrativas y comportamentales. La reestructuración curricular llevada a cabo en estos países, redujo las asignaturas relacionadas con las ciencias básicas y aumentó las asignaturas orientadas a la atención farmacéutica. Los créditos del plan de estudios fueron así guiados hacia modelos experimentales más clínicos con el fin de preparar mejor los alumnos para las responsabilidades profesionales del farmacéutico.

En Europa, los Ministros de Educación firmaron la Declaración de Bolonia en 1999, creando el Espacio Europeo de Educación Superior. El objetivo era aumentar la competitividad del sistema europeo de educación superior y promover la movilidad y la empleabilidad de los graduados de educación superior. La cualificación profesional del farmacéutico pasó a ser reconocida por las Directivas 2005/36/EC y 2013/55/EU, que definen los conocimientos, las competencias y las asignaturas básicas que el grado de farmacia debe proporcionar. De acuerdo con la Declaración de Bolonia, la mayoría de los Estados Miembros cambiaron su plan de estudios de farmacia e introdujeron algunas asignaturas de Atención Farmacéutica y otras de farmacia social/administrativa. La cuestión es saber si estos cambios fueron suficientes para responder a las recomendaciones emitidas por la OMS y por la FIP.

Los farmacéuticos son profesionales de la salud, y su educación y formación deben proporcionarles el alcance de conocimientos, habilidades y actitudes orientadas al paciente. Para eso, en el diseño del currículo, es crucial asegurar que las competencias a alcanzar por los estudiantes estén perfectamente alineadas con los correspondientes resultados de aprendizaje, los contenidos educativos, las actividades de aprendizaje y la evaluación. En este sentido, nuestro objetivo fue evaluar si las universidades están preparando a los alumnos de farmacia para una práctica farmacéutica que centra su atención en el paciente y adecuando los planes de estudio a estas necesidades de la profesión.

Iniciamos nuestra investigación con un estudio que comparó la información proporcionada sobre el grado de farmacia en las páginas web de las facultades de farmacia de todo el mundo, desde la perspectiva de estudiantes internacionales. Hemos concluido que todavía hay un gran número de facultades de farmacia sin página web y que la calidad de las webs se distribuye de manera desigual en todo el mundo. Aproximadamente la mitad de las facultades de farmacia con páginas web no tienen una versión completa en inglés, y la información académica considerada importante por los estudiantes internacionales no siempre se encuentra disponible. Oceanía, América del Norte y Europa fueron las regiones con páginas web que proporcionan mejor información para los estudiantes internacionales. Para satisfacer las necesidades de información de los estudiantes internacionales, debe existir una

versión en inglés de la web e debe incluir, al menos, las guías docentes de todas las asignaturas, información sobre los aspectos financieros (costos y subvenciones), listado de profesorado e información sobre todos los requisitos administrativos.

Hemos analizado y comparado los contenidos programáticos del currículo del grado de farmacia de Estados Unidos y Espacio Europeo de Educación Superior (EEES) con el fin de conocer la carga de las asignaturas relacionadas con una práctica farmacéutica centrada en el paciente. Hemos descubierto que las instituciones de educación superior en los países del EEES mantienen un mayor enfoque en las ciencias básicas y una menor carga de las ciencias clínicas en comparación con los Estados Unidos. A pesar de los cambios curriculares en el EEES tras la firma de la Declaración de Bolonia, las diferencias encontradas con este estudio parecen no estar de acuerdo con las recomendaciones internacionales, existiendo recorrido para la mejora en la educación universitaria de farmacia en Europa hacía una práctica centrada en el paciente.

La educación en farmacia debe basarse en la adquisición de competencias y un cuadro de competencias ayuda en el desarrollo de currículos de farmacia. En España, las competencias que cualifican a los farmacéuticos para el ejercicio de la profesión están legalmente establecidas desde 2008 por la Orden Ministerial CIN/2137/2008. Los resultados de nuestro estudio muestran que las facultades de farmacia españolas no utilizan adecuadamente el marco oficial de competencias español. Las competencias están mal utilizadas, sin emparejamiento real entre ellas y el contenido educativo impartido en las asignaturas. Esta mala utilización de las competencias en España es más evidente en las competencias que están relacionadas con una práctica centrada en el paciente.

Hemos creado un catálogo de contenidos educativos para un currículo de farmacia centrado en paciente a través de un análisis cualitativo de los contenidos docentes de 1703 asignaturas del área de farmacia práctica de los planes de estudios de 110 facultades de farmacia de Australia (n=15), Canadá (n=5), Estados Unidos (n=89) y Nueva Zelanda (n=1). Las guías docentes fueron obtenidas desde las páginas web de las facultades de farmacia, excluyendo las que no tenían el plan de estudios completo disponible en inglés. Además, se solicitó por correo electrónico a los profesores

responsables de las asignaturas información adicional, obteniendo respuesta con información para 119 asignaturas. Se creó un árbol de contenidos inicial a partir de directrices del Accreditation Council for Pharmacy Education de los Estados Unidos. Se realizó un proceso iterativo de codificación dirigida, para obtener el árbol final de códigos que permitiese clasificar los contenidos docentes del área de farmacia práctica. Al final se llegó a un listado jerarquizado de 355 temas del área de farmacia práctica. Este catálogo puede ayudar en la creación de un currículo de farmacia que prepare a los estudiantes para una práctica centrada en el paciente. Y puede también ser utilizado como un instrumento para verificar la compleción de los contenidos educativos centrados en el paciente que se enseñan en el grado de farmacia de cualquier universidad.

Palabras-clave: práctica centrada en el paciente; educación en farmacia; currículo; contenidos educativos; competencias.

ABSTRACT

Pharmacists are healthcare professionals, and their education and training must be patient-centered. In this sense, our objective was to assess whether universities are preparing pharmacy students for a patient-centered practice and whether the pharmacy curricula are adapted to this need of the profession.

Firstly we compare information available on the websites of the universities with undergraduate pharmacy degree programs across the globe from the perspective of international students. We concluded that there are still a high proportion of colleges of pharmacy without website, and the quality of pharmacy colleges' websites is unevenly distributed across the world. To fulfill the information needs of the international students an English version of the website should exist and include, at least, a complete syllabus of full disciplines, financial aspects (costs and grants), complete faculty directory, and all the administrative requirements.

When we analyzed and compared course contents of United States (USA) and European Higher Education Area (EHEA) undergraduate pharmacy curricula, we found that institutions in EHEA countries maintain a greater focus on basic sciences and a lower load of clinical sciences compared to the United States. These differences may not be in accordance with international recommendations to educate future pharmacists focused on patient care.

Pharmacy education should be based on the acquisition of competencies, supported by a competency framework, that assists in the development of pharmacy curricula. In Spain, the competencies that qualify pharmacists for the practice of the profession are legally enforced since 2008 by the CIN/2137/2008 Ministerial order. The results of our study show that colleges of pharmacy in Spain do not appropriately use the official Spanish competency framework. Competencies are frequently mismatched, with no real alignment between them and the courses' educational content. Competence mismatching in Spain is most evident in the patient-focused competencies.

Through a qualitative analysis of the educational contents included in the syllabus of the pharmacy practice area courses from Australia, Canada, New Zealand, and the USA pharmacy curricula, and using the benchmarking method, we have created a catalog of educational contents for a patient-centered undergraduate pharmacy curriculum. This catalog can assist in the creation of a pharmacy curriculum that prepares students for a patient-centered practice. And can also be used as an instrument to check the completeness of patient-centered educational contents in any university's undergraduate pharmacy curriculum.

Key-words: patient-centered practice; pharmacy education; curriculum; educational contents; competencies.

RESUMO

Os farmacêuticos como profissionais de saúde devem ter uma educação e formação centrada no doente. Neste sentido, pretendeu-se avaliar se as universidades estão a preparar os estudantes de ciências farmacêuticas para uma prática centrada no doente e se os currículos estão adaptados a esta necessidade da profissão.

Começámos por comparar as informações disponíveis nos *websites* das universidades de todo o mundo que ofereciam o curso de ciências farmacêuticas, partindo da perspectiva dos estudantes internacionais. Concluímos que ainda existe um grande número de faculdades de farmácia sem *website* e que a sua qualidade se encontra distribuída de maneira desigual pelas faculdades de farmácia de todo o mundo. Para atender às necessidades de informação dos estudantes internacionais, deverá existir uma versão do *website* em inglês que inclua, pelo menos, o programa de estudos completo para todas as disciplinas, informação sobre aspectos financeiros (custos e subsídios), um diretório com o corpo docente e informação sobre todos os requisitos administrativos.

Analisámos e comparámos os conteúdos das disciplinas dos cursos de ciências farmacêuticas dos Estados Unidos (EUA) e do Espaço Europeu de Ensino Superior (EEES), e descobrimos que as instituições de ensino superior nos países do EEES mantêm um maior foco nas ciências básicas e uma menor carga de ciências clínicas comparativamente com as instituições dos Estados Unidos. Tais diferenças parecem não estar de acordo com as recomendações internacionais, continuando a existir espaço para a melhoria da educação farmacêutica na Europa no sentido de formar farmacêuticos para uma prática centrada no doente.

A educação em farmácia deve basear-se na aquisição de competências, suportadas por um quadro de competências estabelecidas pela profissão, que orientem o desenvolvimento dos currículos. Em Espanha, as competências que qualificam os farmacêuticos para o exercício da profissão são legalmente aplicadas desde 2008 pela portaria ministerial CIN/2137/2008. Os resultados do nosso estudo mostram que as faculdades de farmácia em Espanha não utilizam adequadamente o quadro oficial de

competências espanholas. As competências são frequentemente mal utilizadas, sem alinhamento real entre elas e o conteúdo educacional leccionado nas disciplinas. Esta má utilização das competências em Espanha é mais evidente com as competências relacionadas com uma prática centrada no doente.

Através de uma análise qualitativa dos conteúdos educacionais leccionados nas disciplinas da área de farmácia prática dos currículos de farmácia da Austrália, Canadá, Nova Zelândia e EUA, e usando o método de *benchmarking*, criámos um catálogo de conteúdos educacionais para um currículo de farmácia centrado no doente. Este catálogo pode auxiliar na criação de um currículo de farmácia que prepara os alunos para uma prática centrada no doente. Pode também ser usado como um instrumento para verificar a completude dos conteúdos educacionais centrados no doente lecionados no curso de ciências farmacêuticas de qualquer universidade.

Palavras-chave: prática centrada no doente; educação farmacêutica; currículo; conteúdos educacionais; competências.

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LIST OF ABBREVIATIONS

ACPE: Accreditation Council for Pharmacy Education

APPE: Advanced Pharmacy Practice Experience

CBE: Competency-based education

ECTS: European Credit Transfer and Accumulation System

EAFP: European Association of Faculties of Pharmacy

EHEA: European Higher Education Area

EPAs: Entrustable Professional Activities

EU: European Union

FIP: International Pharmaceutical Federation

FIP*Ed*: WHO-UNESCO-FIP Education Initiative

GbCF: Global Competency Framework

HEI: Higher Education Institution

IPPE: Introductory Pharmacy Practice Experience

OECD: Organisation for Economic Co-Operation and Development

OSCE: Objective Structured Clinical Exam

OSATS: Objective Structured Assessment of Technical Skills

PharmD: Doctor of Pharmacy

PHAR-QA: Quality Assurance in European Pharmacy Education and Training

SD: standard deviation

SPSS: Statistical Package for the Social Sciences

UK: United Kingdom

UNESCO: United Nations Educational, Scientific and Cultural Organization

USA: United States of America

WHO: World Health Organization

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GLOSSARY

Ability: An inherent or acquired faculty for doing or achieving something.[1]

Assessment: The process through which the progress and achievements of a learner or learners is measured or judged in compliance with specific quality criteria.[2]

Behavioural competency: typical behaviour observed when effective performers apply motives, traits or skill to job relevant tasks.[3]

Benchmarking: A systematic process of comparing the activities, processes and/or performance of a programme, organization, country, learner, etc. against a theoretical, political or existing reference with the aim of identifying ways to improve performance.[4]

Clinical pharmacy: describe the work of pharmacists whose primary job is to interact with the healthcare team, interview and assess patients, make specific therapeutic recommendations, monitor patient responses to drug therapy and provide medicines information.[5]

Clinical pharmacists: are licensed pharmacists with specialized advanced education and training who possess the clinical competencies necessary to practice in team-based, direct patient care environments.[6] Clinical pharmacists work primarily in hospitals and acute care settings and provide patient-oriented rather than product-oriented services.[5]

Competencies: Knowledge, skills, behaviours and attitudes that an individual accumulates, develops, and acquires through education, training, and work experience.[7]

Competency-based curriculum: A curriculum that emphasizes the complex outcomes of a learning process (i.e. knowledge, skills and attitudes to be applied by learners) rather than mainly focusing on what learners are expected to learn about in terms of traditionally-defined subject content. In principle such a curriculum is learner-centred and adaptive to the changing needs of students, teachers and society. It implies that

learning activities and environments are chosen so that learners can acquire and apply the knowledge, skills and attitudes to situations they encounter in everyday life. Competency-based curricula are usually designed around a set of key competences/competencies that can be cross-curricular and/or subject-bound.[2]

Competency-based education and training: Competency-based education and training focuses on the ability of the students and practitioners to deploy skills, attributes and knowledge to perform specific tasks and, more broadly, a clinical or healthcare role or function (defined by research team).[8]

Competency framework: A complete collection of competencies that are thought to be essential to performance.[7]

Core competencies: Core competencies are considered to be essential competencies. They may exist within a workforce role or span across different workforce roles.[8]

Curriculum: systematic and intended packaging of competencies (i.e. knowledge, skills and attitudes that are underpinned by values) that learners should acquire through organized learning experiences both in formal and non-formal settings.[9]

Curriculum alignment: A process aimed at ensuring coherence and consistency between the intended outcomes as specified in the formal curriculum and teaching methods, assessment tasks, and learning activities in the classroom.[2]

Curriculum design: The process of meaningfully constructing and interconnecting the components of a curriculum so as to address such fundamental questions as what needs to be learned and how and why, the resources required and how learning will be assessed.[2]

Curriculum development: The process of designing the national, local or school curriculum. In order to produce a quality curriculum, this process should be planned and systematic. It should value the input of stakeholders and also cater for sustainability and long-term impact. In contemporary educational practice curriculum development is seen as a comprehensive cycle of development, implementation, evaluation and revision to ensure that the curriculum is up-to-date and relevant.[2]

Learning content: The topics, themes, beliefs, behaviours, concepts and facts, often grouped within each subject or learning area under knowledge, skills, values and attitudes, that are expected to be learned and form the basis of teaching and learning.[2]

Learning outcomes (i): a statement of what a learner is expected to know, understand and be able to do at the end of a period of learning emphasizing the application of the ability, capacity or skill to accomplish a task.[10]

Learning outcomes (ii): are promoted as a means of describing the outcomes of a qualification and comparing qualification types. Learning outcomes encompass the three dimensions of: **Knowledge** (what students know or understand); **Skills** (what students can do or how they apply their knowledge and understanding); **Competencies** (the context in which knowledge and skills can be applied. This dimension includes both specific and generic competencies, the latter often referred to as graduate attributes or qualities in the higher education sector).[11]

Patient-centred care: Any care that is respectful of and responsive to individual patient preferences, needs, and values, and ensures that patient values guide all clinical decisions.[12]

Pharmaceutical care (i): the responsible provision of medicines therapy for the purpose of achieving definite outcomes, to improve patient's quality of life.[7]

Pharmaceutical care (ii): the pharmacist's contribution to the care of individuals in order to optimize medicines use and improve health outcomes.[13]

Pharmaceutical services: represent all the services that pharmacists require to resolve a patient's drug therapy problems. These services range from the provision of medicines information to patient counselling to medicines distribution.[14]

Pharmacy education: refers to the educational design and capacity to develop the workforce for a diversity of settings (e.g., community, hospital, research and development, academia) across varying levels of service provision and competence (e.g., technical support staff, pharmacist practitioners, pharmaceutical scientists, pre-

service students) and scope of education (e.g., undergraduate, post-registration, continuing professional development, practitioner development, lifelong learning).[15]

Pharmacy practice: the provision of medications and other healthcare products and services and to help people and society to make the best use of them.[5]

Social pharmacy: The study of social and behavioural factors influencing medicine use including medicine- and health-related beliefs, attitudes, rules, relationships and processes. It may deal with the study of social aspects of medicines (e.g. drug research and development, production and distribution of medicines, drug information, control of supply) or the perceptions and use of medicines by consumers (e.g. factors affecting adherence, understanding of side effects). It draws upon disciplines such as sociology, social psychology, psychology, political science, education, communication, economics, history and anthropology.[11]

Syllabus (i): is the outcome of curriculum development and contains both an instructional plan and details of the instructional process to be used within a defined unit of study.[16]

Syllabus (ii), plural syllabi or syllabuses: A document which outlines the aims, selection and sequence of contents to be covered, mode of delivery, materials to be used, learning tasks and activities, expected learning objectives or outcomes, and assessment/evaluation schemes of a specific course, unit of study or teaching subject. It is often used incorrectly as an equivalent of the term “curriculum”.[2]

1. BACKGROUND

1.1. Higher Education

Higher education is the highest level of education system, usually referring to education provided at universities, colleges, schools, polytechnic institutes or other institutions that confer academic degrees or professional degrees. University education should be oriented to provide solid academic training, guided by research and the creation of knowledge, while polytechnic education should focus on vocational and advanced technical training professionally-oriented.[17] Higher education typically comprises graduate studies and post-graduate studies, as well as vocational training. In some educational systems, mainly in the Anglo-Saxon model, the terminology used is different, with the graduate level being referred as undergraduate and postgraduate referred as graduate.

In Europe, through the Bologna Declaration, was created in 1999 the European Higher Education Area (EHEA). The establishment of the EHEA was intended to increase the international competitiveness of the European system of higher education, allowing mobility and employability of citizens in Europe. In the EHEA, students are allowed to start their education in one institution of higher education, and to continue and complete their studies in another, obtaining a European diploma recognized in any university of any EHEA Member State. To make this possible, the European higher education institutions have had to work in an integrated and harmonized manner, creating an identical structure and offering similar and comparable degrees in terms of content and duration.[18] The European higher education adopted a system based in two main cycles (undergraduate and graduate). Conclusion of the first cycle is compulsory for access to the second cycle of studies and lasts at least three years. The second cycle should leads to the master or doctorate degree.[18] In 2003, during the European Ministers of Higher Education Conference, that occurs in Berlin, was establish the doctorate level as the third cycle.[19] With the Bologna Process a system of credits (ECTS - European Credit Transfer and Accumulation System) was established to express the duration of a study program. Typically, to complete one academic year 60 ECTS credits are required, and each ECTS credit corresponds to approximately 25-30

hours of study. The first cycle of studies corresponds to 180 ECTS and the second cycle corresponds to 120 ECTS.[20]

Over the last decades, higher education institutions (HEIs) around the world have been increasing the focus on internationalization. The internationalization of HEIs aims to improve student preparedness for international issues, internationalize the curriculum, improve quality of teaching and learning activities, strengthen institutional research and knowledge production, enhance the international reputation and ranking of the institution, understand and compare the institution performance within the context of international practices and standards, enhance international cooperation, increase international networking by faculty and researchers, and increase revenue generation with foreign students.[21, 22] The academic mobility, international cooperation, international exchange and a period of study abroad are the main ways to promote the internationalization of HEIs. The Erasmus Programme in Europe and the Fulbright Scholars Program in the United States are examples of initiatives that provide students an academic experience in a foreign country.[23] The number of students studying abroad has increased dramatically in recent years, with 3.3 million international students' enrolled in OECD tertiary education programs in 2015.[24] In the process of choosing an HEI for a study aboard experience, the university website is the first source of information. Potential international students mainly seek information on academic programs, cost, scholarship information, financial aid, and admissions information.[25] In addition, the online availability of the curriculum content allows students to choose the HEI that best suits their interests.[26] The evaluation of the online availability of syllabus seems to be important as international students use this information to make a more conscious decision in the process of choosing the course and institution of higher education.

1.2. Curriculum Development

In the literature there are several definitions of what a curriculum is, but in general this term refers to a set of experiences and objectives that students should achieve during their educational process.[27, 28] For UNESCO, a "curriculum is a systematic and intended packaging of competencies (i.e., knowledge, skills and attitudes that are underpinned

by values) that learners should acquire through organized learning experiences in both formal and non-formal settings".[9] Through the curriculum students are prepared for their professional life and the curriculum development must meet society's needs.

According to Ralph Tyler, there are four crucial questions that must be answered in developing a curriculum: 1) What educational purposes should the school seek to attain?; 2) What educational experiences can be provided that are likely to attain these purposes?; 3) How can these educational experiences be effectively organized?; 4) How can we determine whether these purposes are being attained?. For this author, when developing a curriculum, the first thing that should be taken into account is the educational goals. Depending on these objectives, the educational contents are subsequently delineated, the necessary materials selected, the teaching procedures developed, and the assessments prepared.[29] Following Tyler's idea and in order to design a curriculum that fits the needs of society, HEIs should be able to identify the educational objectives and competencies that a graduate must acquire to practice their profession. The society needs are continually evolving, making curriculum development an ongoing process under constant evaluation and revision.

The development of a competency-based curriculum is increasingly common and should take into account some principles:[30]

- follow a competency framework;
- consult stakeholders (e.g. professional entities) about the competencies need for professional practice;
- think ahead, that is, when implementing a change, think about what job market will need when students finish their degree;
- integrate course content and skills throughout the curriculum;
- appoint curriculum coordinators for monitor and readjust the curriculum development process;
- avoid an overburden of summative assessments, wherever possible select formative assessments, since they allow student evaluation during the teaching-learning process;

- use authentic learning activities and assessment tasks to engage and motivate students in the learning process;
- adopt frameworks for cognitive and skills development;
- mapping curricular elements (e.g. course contents) against existing frameworks is useful for internal quality improvement;
- ensure management continuity;
- the instructors should develop educational expertise in teaching and competency assessment;
- develop scholarship in teaching and learning for instructs and curriculum developers.

The development of a curriculum must be expressed in comprehensive and accessible documents, such as curriculum frameworks, course curricula/syllabi, and in relevant and helpful learning materials, such as textbooks, teacher guides and assessment guides.[31] A course syllabus is the principal outcome of curriculum development and works as an instructional plan or guideline for teachers and students about one particular course.[16]

1.2.1. Designing a Course Syllabus

The course syllabus is a communicative document that works as a type of contract between the professor and the students.[32] The course syllabus communicates to students what is expected to happen during the course, that is, what the course offers to students and the results expected from them. This instrument also improves students learning, structures their work over the course, and motivates them to achieve goals; prevents student-faculty misunderstandings; assists faculty in course planning and teaching process; promote communication between faculty members about courses; and increases curricular quality.[33, 34]

Usually, the course coordinator is responsible for writing, updating and distributing the syllabus in paper or electronic form. The distribution and discussion of the syllabus should be done in the first class, in order to introduce and motivate students to the course. When the syllabi are already available on the university website, the student

can consult them before the start of classes. In fact, the online syllabi availability is a way to attract students to enroll in a certain university degree. The students could be informed about the educational content of the courses and decide if the degree curriculum fits their interests.[16]

The syllabus writing should be learning-centered, its structure must be well-organized and its content should be detailed and clear, to ensure that students understand what is required to achieve with the courses educational objectives.[35] The syllabus must also be written in such a way that the course contents motivates and engages the students in the learning process, and that they perceive the competencies that are expected to be achieved.[33] In the literature there are some examples of syllabus and checklists that are intended to assist teachers in syllabus development.[33, 34, 36] There is no perfect syllabus that fits all courses, but it is possible to create an attractive and user-friendly syllabus with all the information that should appear in this type of document (Appendix 1 contains an illustrative course syllabus). General course information (e.g. course name and identification, number of credits assign), course instructional team, course goals, course objectives (skills, knowledge and attitudes that students need to acquire), description of course content including the sequence of topics/readings and learning activities/assignments, time schedule, learning and teaching methods, student assessment and grading, and academic policy information (rules and regulations for the course) are some of the fundamental components that must be included in the course syllabus. In order to ensure that the course goals are met, it is also essential that the syllabus include an alignment between the learning outcomes, learning activities/assignments and assessment.[33, 34, 36]

1.2.2. Components of the Course Syllabus

General course information

- Course name and course code;
- Year and term/quarter/semester in which the course is offered;
- Location and time of class;

- Credits/units/time and student workload required, including the class contact hours and the number of hours of independent study;
- A list with pre-requisites (course(s) that must be completed before enrolling the course) or co-requisites (another course that must be taken at the same time);
- Course description: a brief description that explains the purpose of the course;

Course instructional team

- Instructors' names and their function (e.g. course coordinator, laboratory instructor). The degree(s) and titles could also be included;
- Office location, office hours and contact information (e.g. phone number and e-mail address);
- Additional information such as teaching philosophy and instructor professional backgrounds may also be included;

Course goals

- General aims for the course; this is goal statements that describe a general learning outcome;

Course learning objectives

- Correspond to measurable skills, knowledge and attitudes that students need to acquire, i.e., specific learning outcomes (competencies); this is what the student should be able to know or do upon successful completion of the course;
- The course objectives should be written with action verbs (e.g. evaluate, analyze, identify, explain) and from the students' point of view, to help them understand the expectations that they will need to meet in order to pass the course;
- The course learning outcomes must follow a competency framework;

Course content

- Description of the course educational content including the sequence of topics/readings and learning activities/assignments;

Time schedule/course plan

- Class schedule/course plan is usually organized by weeks. This item is very important to help students to organize and plan their study;
- Type of class (e.g. lectures, laboratory) and instructor responsible for the class;
- Educational topic or theme of the class;
- Landmark events, holidays, assessments, due dates for work and project presentation;
- Reading and others assignments required for the class;

The learning environment

- Learning and teaching methods (e.g. active learning strategies, such as laboratory experiences, case studies, small-group discussions and brainstorms of ideas, games, role-plays). The use of this student-centered teaching methods can help students to become engaged in the learning process and increases the participation in the class;
- List with the required and recommended texts;
- Course materials and attire;

Student assessment and grading

- Assessment methods (e.g., oral or written examination, group projects, simulation-based assessment, OSCE, OSATS). The assessment methods are used to determine whether students have achieved the desired course learning objectives. The selection of the assessment method depends on the learning outcome supposed to be tested. The students' assessment could be formative (observe the student learning during the teaching-learning process) or summative (assessments occur at the end of a program or course).
- Weighting (%) of each assessment;

- Grading criteria and pass requirements;
- Consequences for missed assessments;
- Grade posting;

Academic policy information

- Changes in the syllabus: the course syllabus must include a statement informing students that there may be changes during the semester.
- Last course revision date;
- Students with disabilities and special needs;
- Student conduct and classroom policies: the classroom policies must be in accordance with university policies. It is important to include specific policies regarding ethics and academic honesty (e.g. plagiarism), students' behaviors (e.g. use of mobile phones and laptops in class, punctuality, class participation) and work habits (e.g. due dates for assignments and exams).

Additional information

- If necessary the course syllabus may include additional information such as study suggestions and preparation for assessments, information on how to access the course website, and appendices.

1.3. Pharmacy Education

To work as a pharmacist it is necessary to complete a higher degree in pharmacy, and in some cases an examination is also required. Throughout the world, different names are assigned to the pharmacy degree, this may have different access requirements and their duration may also differ from country to country. For example, in USA to become a pharmacist it is necessary to complete an accredited doctor of pharmacy (PharmD) degree. This professional program (4 academic years) requires a minimum of 2 pre-professional academic years or the equivalent college-level course work prior admission.[37] In most cases, after the PharmD, it is necessary to pass in the North American Pharmacist Licensure Exam (NAPLEX) and the Multistate Pharmacy Jurisprudence Exam (MPJE) to get the state-issued license to work as a pharmacist. In

Canada, both Bachelor of Science in pharmacy (BSc Pharm) and PharmD are professional degrees and require at least 5 years of education in a 1+4 or 2+4 model. After that, a traineeship period and provincial and national examinations are required to become a licensed pharmacist.[38] In Europe, with the implementation of the Bologna Process, it was established that the pharmacy degree must provide at least five years of theoretical and practical training, including a six-month traineeship in a community or hospital pharmacy.[20, 39] In most EHEA member countries after graduation, entry to practice does not require an examination, however, professional registration is required. In the United Kingdom, although it has also signed the Bologna Declaration, in order to become a pharmacist it is necessary to complete an accredited master degree in pharmacy (MPharm) that lasts 4 years, complete one year of pre-registration period in a community or hospital pharmacy (independent of the MPharm), and pass a registration exam. A five-year MPharm degree including two intercalated periods of pre-registration training and registration exam it is also possible.[40] Despite these differences, the final goal of any pharmacy degree is to provide students the necessary competencies for professional practice.

1.3.1. Evolution of the Profession and Pharmacy Education

Over the past 50 years, the pharmaceutical profession has undergone significant changes, especially with the shift of focus from the product to the patient. With industrialization, society has changed, and the purpose of the pharmacy profession has had to adapt to society's needs. The role of the pharmacist has evolved from production and traditional dispensing of medicines to a new responsibility: ensure the safe use of drugs in patients.[41] Although in the literature there are previous descriptions, it was in the mid-1960s that the clinical pharmacy movement emerged as a new concept of pharmacy practice. The clinical movement began in hospitals, where the pharmacists provide care to patients, in collaboration with physicians and other healthcare professionals, in a decentralized pharmacy or on a patient care unit.[42] However, this concept is extended to all health care settings where the pharmacist has a patient-oriented practice.[43]

With the clinical pharmacy, a number of new opportunities began to increase for pharmacists, including the development and management of drug distribution systems, obtaining a patient history, and provision of drug information. These opportunities required pharmacists to acquire new knowledge and skills to assume new functions such as distribution and inventory control, adoption of unit dose packaging, interpretation of physician's orders, detection of medication errors, identification and monitoring adverse drugs reactions, management and storage of data, collection, assessment, interpretation and documentation of patient information, quality assurance programs and drug information services.[42, 44]

In February 1967 during the Pharmacy-Medicine-Nursing Conference on Health Education, was indicated that pharmaceutical education required significant changes in order to meet the new roles and responsibilities of the pharmacists. There has been a need to develop and include a clinical component in the curriculum in order to make education patient-oriented.[44, 45] In this sense, some universities have introduced into the curriculum the "clinical pharmacy" course.[46] The inclusion of behavioral sciences in the curriculum and the development of communication skills were also required so that pharmacists could work and communicate with physicians and other health care professionals in an interdisciplinary way.[47] Despite the evident and necessary change in the pharmacy curriculum from the science to a patient care era, this was not easy and there was resistance to curricular changes.[48-50]

In 1990, Hepler and Strand stated "that clinical knowledge and skills by themselves are not sufficient to maximize the effectiveness of pharmaceutical services", and advocated pharmaceutical care as a necessary philosophy of pharmacy practice.[51] The authors defined pharmaceutical care as "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life". These outcomes could be the cure of a disease, the reduction or elimination of symptoms, arresting or slowing of a disease process, and preventing a disease or symptoms.[51] For many years the definition of pharmaceutical care has generated some confusion, especially with regard to the terms it included. In order to clarify this concept, in 2013, the Pharmaceutical Care Network Europe (PCNE) redefined pharmaceutical care as being "the pharmacist's contribution to the care of individuals

in order to optimize medicines use and improve health outcomes".[13] As the pharmacist began to play a more active role in the health system, the concept of pharmaceutical care began to be more prominent, and the practice became more patient-centered.

1.3.2. Recommendations for Pharmacy Education

The pharmacist's role in the health system was recognized by the World Health Organization (WHO). A Consultative Group on the role of the pharmacist in the health care system was established and two meetings were held: the first took place in New Delhi (India) in 1988 and, the second in Tokyo (Japan) in 1993. The WHO indicated that the pharmacy profession and educators should follow important recommendations to ensure pharmacists with skills in pharmaceutical care:[52]

- continuous review of the outcomes, content, and process of the pharmacy undergraduate curriculum;
- adequate balance of curricular contents in basic sciences, pharmaceutical sciences, biomedical and clinical sciences, socioeconomic and behavioral sciences with practical experience;
- introduction of courses in pharmacy law, ethics and practice that contributes to the role of the pharmacist in the rational use of drugs and in the prevention and management of drug abuse;
- introduction of other courses related to the implementation of patient-oriented practice, such as communication and health education of the public;
- more practical and problem-oriented teaching methods;
- integration of education components and training of pharmacy students with other health students;
- patient-related internship period for achieving competencies in pharmaceutical care;
- adoption of the pharmaceutical care philosophy in continuing education and postgraduate studies.

The WHO continued to emphasized the importance of collaboration between pharmacists and other health professionals, and stressed the responsibility of

pharmacists to: ensure the quality of pharmaceutical products and services, provide informed and objective advice on medicines and their use, promote the concept of pharmaceutical care, and take an active role in illness prevention and health promotion.[53] The Committee of Ministers of the Council of Europe also highlighted the need for the pharmacist to be involved in assessing the results achieved through the use of medicines.[54]

In 1997 in Vancouver, Canada, the WHO Consultative Group reiterates its recommendation on curriculum revision so that pharmacy students can acquire knowledge, skills, attitudes, and behaviors for the practice of pharmaceutical care. To support the role of the pharmacist was created the concept of "seven star pharmacist", where each star corresponds to a function: caregiver, decision-maker, communicator, leader, manager, lifelong-learner, and teacher.[55] Subsequently the role of the pharmacist as researcher was added.[5] A pharmacy curriculum should be developed based on society needs. In this sense, it is up to the university to define the content of the courses, the educational context, and the learning methods, which lead to the achievement of the desired educational outcomes. Although each country has its own societal and educational needs, any pharmacy educator around the world must followed common principles: the educational results should be related to the concept of seven-star pharmacist; the learning methods should be student-centered; development of problem solving and critical thinking skills in students; and the curriculum development should be a continuous and dynamic process that has to meet the constant needs of the profession.[55]

At the fourth meeting of the Consultative Group on the role of the pharmacist in the health care system, the role of the pharmacist in self-care and self-medication was highlighted. It was recommend that the undergraduate pharmacy curriculum "should be reviewed and revised to ensure that students learn about the relevant aspects of information management and technology, behavioural sciences, and communication and health problem solving".[56]

Hepler and Strand's concept of pharmaceutical care had a huge impact on the International Pharmaceutical Federation (FIP), which recognized pharmaceutical care

provision as Good Pharmacy Practice. To ensure that pharmacists have the knowledge and skills needed for pharmacy practice, FIP has also established a list of recommendations that undergraduate pharmacy programs should follow, such as:[57]

- prepare pharmacy students with a solid and balanced foundation in natural, pharmaceutical and healthcare sciences for provision of pharmacy practice in a multi-professional healthcare delivery settings;
- ensure that patient-focused pharmaceutical care is a mandatory part of the curriculum;
- continuous curriculum development in order to keep up with the evolution of the profession;
- pharmacy students must acquire knowledge, skills (e.g., professional, social and communication skills), attitudes and behaviors for the practice of profession;
- educational outcomes should reflect the needs of society and the contemporary and developing practice of pharmacy in a particular country;
- the curriculum should be designed to ensure that established educational outcomes are achieved by students;
- teaching and learning process should be student-centered; the course syllabus must include the educational philosophy, structures, outcomes, methods and context;
- practicing pharmacists should contribute to the training of future pharmacists;
- national pharmaceutical associations should share responsibility for the education of pharmacy students, for example by involving themselves in curriculum design;
- colleges of pharmacy should share knowledge and educational resources with colleges of pharmacy worldwide, and with educators from other health professionals.

With the aim of improve health through advancing pharmacy education worldwide, FIP in collaboration with WHO and UNESCO created the Pharmacy Education Taskforce. The WHO-UNESCO-FIP Education Initiative (FIP*Ed*), in their 2013 global education report, recommended an alignment of pharmacy curricula with the pharmacy practice,

emphasizing the importance of clinical education and patient-centered curricula.[58] They also defended that the pharmacy education should be based on the Needs-Services-Competencies-Education cycle. According to this model, the first step is to identify the local and national health-related needs. Second, should be defined which pharmaceutical services meet the population needs. Next, it is necessary to identify the competencies that a graduate must achieve to provide these services. Lastly, a competency-based education program should be designed to help pharmacists achieve the desired competencies.[15, 59]

With the aim of guide the process of education reform, recently FIP published the Nanjing Statements on Pharmacy and Pharmaceutical Sciences Education. This document comprises 67 statements, grouped into 8 clusters, that represent "the international expectations on what an effective pharmaceutical education system looks like to meet local needs".[60]

Hughes evaluated what topics pharmacy students, trainees, pharmacists and pharmacy academics perceive as relevant to pharmacy practice.[61] His results revealed that topics related to patient care had received high relevance rating, whilst those related to basic sciences obtained lower scores. This study also concluded that pharmacy students "had a clear vision of what their future role as a pharmacist will be, and how and what they need to learn in order to fulfil that role." Overall topics related to patient care acquired more relevance as students advanced through the pharmacy program, while those related to the basic sciences declined in relevance.[61]

1.3.3. Competency Frameworks for Pharmacy

As mentioned above, the pharmacy curriculum must be developed taking into account the needs of society in order to prepare students with the necessary competencies to respond to the individual patient and to population health-related needs.[62] The use of competency-based education is very common among health professions and pharmacy is no exception.[63, 64] For the development of a competency-based education, it is crucial to define the competencies that the student must achieve,[63] and these competencies should be understood as the ability to mobilize, articulate and put into

practice the knowledge, skills, and attitudes necessary to effectively perform the activities required in the context of professional practice.[65]

With the aim of supporting the educational development of pharmacy practitioners, the FIP*Ed* created the global competency framework (GbCF) for services provided by pharmacy workforce. This framework, that serves as a mapping tool and undergoes changes with the evolution of the pharmacy profession, contains a core set of behavioral competencies that should be achieved by graduates to enter pharmacy practice. In the GbCF, 100 behavioral competencies are categorized into 20 competencies organized into four main areas (Pharmaceutical Public Health, Pharmaceutical Care, Organization and Management, and Professional/Personal Competencies).[7] In Europe, the PHAR-QA (Quality Assurance in European Pharmacy Education and Training) project has also developed a competency framework that can be used as a quality assurance system.[66] In this framework 50 competencies are organized into 11 domains (Personal competencies: learning and knowledge; values; communication and organizational skills; research and industrial pharmacy. Patient care competencies: patient consultation and assessment; need for drug treatment; drug interactions; drug dose and formulation; patient education; provision of information and service; monitoring of drug therapy).[67] Several competency frameworks for pharmacy education and practice have been developed and implemented to respond to national health-related needs in countries such as Australia,[11] Brazil,[68, 69] Canada,[70] Ireland,[71] New Zealand,[72] Portugal,[73] Singapore,[74] Spain,[75] Thailand,[76] the United Kingdom,[77] and the United States[78, 79].

Competency frameworks can guide the development of pharmacy curricula, however the curriculum "must be designed and delivered (curricular content, teaching and learning methodologies, educational outcomes, etc.) to ensure that these competencies are achieved by all graduates".[62] To avoid the competency misuse and to ensure that all students achieved the necessary competencies for pharmacy practice, the competency framework should be created by the profession, and the course syllabus must perfectly align competencies, learning outcomes, educational contents, learning activities, and assessment tasks. In the literature, numerous articles have reported the development and implementation of competency frameworks for

pharmacy education and practice, however, no studies have been found that define the educational contents that must be taught to a patient-centered practice.

More recently, the use of entrustable professional activities (EPAs) in pharmacy education has been described as a way to evaluate students competencies, especially in the transition of undergraduate education to professional practice.[80, 81] A set of competencies could be aggregate into a given EPA creating "units of professional practice, defined as tasks or responsibilities that trainees are entrusted to perform unsupervised once they have attained specific sufficient competence".[82] In the 2016 ACPE Accreditation Standards the pharmacy colleges "are encouraged to identify professional activities that their graduates perform routinely that help gain the trust of the healthcare team and the public they serve".[83] And the American Association of Colleges of Pharmacy (AACP) published a list of 15 core EPAs and supporting tasks that new pharmacy graduates must be entrusted to perform without direct supervision in their working life.[84, 85] These EPAs statements describe essential activities to pharmacy practice and express what pharmacists should be able to competently do regardless of practice setting.[86] Although EPAs should not be considered as an alternative to design curricula,[82] competency assignment should also be analyzed from the EPAs perspective. Basically, the pharmacy courses provide competencies, and the integration of several competencies support EPAs. The implementation of EPAs in pharmacy curriculum can support students linking their learning to the role and responsibilities of a pharmacist on the health care team.[81]

1.3.4. Pharmacy Curriculum

In response to recommendations issued by WHO and FIP, colleges of pharmacy around the world have modified their curriculum, including educational contents related to pharmaceutical care.[87-89] Curricula from countries such as Australia, Canada, the United States, and New Zealand have been revised and adapted to educate pharmacists to provide patient-centered care as members of the healthcare team.

One of the most innovative changes in the pharmacy curriculum has happened in the United States, with the creation and implementation of the doctor of pharmacy (PharmD) as the sole entry-level degree to the profession.[90] This program requires at

least two academic years or the equivalent college-level course work prior to the admission into a PharmD program (4 academic years). The pharmacy curriculum should follow the Accreditation Council for Pharmacy Education (ACPE) standards and guidelines which defines an adequate balance of biomedical, pharmaceutical, social/behavioral/administrative and clinical sciences and, an integration of pharmacy practice experiences in different settings.[37] With the educational evolution from basic sciences to clinical and integrated courses, the ACPE also recommend the employment of active teaching and learning methods in pharmacy education. The use of active learning strategies has become essential to provide pharmacy graduates with the necessary integration of knowledge, skills, attitudes, values and behaviors to a patient-centered practice. Active learning methods such as problem-based learning, team-based learning, case-based learning, simulation-based learning, and game-based learning, contribute to the development of critical thinking, problem-solving skills, communication, and teamwork, which is fundamental to effective delivery patient-centered care.[91] Other countries such as Canada,[92] Japan, Saudi Arabia and Thailand have also adopted the PharmD as their entry-level degree for the profession.[58]

Pharmacy education in Europe should follow the legislation on the recognition of pharmacist professional qualifications that define the knowledge, skills, and core competencies that pharmacy students must achieve to become pharmacists.[20, 39] As a result of the Bologna declaration, signed in 1999, the pharmacy degree became organized into two training cycles with the duration of at least five years, including a six-month traineeship at a community or hospital pharmacy during or at the end of the program. At the end of the five years of study, a total of 300 ECTS is required to complete the pharmacy degree. Also in 1999, the EAFP Task Force for Implementing Pharmaceutical Care into the Curriculum proposed changes in the pharmacy undergraduate degree, including the introduction of mandatory pharmaceutical care modules.[93] Most European countries have changed their pharmacy curriculum, and some have introduced a clinical component to respond to the European and international recommendations on patient-centered practice.[87, 94-98]

In the literature, there are some studies comparing pharmacy education over Europe. One of them has compared the results of the 1994 report of the Advisory Committee

on Pharmaceutical Training[99] with the results of the 2011 PHARMINE report.[100] This study showed that from 1994 to 2011, there was a decrease in the number of hours related to the "chemical sciences" (from 33% to 26%) and an increase in the number of hours related to the "medical sciences" (from 19% to 28%). These results indicated an evolution towards more clinical courses with a higher content of medical sciences, and that the pharmacy curriculum was in accordance with the European recommendations.[101] However, the "medical sciences" subject area described in the 2011 PHARMINE report included a mix of courses such as human anatomy and physiology, pharmacology, toxicology, parasitology, bio-analysis (of body fluids), radiochemistry, dispensing process, drug prescriptions, prescription analysis, over-the-counter (OTC) medicines, skin illness and treatment, homeopathy, phytotherapy, drugs in veterinary medicine, pharmaceutical care, pharmaceutical therapy of illness and disease, etc.[100] But according to the ACPE course categorization, some of these courses are part of the clinical sciences, whereas others belong to biomedical/basic sciences (e.g., anatomy and physiology) or pharmaceutical sciences (e.g., pharmacology).[37] The 2011 PHARMINE report has tried to answer the question of how pharmacy education is adapted to pharmacy practice in the European Union.[100] In fact, after the Bologna Declaration, there were curriculum revisions in EHEA countries. The question is whether these changes were enough to respond to the recommendations issued by the FIP and WHO.

1.4. Justification of the thesis

University of Granada, through is faculty of pharmacy, was pioneer in the study of pharmacy education and training to create professionals capable to provide patient care. Starting in 1993 with Martinez Romero Doctoral Thesis,[102] several other doctorates studied this theme, although mainly focus in continuing training.[103, 104] Thus, embedded the doctoral program in pharmacy, it´s seems pertinent to gain insight in the current situation of the undergraduate pharmacy education in Europe.

The design of a toolkit could guide pharmacy colleges in the development, implementation, maintenance, and modification of their curriculum so that pharmacy education adapt to the needs of the profession. This tool should provide tips for a

patient-centered pharmacy curriculum, addressing topics such as competency frameworks, educational contents, teaching and learning methods, and assessment methods.

2. THESIS OBJECTIVES

2.1. General objective

The general objective of this study is to assess whether universities are preparing pharmacy students for a patient-centered practice and whether the pharmacy curricula are adapted to this need of the profession.

2.2. Specific objectives

1. Compare information available on the websites of the universities with undergraduate pharmacy degree programs across the globe from the perspective of international students.
2. Analyze and compare course contents of United States and European Higher Education Area undergraduate pharmacy curricula to determine the amount of patient-centered care courses.
3. Analyze whether the pharmacy curricula in Spain provide the minimum competencies that students must acquire for the practice of pharmacy, and whether those competencies are properly assigned to the curriculum courses.
4. Create a catalogue of educational contents for the undergraduate pharmacy curriculum that focuses on preparing students for a patient-centered practice.

3. A GLOBAL COMPARISON OF INTERNATIONALIZATION SUPPORT CHARACTERISTICS AVAILABLE ON COLLEGE OF PHARMACY WEBSITES

3.1. Introduction

The global rise in internet users has increased the number of websites that are used as sources of information. Universities followed this evolution by creating websites that give prospective students their first impressions of the schools.[105-107] Currently, university and college websites are used as highly influential recruitment tools.[108-110] These university websites provide information about the schools' courses, educational programs, and online learning facilities and assignments.[111] The types of information searched on these websites depend on whether the given user is a student, professor, researcher, administrative staff member, or occasional visitor. Students are mainly interested in study plans, timetables, and exam grades. Occasional visitors, who may be prospective students, are mainly interested in study plans, facilities, building locations, registration information, and admission requirements.[112]

The previous literature demonstrates the importance of university websites in the process of selecting a college. Prospective students trust information provided on a college website and will use this information to help them decide whether to "apply" or not at this stage in the process. Majors and tuition, followed by ranking, size and location, were the most commonly searched information items on college websites.[113]

The 2010 E-Expectations Report indicated that one in four students reported "removing a school from their prospective list because of a bad experience on that school's Web site", and 92% reported that "they would be disappointed with a school or remove it entirely from their list if they didn't find the information they needed on the school's Web site". A list of academic programs or degrees and academic program details were the two most valued contents (28.3% and 18.6% of the students, respectively).[106] In the 2014 E-Expectations Report, prospective students (77%) and their parents (69%) rated college websites as the most influential resource for college search.[110] Schimmel et al reported that 94% of students stated that before considering a school, they examined the website, which was important in their decision-making process about which institution they would attend.[114] Students considered that programs, course availability, location, and accreditations were the most important

aspects of Schools' websites, and that this information should be accessible from the homepage.[114]

Over the past 30 years, internationalization in higher education has been increasing,[115, 116] specifically in terms of the number of students who want to study abroad.[23, 117, 118] The main reasons for the internationalization of institutions of higher education include improving student preparedness, internationalizing the curriculum, and enhancing the international profile of the institution.[22, 119] For international students, university websites were also the primary source of information about these institutions,[120] and students' experiences with university websites was reported as one of the most-influential factors in their decision to apply to a given university.[25] Noel-Levitz reported that the top five items searched on college websites by prospective undergraduate international students were academic programs/majors, cost, scholarship information, financial aid, and admissions information.[25] In addition, university websites act as a source of information for international students throughout their study abroad experience.[121]

Pharmacy education is not an exception in the internationalization of higher education, and pharmacy students have demonstrated interest in experiences abroad.[122] Thus, our aim was to compare information available on the websites of the universities with undergraduate pharmacy degree programs from the perspective of international students.

3.2. Methods

Institutions providing pharmacy education have different denominations around the world (i.e., colleges, schools, faculties). In this study, we used the term "colleges" to refer to all such higher-education institutions.

Information about all colleges of pharmacy in the world was collected from the Official World List of Pharmacy Schools, which was available on the website of the International Pharmaceutical Federation (FIP).[123] Small errors, such as duplicate records or data from colleges that did not provide entry-level degrees for pharmacy, were removed from the list.

By means of a Google search, the existence of a pharmacy college website for each college was investigated. Following previously published standards, a web content analysis was performed.[124-126] Data about languages, available information items and syllabus presence, and quality were collected from each college website during 2014. A website was considered to contain all syllabi if no more than 5 course syllabi were missing. Additional information about the colleges and their positions in ranking lists was obtained from the Academic Ranking of World Universities 2015.[127] A Web content analysis of websites with versions in English, Spanish, French, Portuguese, Italian, or German was performed. Then, the websites were grouped according to the region as described in the World Factbook.[128]

To compare the websites quantitatively, a scoring method was created. Based on the content valued by students in previous studies, we assigned 1 point to each of the following items of information available on the website: degree granted, credits/hours required for the degree, the head of the college, faculty directory, admission requirements, tuition, pharmacy careers, professional competencies and outcomes, and curriculum information. Syllabi, when on the website, were scored according to quality, with 1 point for weak and partial syllabi and 2 points for complete and rich syllabi. A complete and rich syllabus was defined as one that, in addition to a description of course content, provides information about course goals (competencies) and course objectives (skills, knowledge and attitudes that students need to acquire), units/time required and pre-requisites/co-requisites, instructor contact information, learning environment (facilities and teaching methods, required and recommended texts, and materials and attire), time schedule/course plan, assessment methods, technical classroom, and college policy information.[33] If the website had the information also available in a foreign language, we assigned 1 extra point. The maximum (i.e., the best) score possible was 12 points.

For each country with pharmacy colleges, we collected the following information: whether the country belongs to the G20;[129] whether country belongs to the Organization for Economic Co-operation and Development (OECD);[130] the region of the world where the country is located;[128] the total area of the country;[128] its population;[128] whether the country's official language is English;[128] the number of

internet users;[128] the number of mobile cellular telephone subscribers;[128] the number of pharmacists in the country;[131] its 2012 Human Development Index (HDI) Value;[132] its 2012 HDI rank;[132] its 2012 Gross National Income (GNI) per capita;[132] and its 2015-2013 population with at least a secondary education.[132]

Website scores were compared using a t-test for dichotomous factors and an ANOVA with Bonferroni post-hoc polychotomous analysis. For all analyses, a level of 5% was considered significant. The data were analyzed using SPSS version 20 (IBM, Armonk, NY).

3.3. Results

A total of 1839 pharmacy colleges were extracted from the FIP Official World List of Pharmacy Schools (Table 3.1).[123] According to the World Factbook region map,[128] colleges of pharmacy were distributed as follows: 117 from Africa, 19 from Central Asia, 23 from Central America, 282 from East and Southeast Asia, 211 from Europe, 101 from the Middle East, 161 from North America, 19 from Oceania, 329 from South America, and 577 from South Asia.

Table 3.1 - Number of Pharmacy Colleges per country extracted from the FIP Official World List of Pharmacy Schools (n= 1839)

Country	Total	Country	Total	Country	Total
Afghanistan	1	Guinea	1	Oman	2
Algeria	9	Guyana	1	Pakistan	27
Argentina	11	Haiti	1	Palestinian Territory, Oc	4
Armenia	2	Honduras	1	Panama	2
Australia	16	Hong Kong SAR China	1	Papua New Guinea	1
Austria	3	Hungary	4	Paraguay	6
Azerbaijan	1	Iceland	1	Peru	19
Bangladesh	9	India	535	Philippines	35
Belarus	1	Indonesia	17	Poland	10
Belgium	6	Iran, Islamic Republic of	14	Portugal	9
Benin	1	Iraq	13	Qatar	1

Table 3.1 - Number of Pharmacy Colleges per country extracted from the FIP Official World List of Pharmacy Schools (n= 1839)

Country	Total	Country	Total	Country	Total
Bolivia	7	Ireland	3	Romania	10
Bosnia and Herzegovina	1	Israel	2	Russian Federation,	15
Brazil	261	Italy	29	Rwanda	1
Bulgaria	1	Jamaica	1	Saudi Arabia	14
Burkina Faso	1	Japan	67	Senegal	1
Cambodia	2	Jordan	10	Serbia	1
Cameroon	4	Kazakhstan	1	Sierra Leone	1
Canada	10	Kenya	4	Singapore	1
Cape Verde	1	Korea, Republic of,	20	Slovakia	1
Chile	9	Kosovo	1	Slovenia	1
China	102	Kuwait	1	South Africa	9
China Taiwan	6	Kyrgyzstan	1	Spain	16
Colombia	7	Latvia	2	Sri Lanka	1
Congo, The Democratic Republic	1	Lebanon	5	Sudan	9
Costa Rica	1	Liberia	1	Sweden	3
Cote d'Ivoire	1	Libyan Arab Jamahiriya	3	Switzerland	3
Croatia	1	Lithuania	1	Syrian Arab Republic	7
Cuba	3	Macedonia	2	Tajikistan	1
Cyprus	3	Madagascar	2	Tanzania, United Republic	3
Czech Republic	2	Malawi	1	Thailand	16
Denmark	1	Malaysia	11	Togo	1
Dominican Republic	4	Mali	1	Trinidad and Tobago	1
Ecuador	4	Malta	1	Tunisia	1
Egypt	23	Mauritius	1	Turkey	13
El Salvador	3	Mexico	30	Uganda	3
Estonia	1	Moldova	1	Ukraine	6
Ethiopia	12	Morocco	2	United Arab Emirates	8
Fiji	1	Mozambique	2	United	26

Table 3.1 - Number of Pharmacy Colleges per country extracted from the FIP Official World List of Pharmacy Schools (n= 1839)

Country	Total	Country	Total	Country	Total
				Kingdom	
Finland	3	Myanmar	1	United States	121
France	24	Namibia	1	Uruguay	1
Gabon	1	Nepal	4	Uzbekistan	1
Georgia	1	Netherlands	2	Venezuela	3
Germany	22	New Zealand	2	Viet Nam	2
Ghana	2	Nicaragua	4	Yemen	3
Greece	4	Nigeria	11	Zambia	1
Guatemala	2	Norway	5	Zimbabwe	1

No website was found for 246 (13.4%) colleges of pharmacy. Of the 1593 colleges with websites, 51.3% (n=817) had a complete website in English, 15.2% (n=242) had websites partially translated into English, and 33.5% (n=534) had a website in other languages. Surprisingly, 5 colleges of pharmacy from countries with English as a co-official language had no English version of the website (3 in Cameroon, 1 in Canada, and 1 in Sudan). Of the 949 colleges from countries with official and co-official languages other than English, 529 (55.7%) had no English version, 239 (25.2%) had a partial translation into English, and 181 (19.1%) had a complete version of the website in English. Egypt and Greece present the highest proportion of websites translated into English, with 15 of 21 Egyptian colleges and all 4 Greek colleges presenting English versions. In contrast, Brazil and China presented English versions of their websites in 1 of the 252 Brazilian colleges and 7 of 99 Chinese colleges. A total of 1466 (92.0%) had a website in English, French, German, Italian, Portuguese or Spanish and, subsequently, undergone a web content analysis (Figure 3.1 and Table 3.2).

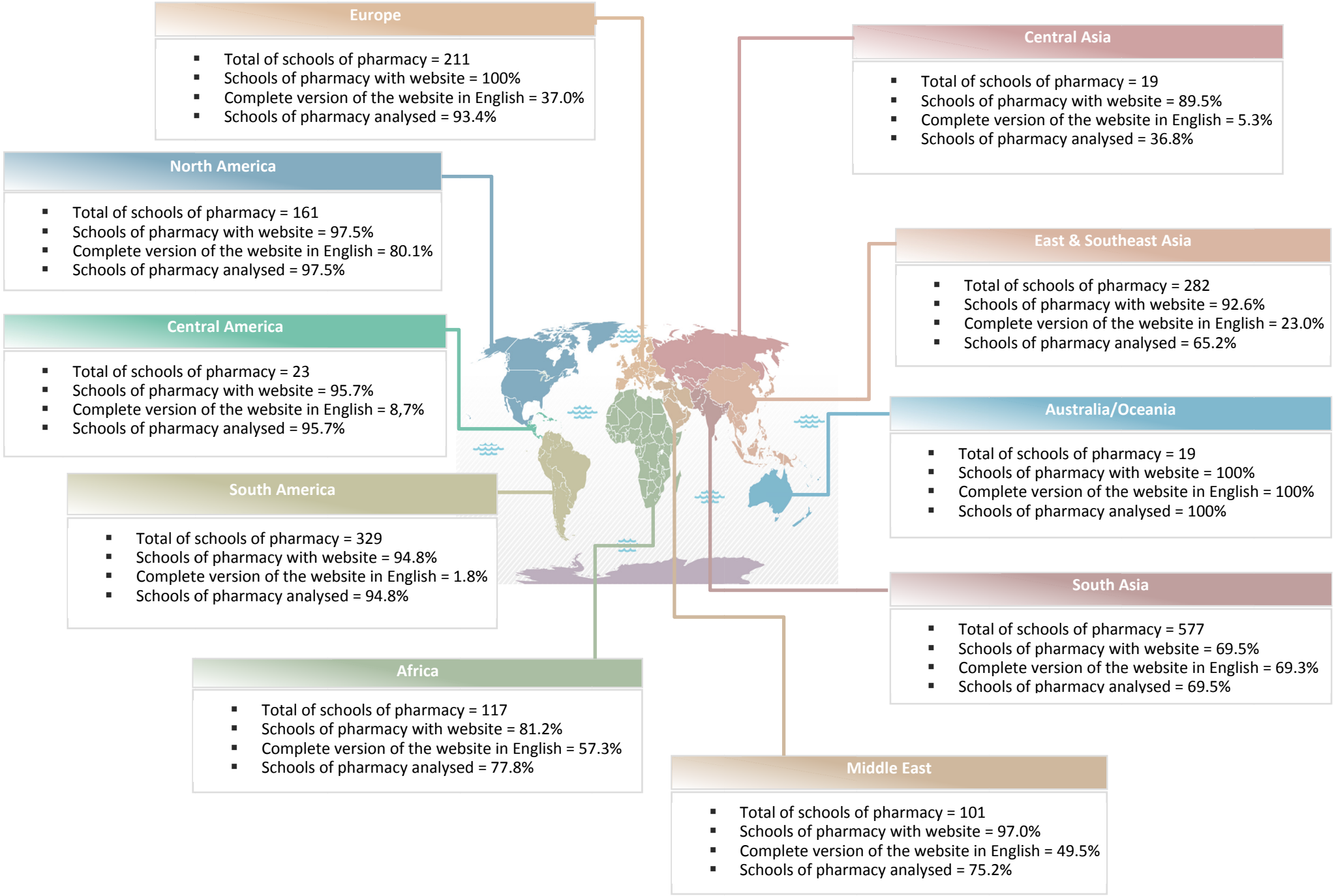

Figure 3.1 - Distribution of pharmacy schools by region

Table 3.2 - Number of Pharmacy Colleges with Information on the Website According to the Regions Where is Located (n=1466)

Information available on the website	Africa (n=91)	Central Asia (n=7)	Central America (n=22)	East & SouthEast Asia (n=184)	Europe (n=197)	Middle East (n=76)	North America (n=157)	Oceania (n=19)	South America (n=312)	South Asia (n=401)	Total (n=1466)
Information on the degree granted?	82 (90.1%)	1 (14.3%)	22 (100.0%)	71 (38.6%)	170 (86.3%)	49 (64.5%)	157 (100.0%)	19 (100.0%)	306 (98.1%)	396 (98.8%)	1273 (86.8%)
Information on the credits/hours on the degree?	33 (36.3%)	0 (0.0%)	14 (63.6%)	28 (15.2%)	113 (57.4%)	41 (53.9%)	140 (89.2%)	18 (94.7%)	197 (63.1%)	118 (29.4%)	702 (47.9%)
Information about the head of the college?	64 (70.3%)	1 (14.3%)	16 (72.7%)	46 (25.0%)	157 (79.7%)	48 (63.2%)	142 (90.4%)	18 (94.7%)	226 (72.4%)	299 (74.6%)	1017 (69.4%)
Have faculty directory?	43 (47.3%)	0 (0.0%)	5 (22.7%)	43 (23.4%)	150 (76.1%)	36 (47.4%)	138 (87.9%)	19 (100.0%)	133 (42.6%)	269 (67.1%)	836 (57.0%)
Information about admission requirements?	51 (56.0%)	0 (0.0%)	5 (22.7%)	43 (23.4%)	149 (75.6%)	30 (39.5%)	148 (94.3%)	19 (100.0%)	70 (22.4%)	300 (74.8%)	815 (55.6%)
Information about tuition?	21 (23.1%)	0 (0.0%)	2 (9.1%)	9 (4.9%)	89 (45.2%)	20 (26.3%)	129 (82.2%)	16 (84.2%)	99 (31.7%)	130 (32.4%)	515 (35.1%)
Information about pharmacy careers?	24 (26.4%)	1 (14.3%)	12 (54.5%)	32 (17.4%)	125 (63.5%)	19 (25.0%)	111 (70.7%)	16 (84.2%)	240 (76.9%)	102 (25.4%)	682 (46.5%)
Information about professional competencies and outcomes?	20 (22.0%)	0 (0.0%)	10 (45.5%)	19 (10.3%)	108 (54.8%)	22 (28.9%)	131 (83.4%)	14 (73.7%)	185 (59.3%)	16 (4.0%)	525 (35.8%)
Curriculum information on the website?	48 (52.7%)	0 (0.0%)	16 (72.7%)	45 (24.5%)	159 (80.7%)	43 (56.6%)	155 (98.7%)	17 (89.5%)	243 (77.9%)	152 (37.9%)	878 (59.9%)
Syllabus information on the website? (weak syllabus)	15 (16.5%)	0 (0.0%)	3 (13.6%)	14 (7.6%)	59 (29.9%)	25 (32.9%)	101 (64.3%)	14 (73.7%)	50 (16.0%)	69 (17.2%)	350 (23.9%)
Syllabus information on the website? (complete syllabus)	2 (2.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	19 (9.6%)	3 (3.9%)	10 (6.4%)	2 (10.5%)	6 (1.9%)	0 (0.0%)	42 (2.9%)
Mean website score (SD)	4.5 (2.7)	0.2 (1.0)	4.8 (1.9)	1.5 (2.7)	6.7 (3.7)	4.0 (4.2)	8.8 (1.7)	9.2 (1.7)	5.7 (2.0)	4.7 (1.9)	5.0 (3.3)

The mean website score of the 1593 colleges of pharmacy was 4.98 (SD=3.3). A total of 303 (19.0%) colleges scored zero points, while eight colleges scored the maximum 12 points. While Oceania, North America and Central America had no colleges scoring zero, Central Asia and East and Southeast Asia had 94.1% and 72.8% of colleges scoring zero, respectively (Figure 3.2).

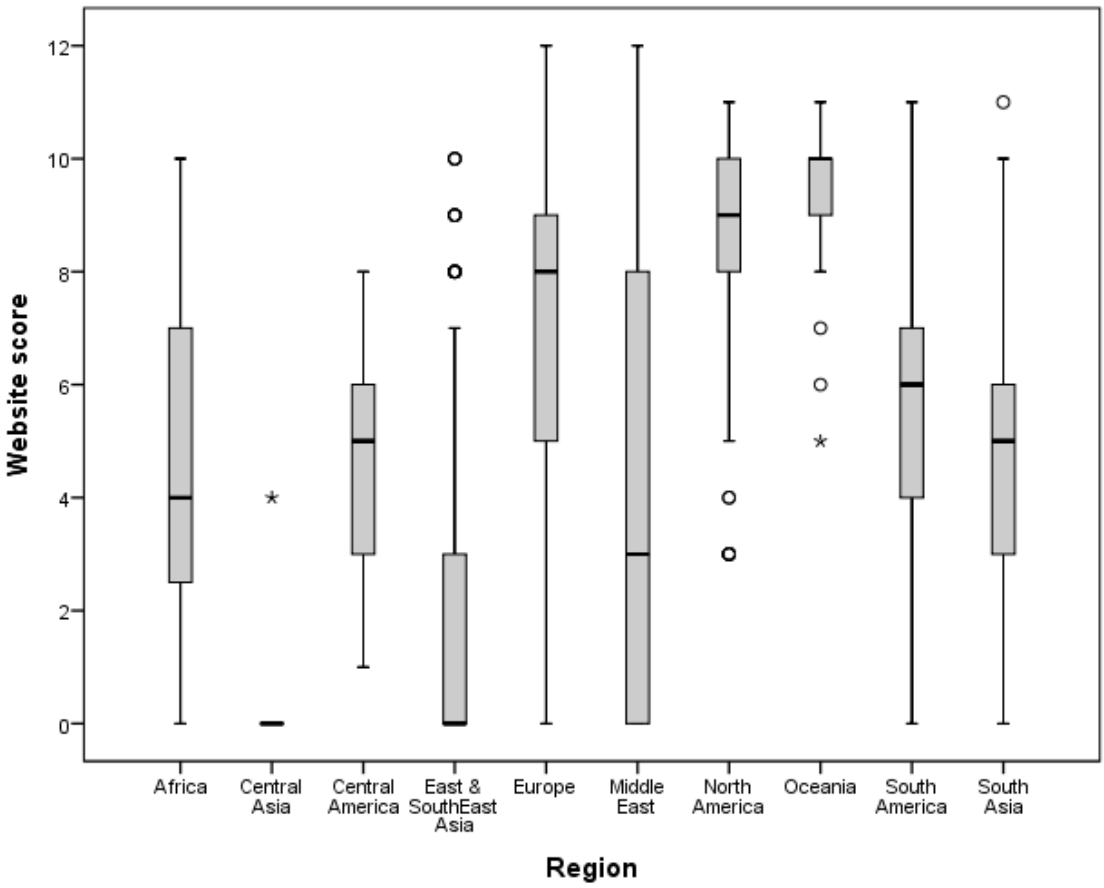

Figure 3.2 - Score of the pharmacy college website in the different region of the world where the colleges are located

A significant difference among the scores of different global regions appeared, as shown in Table 3.3 (ANOVA F=117.7; df=9; p<0.001). Significant associations or correlations were also found for website scores and the majority of socio-economic variables, but not with the number of pharmacists per 10,000 inhabitants (Table 3.4).

Table 3.3 - Score of the Pharmacy College Website in the Different Regions of the World Where the Colleges are Located

	Africa	Central Asia	Central America	East & South East Asia	Europe	Middle East	North America	Oceania	South America
Central Asia	S								
Central America	Ns	S							
East & South East Asia	S	Ns	S						
Europe	S	S	Ns	S					
Middle East	Ns	S	Ns	S	S				
North America	S	S	S	S	S	S			
Oceania	S	S	S	S	S	S	Ns		
South America	S	S	Ns	S	S	S	S	S	
South Asia	Ns	S	Ns	S	S	Ns	S	S	S

ANOVA ($p<0.001$) with Bonferroni post-hoc analysis: S=significant difference; Ns=non-significant difference

Table 3.4 - Association of Socio-Economic Variables with the College Website Score

Categorical co-variates		**Mean (SD)**	***p* value**
Country member of the G20			0.016*
	Yes	4.9 (3.4)	
	No	4.6 (3.2)	
Country member of the OECD			<0.001*
	Yes	6.6 (3.9)	
	No	4.3 (2.8)	
Integer co-variates		**Pearson's R**	***p* value**
HDI		+0.268	<0.001
HDI rank		-0.292	<0.001
GNI per capita		+0.352	<0.001
2015-2013 Population with at least secondary education (2015-2013)		+0.193	<0.001
Percentage of internet users		+0.269	<0.001
Percentage of mobile phone users		+0.156	<0.001
Shangai Rank 2015 (non included=1000)		-0.216	<0.001
Number of pharmacists per 10,000 inhabitants (WHO)		-	0.339

3.4. Discussion

The purpose of this study was to compare the internationalization of pharmacy college websites by analyzing information available on the websites. We found Europe, North America and Oceania as the global regions with pharmacy college websites that provide more information for international students. Most higher-education institutions emphasize the importance of internationalization.[119, 133] According to the International Association of Universities (IAU) 4th Global Survey, academic institutions in Asia, Pacific and North America are most likely to have quantitative international student recruitment targets.[133] However, in our study, the websites of pharmacy colleges located in Asian regions had lower scores, going against the intention of internationalization. On the other hand, Europe, North America and Oceania are the global regions with pharmacy colleges that seem to be better-prepared to receive international students, though Europe obtains the largest score range in our study.

To attract international students, it is essential that university websites have clear navigation,[120] take multicultural differences into account,[134] and make an effort to have their texts completely translated into English.[135] Despite the fact that the majority of higher-education institutions seem to acknowledge the importance of internationalization,[16, 33] our study showed that while most pharmacy colleges had websites (86.6%), 33.5% of websites were not in English, and 15.2% were only partially translated into English. The lack of English versions of these websites is even more unusual in three countries that have English as a co-official language (i.e., Cameroon, Canada, and Sudan). It is also surprising that countries involved in major development processes—namely, two BRICS countries, Brazil and China—have an extremely low proportion of colleges with English-version websites. As a basic pre-requisite for making pharmacy college websites accessible to international students, it seems that further efforts are needed to create English versions of these websites, since English is considered the academic *lingua franca*.[136]

We found that the information available on the pharmacy college websites was not always current, complete or accurate. Many of the websites were not well-organized, making it difficult to search for information, which corroborates previous studies.[134]

Meyer and Jones asked students about information they needed but could not find or found but with much effort on university websites. Students reported that they needed information such as lists of degree programs, admission information, program requirements and costs, lists of faculty and syllabi and that this information should be easily accessible. According to the authors, this type of information is the "information that helps the student function as a student". Despite this, some students reported never finding information about paying tuition, faculty directories and contact information, course syllabi/course descriptions and graduation requirements or finding this information after much effort or with help.[134] In our study, admission requirements, program costs, and faculty directories were available in 55.6%, 35.1%, and 57.0% of pharmacy college websites, respectively. Approximately 73% of the 1466 colleges of pharmacy failed to provide course syllabi on their website, 24% included a weak syllabus (containing just a brief description of course content), and only 3% presented a complete syllabus. According to Noel-Levitz, course content was one of the most important issues for international students.[26] This information can help students choose the college of pharmacy with the curriculum that best suits their interests. Furthermore, since syllabi include descriptions and course plans, they are an instrument that enhances student learning, assists faculty teaching, increases communication between faculty members about courses, and improves curricular quality.[33, 137, 138] Providing complete information about pharmacy degrees, especially through syllabi, is a crucial requirement for pharmacy colleges websites to allow international students make informed choices.

As expected, the results show that the richest countries (i.e., those with the highest socio-economic variables) seem more prepared to receive international pharmacy students, since their websites scored better. Colleges in developing countries should keep in mind that economic and political considerations may influence students' college choice and may also provide them with educational motivation.[139] For example, students interested in tropical medicine may prefer moving to African countries, regardless of these countries' lower socio-economic variables.

Our study demonstrates that the percentage of internet users and the percentage of mobile-phone users have a significant relationship with website scores such that they

can predict the wealth of the country where the pharmacy colleges are located. To attract international students, it may be important for students to have a good experience with the college's website through the computer as well as on a mobile device.[120]

The only socio-economic variable analyzed with no significant association with the college website score was the number of pharmacists per 10,000 inhabitants, indicating that the number of pharmacists is not a determining factor for how willing pharmacy colleges are to internationalize.

One potential limitation of our study is that we only evaluated the content of websites written in English, Spanish, French, Portuguese, Italian, or German. However, these six languages are the official or co-official languages in 68 countries with pharmacy colleges that have websites; therefore, our analysis covers a population of more than 3.5 billion people, representing five of the top ten languages on the global internet.[140] Another possible limitation was the fact that the websites of pharmacy colleges were extracted from the FIP Official World List of Pharmacy Schools, which could not be updated; however, the FIP is the supranational organization in the world of pharmacy, with a specific section on pharmacy education (FIPEd). The scoring system we used does not differentially weight the various elements, which would require that a consensus technique (e.g. Delphi) should be previously done. As we only evaluated the information provided in websites through a content analysis, our study did not consider the impact of website design and ease of use features.

3.5. Conclusion

Our study shows that a high proportion of pharmacy colleges still do not have a website, and approximately half of pharmacy college websites do not have an English version. Academic information considered important by students, including syllabi, admission requirements, program costs, and faculty directories, were not always available on the colleges' websites. The results show that there is still much to be done to improve the websites of pharmacy colleges so that they attract international students. Most pharmacy colleges need to update their websites by creating an English

version and providing academic information necessary for students to make informed choices about which college of pharmacy offers the curriculum that best serves their interests.

4. A COMPARISON OF PATIENT-CENTERED CARE IN PHARMACY CURRICULA IN THE UNITED STATES AND EUROPE

4.1. Introduction

The global pharmacy profession has shifted from a product oriented to a patient-centered practice.[141] Consequently, pharmacy education is adapting to this paradigm.[50, 142] The movement toward clinical education in pharmacy curricula has been discussed in the United States for a long time.[48] International organizations have delivered statements and positions to guide this movement. The World Health Organization (WHO) recommended an appropriate balance of the following components in curricula: basic sciences, including pharmaceutical and biomedical sciences, and clinical sciences, socioeconomic and behavioral sciences, and practical experience. Moreover, WHO stressed that courses related to the implementation of patient-centered care (e.g., communication skills) should be introduced.[52, 55, 143] The International Pharmaceutical Federation (FIP) supports pharmacy education improvement while emphasizing clinical education and the importance of patient-centered care curricula.[58]

Some countries have adapted their curricula to face the changes in the pharmacy profession as it moves toward clinical and patient care.[38, 144] Other countries have focused efforts on improving areas of pharmacy curricula, such as clinical pharmacy[97, 145, 146] and the social and behavioral sciences.[147-150] In the United States, the change in pharmaceutical education was marked by the creation of the doctor of pharmacy (PharmD) as the sole degree required to enter practice.[90, 151] The US-based Accreditation Council for Pharmacy Education (ACPE) standards and guidelines have been adapted to address the patient-centered practice requirements.[37] Curriculum reform has increased disciplines oriented toward providing clinical experiential models and has improved the competencies related to evidence-based practice and patient-centered care, whether in community or institutional pharmacy practice.[152, 153]

European Union (EU) treaties support the mobility of professionals across Europe without requiring further training or diploma validation, meaning that a degree obtained in one EU member country is valid across the European Union. With the aim of creating a harmonized European Higher Education Area (EHEA), in June 1999,

European ministers of education signed the Bologna Declaration. A system of easily comparable degrees was adopted among EU countries.[18] To date, 48 EU countries have adopted the Bologna Declaration (Table 4.1).[154]

Table 4.1 - European Higher Education Area Members

Since 1999	Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom
Since 2001	Croatia, Cyprus, Liechtenstein, Turkey
Since 2003	Albania, Andorra, Bosnia and Herzegovina, the Holy See, the Russian Federation, Serbia, The Former Yugoslav Republic of Macedonia
Since 2005	Armenia, Azerbaijan, Georgia, Moldova, Ukraine
Since 2007	Montenegro
Since 2010	Kazakhstan
Since 2015	Belarus

A consequence of the Bologna process was EU legislation that dictated definitions of the knowledge, skills, and core competencies that undergraduate education should provide to students seeking to become pharmacists.[39] The pharmacy degree had to adapt to a structure based on a 2-cycle (i.e., bachelor and master) degree system with at least 5 years of study corresponding to 300 European Credit Transfer and Accumulation System (ECTS). This training includes at least four years of full-time theoretical and practical training administered at a university or a recognized equivalent institute, and at least six months of University supervised practical training through a rotation between a community pharmacy and a hospital (with a mandatory 4-month period in community pharmacy).[20, 39] In line with the Bologna Declaration, the majority of EHEA countries changed their pharmacy curricula,[155, 156] but it is not clear whether these modifications have led the European curricula to be more patient-centered. Thus, our aim was to analyze and compare course contents of USA and EHEA undergraduate pharmacy curricula to determine the amount of patient-centered care courses.

4.2. Methods

Lists of schools of pharmacy in the United States and the EHEA were extracted from the FIP Official World List of Pharmacy Schools.[123] Small errors, such as duplicate data and schools that did not provide entry-level degrees for the profession, were removed from the list. The websites of all of the pharmacy schools in these two regions were located and analyzed. To be eligible for the study, the institutions had to meet the following criteria: a website in English, French, German, Italian, Portuguese or Spanish; a complete curriculum for the academic year 2013-2014 on the website; the hours or credits per course in the curriculum; a syllabus of all courses available on the website (as a tolerance criterion, a lack of up to five syllabi was allowed); and an internship (pharmacy practice experiences) integrated into the curriculum.

To obtain a representative sample of the pharmacy education institutions per country, randomized selection was performed via the generation of a list of random numbers. Twenty-five percent of the schools from each country, with a minimum of four institutions per country, were selected. For the countries with fewer than four pharmacy education institutions meeting the criteria, all of the schools were included in the sample. The syllabi for all of the courses from the selected schools in the sample were downloaded. Elective courses were excluded from the analysis.

To analyze the course contents in the syllabi, we created a guidance for data extraction and classification. Based on the "Curricular Core – Knowledge, Skills, Attitudes, and Values" section of ACPE's Standards,[37] we created a 4-area categorization system. Social/behavioral/administrative pharmacy sciences included health care delivery systems, economics/pharmacoeconomics, practice management, pharmacoepidemiology, pharmacy law and regulatory affairs, history of pharmacy, ethics, professional communication, social and behavioral aspects of practice, and informatics. Clinical sciences included pharmacy practice and pharmacist-provided care, medication dispensing and distribution systems, pharmacotherapy, pharmacist-provided care for special populations, drug information, medication safety, literature evaluation and research design, and patient assessment laboratory. Experiential courses included pharmacy practice experiences, thesis projects, courses that

combined (real or simulated) clinical environments, knowledge related to social/behavioral/administrative pharmacy sciences and clinical sciences. Finally, other/basic sciences included biomedical sciences, pharmaceutical sciences, and other courses, including general education courses (i.e., subjects outside pharmacy area).

When the contents of a course described in the syllabi could fit into more than one category, we classified that course in the more appropriate category based on the majority of the topics in the course description. The unit of course loads provided in the institution's website, such as credits/hours, credits, or hours, were extracted. Elective courses were not considered, but the number of credits/hours, credits, or hours required from elective courses were computed for the overall total. The accumulated load of credits/hours, credits, or hours dedicated to each subject area were calculated. Three of the four areas were considered patient-centered care: clinical sciences, social/behavioral/administrative sciences, and experiential.

The data were extracted by one researcher. To ensure the utility of the guidance for extraction and the internal validity of the study, a randomized sample of 25% of the selected educational institutions was extracted by a second researcher. The inter-rater agreement was estimated by calculating the Cohen's kappa coefficient.[157] Disagreements were analyzed by a third researcher to determine whether the guidance for data extraction needed to be refined.

For an overall comparison of the countries from these two regions with different course-credit systems, we created a scoring method. First, we calculated the mean percentages of credit/hours in each area among the schools in each country. For the three patient-centered care areas (clinical, social, and experiential), countries were ordered according to the mean percentages of credit/hours from highest to lowest, and each country was attributed a score that corresponded to its rank order in each of these three lists (18 points to the highest number credit/hours in each of the three categories). Conversely, countries were ordered lowest to highest (inverted order) according to their mean percentage of credit/hours from basic sciences, and the score attributed corresponded to this inverted order (18 points to the lowest number credit/hours in basic sciences). Thus, the maximum (i.e., the best) score possible was

72 points (18 points x 4 areas), and the minimum (i.e., the worst) score possible was 4 points (1 point x 4 areas).

To assess the interrater agreement regarding the validation of the extraction method, Cohen's kappa coefficients were used.[157] Kappa values from 0.61 to 0.80 were associated with "substantial agreement,: and kappa values over 0.80 were associated with "almost perfect agreement."[158] To test the assumptions of the normal distributions of the study data, Kolmogorov-Smirnov normality tests were performed. The data were analyzed using nonparametric methods; Mann-Whitney tests were used to compare the means of two independent populations. Finally, a model for predicting the geographical origin (i.e., United States or EHEA) of the schools was created using logistic regression on the percentages of the credits/hours of the three patient-centered care areas as covariates. For all of the analyses, a level of 5% was considered significant. The data were analyzed using SPSS, v20 (IBMachines Corp., Armonk, NY).

4.3. Results

Websites of the 364 schools of pharmacy that appeared in the FIP Official World List of Pharmacy Schools,[123] including 121 from the United States and 243 from the 41 EHEA countries, were considered for the study. Institutions were excluded if they lacked: a website in English, French, German, Italian, Portuguese, or Spanish (n=62), a complete curriculum for the activity in the academic year 2013-2014 available on the website (n=14), hours or credits per course (n=51), a syllabus of all of the courses available on the website (n=78), and internship (pharmacy practice experience) not integrated into the curriculum (n=11).

Of the 148 potential schools, 59 were randomly selected for the analysis (23 from the United States and 36 from the 17 EHEA countries, Table 4.2). In the validation phase, 25% of the 59 schools selected for the sample were independently analyzed by two authors (six from the EHEA countries and nine from the USA), which resulted in an interrater agreement with a Cohen kappa = 0.91. The kappa coefficient for the six EHEA schools of pharmacy was 0.94 and for the nine USA schools, 0.91; both of these values were considered almost perfect agreements.

Table 4.2 -Pharmacy Colleges in the United States and European Higher Education Area

	No. Pharmacy Schools			
Country	**Total[a]**	**Met Inclusion Criteria**	**No. Included**	**Pharmacy Colleges Included**
Armenia	2	0	0	
Austria	3	0	0	
Azerbaijan	1	0	0	
Belgium	6	3	3	- Catholic University of Louvain, Faculty of Pharmacy and Biomedical Sciences - Ghent University, Faculty of Pharmaceutical Sciences - University of Liege, Pharmacy Department
Bosnia and Herzegovina	1	0	0	
Bulgaria	1	1	1	- Medical University of Sofia, Faculty of Pharmacy
Croatia	1	0	0	
Cyprus	3	0	0	
Czech Republic	2	1	1	- Charles University, Faculty of Pharmacy
Denmark	1	0	0	
Estonia	1	1	1	- University of Tartu, Institute of Pharmacy
Finland	3	0	0	
France	24	2	2	- Université de Bordeaux, UFR des Sciences pharmaceutiques - Université de Strasbourg, Faculté de Pharmacie
Georgia	1	0	0	
Germany	22	0	0	
Greece	4	2	2	- Aristotle University of Thessaloniki, School of Pharmacy - University of Athens, School of Pharmacy
Hungary	4	2	2	- University of Pécs, Faculty of Pharmacy - University of Szeged, Faculty of Pharmacy
Iceland	1	1	1	- University of Iceland, Faculty of Pharmaceutical Sciences
Ireland	3	0	0	
Italy	29	16	4	- Università di Messina, Facoltà di Farmacia - Università di Milano, Facoltà di Farmacia - Università di Pisa, Facoltà di Farmacia - Università di Modena, Facoltà di Farmacia
Kazakhstan	1	0	0	
Latvia	2	0	0	
Lithuania	1	0	0	
Macedonia	2	2	2	- Ss. Cyril and Methodius University of Skopje, Faculty of Pharmacy - Goce Delcev University of Stip, Faculty of Medical Sciences
Malta	1	1	1	- University of Malta, Department of Pharmacy
Moldova	1	0	0	

Table 4.2 -Pharmacy Colleges in the United States and European Higher Education Area

	No. Pharmacy Schools			
Country	**Total[a]**	**Met Inclusion Criteria**	**No. Included**	**Pharmacy Colleges Included**
Netherlands	2	1	1	- University of Groningen, Department of Pharmacy
Norway	5	0	0	
Poland	10	0	0	
Portugal	9	6	4	- Universidade da Beira Interior, Faculdade de Ciências da Saúde
				- Universidade de Lisboa, Faculdade de Farmácia
				- Universidade do Porto, Faculdade de Farmácia
				- Universidade Lusófona de Humanidades e Tecnologias, Faculdade de Ciências e Tecnologias da Saúde
Romania	10	0	0	
Russian Federation	15	0	0	
Serbia (including Kosovo)	2	0	0	
Slovakia	1	0	0	
Slovenia	1	1	1	- University of Ljubljana, Faculty of Pharmacy
Spain	16	10	4	- Universidad Cardenal Herrera CEU, Facultad de Ciencias de la Salud
				- Universidad de Navarra, Facultad de Farmacia
				- Universidad de Valencia, Facultad de Farmacia
				- Universidad San Pablo CEU, Facultad de Farmacia
Sweden	3	0	0	
Switzerland	3	2	2	- Swiss Federal Institute of Technology in Zurich (ETH Zurich)
				- Université de Genève, Section des sciences pharmaceutiques
Turkey	13	5	4	- Ataturk University, Faculty of Pharmacy
				- Istanbul Kemerburgaz University, School of Pharmacy
				- Marmara University, Faculty of Pharmacy
				- University of Mersin, Faculty of Pharmacy
Ukraine	6	0	0	
United Kingdom	26	0	0	
United States	121	91	23	- Belmont University, College of Pharmacy
				- Chicago State University, College of Pharmacy
				- D'Youville College, School of Pharmacy
				- Florida Agricultural & Mechanical University, College of Pharmacy and Pharmaceutical Sciences
				- Hampton University, School of Pharmacy
				- Husson University, School of Pharmacy
				- Lipscomb University, College of Pharmacy
				- Midwestern University, Chicago College of Pharmacy
				- Northeastern University, Bouvé College of Health Sciences, School of Pharmacy
				- Nova Southeastern University, College of Pharmacy
				- Ohio Northern University, Raabe College of Pharmacy

Table 4.2 -Pharmacy Colleges in the United States and European Higher Education Area

	No. Pharmacy Schools			
Country	**Total[a]**	**Met Inclusion Criteria**	**No. Included**	**Pharmacy Colleges Included**
				- Philadelphia College of Osteopathic Medicine, School of Pharmacy (Georgia Campus) - St. John Fisher College, Wegmans School of Pharmacy - University of Cincinnati, James L. Winkle College of Pharmacy - University of Florida, College of Pharmacy - University of Hawaii at Hilo, Daniel K. Inouye College of Pharmacy - University of Iowa, College of Pharmacy - University of Maryland, School of Pharmacy - University of Missouri-Kansas City, School of Pharmacy - University of New Mexico, College of Pharmacy - University of North Texas Health Science Center, School of Health Professions - Virginia Commonwealth University, School of Pharmacy - Western New England University, College of Pharmacy
Total	364	148	59	

[a] According to data extracted from Official World List of Pharmacy Schools

Comparisons of the USA and EHEA revealed no difference in the percentages of credits/hours for elective courses (p=0.43; USA=7.1% SD=3.8; EHEA=6.4% SD=4.2). However, differences were identified in the percentages of credits/hours dedicated to each of the four subject area categories: social/behavioral/administrative pharmacy sciences (p=0.038, USA=7.8%, SD=2.6; EHEA=6.0%, SD=3.0), clinical sciences (p<0.001, USA=16.7%, SD=5.0; EHEA=4.1%, SD=3.2), experiential courses (p<0.001, USA=26.4%, SD=4.8; EHEA=17.9%, SD=7.0), and other/basic sciences *(*p<0.001; USA=49.0%, SD=5.0; EHEA=72.0%, SD=8.9).

The curriculum with the highest mean percentage of clinical sciences was that of the United States at 16.7% (SD=5.0) followed by Malta at 12.3% (SD=0). The clinical sciences courses were elective courses in the curricula of Slovenia (Figure 4.1). Iceland had the curriculum with the highest mean percentage content in social/behavioral/administrative pharmacy sciences at 10.7% (SD=0), and Greece had the curriculum with the lowest with only 1.5% (SD=2.2, Figure 4.2). Figure 4.3 shows that Malta exhibited the highest percentage of experiential courses at 37.4% (SD=0) and that Bulgaria exhibited the lowest percentage of 11.8% (SD=0). Greece, with 80.3% (SD=5.7), was the country with the highest percentage of basic sciences, such as basic biomedical and pharmaceutical sciences. Malta and the United States were the countries with the lowest mean percentages of basic sciences with 45.8% (SD=0) and 49.0% (SD=5.0), respectively (Figure 4.4).

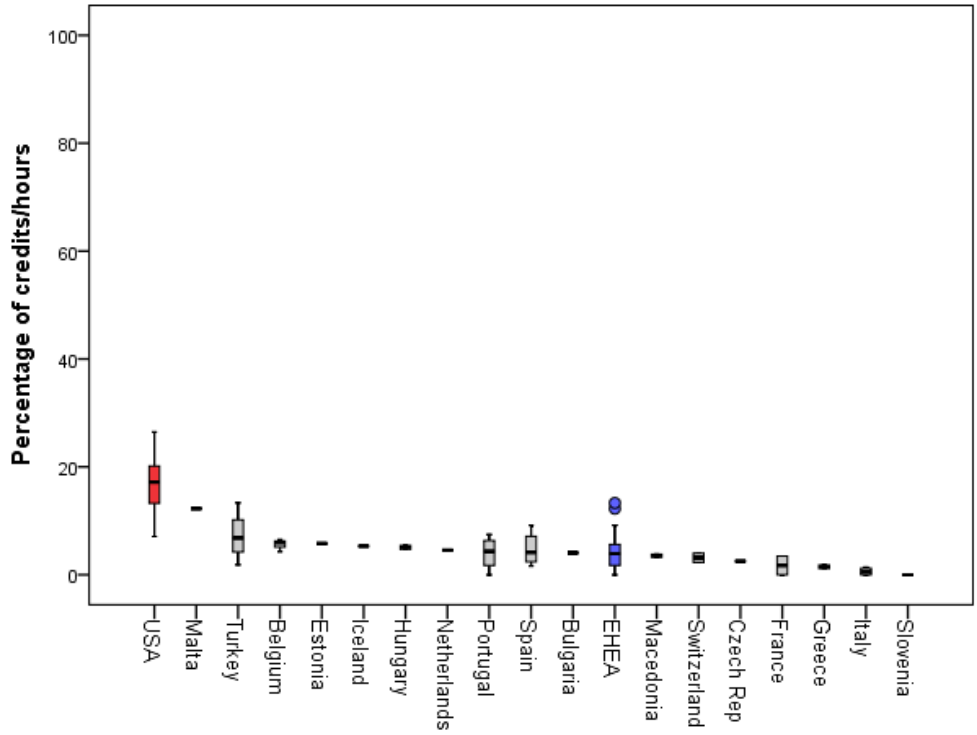

Figure 4.1 - Percentage of credits/hours for clinical sciences out of the total credit/hours of mandatory courses (box-plot: boxes represent the interquartile range (IQR); error lines represent +/- 1.5 times the IQR; circles represent outliers)

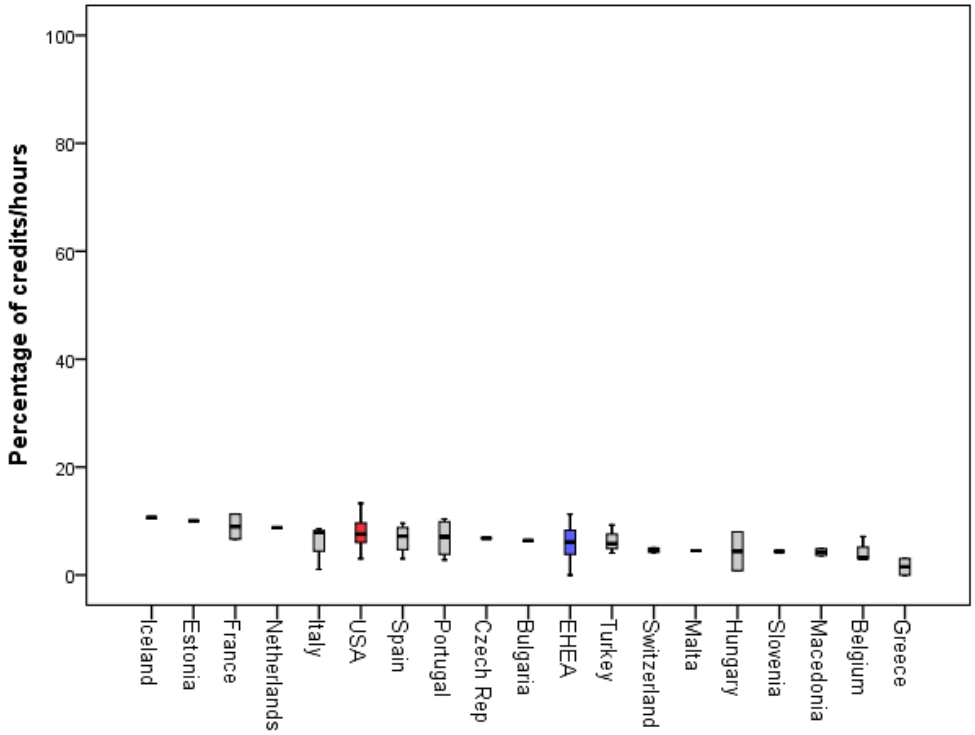

Figure 4.2 - Percentage of credits/hours for social/behavioral/administrative pharmacy sciences out of the total credit/hours of mandatory courses (box-plot: boxes represent the interquartile range (IQR); error lines represent +/- 1.5 times the IQR; circles represent outliers)

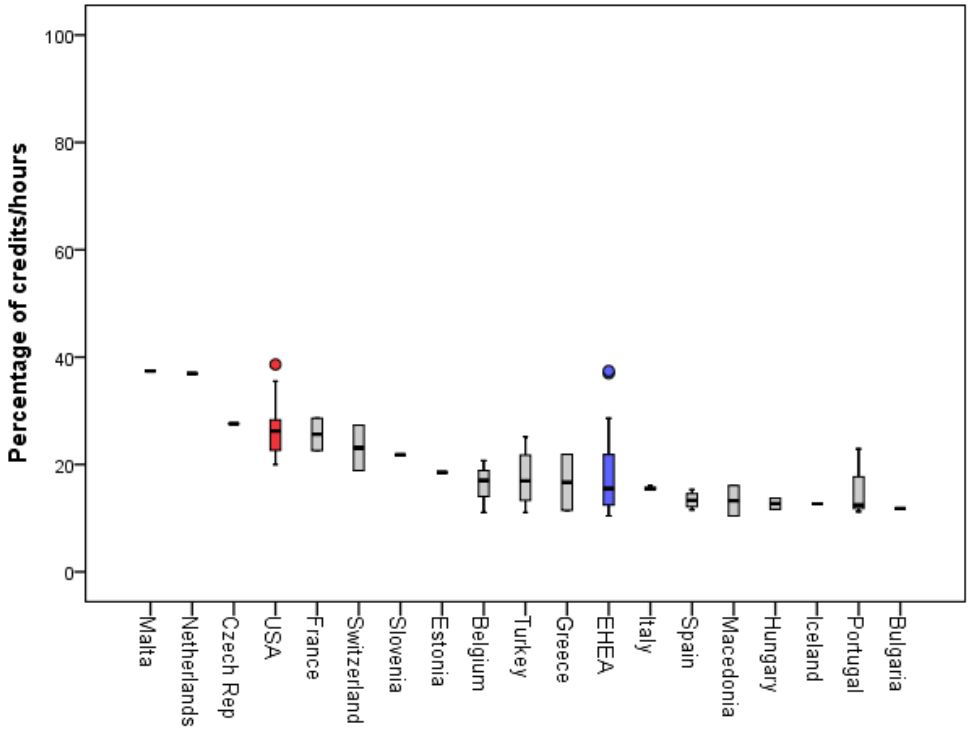

Figure 4.3 - Percentage of credits/hours for experiential courses out of the total credit/hours of mandatory courses (box-plot: boxes represent the interquartile range (IQR); error lines represent +/- 1.5 times the IQR; circles represent outliers).

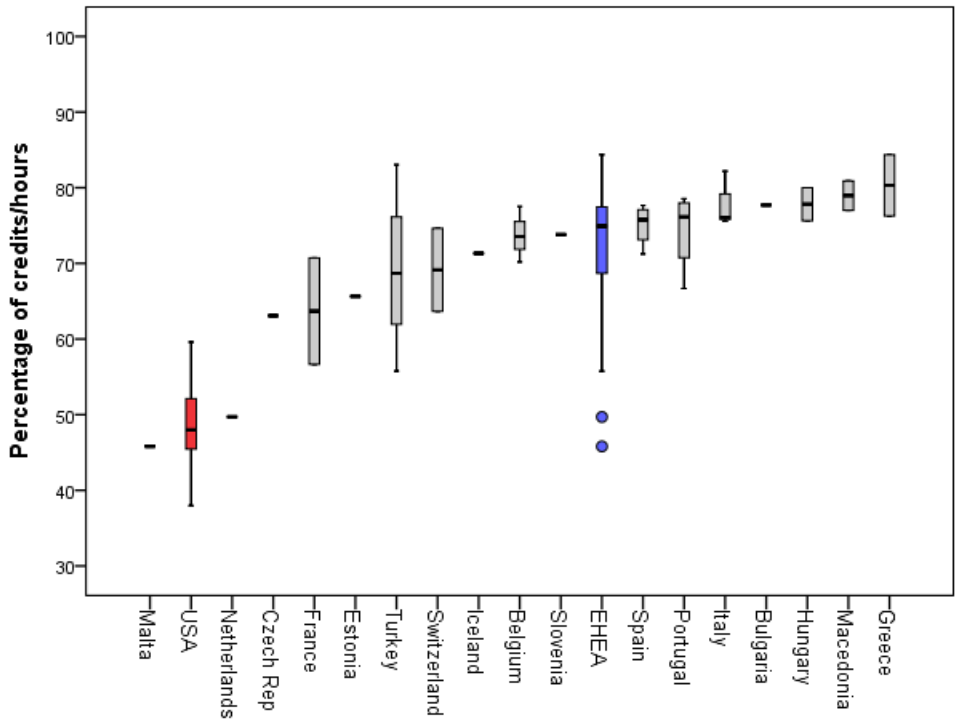

Figure 4.4 - Percentage of credits/hours for other course (basic biomedical sciences, basic pharmaceutical sciences and others) out of the total credit/hours of mandatory courses (box-plot: boxes represent the interquartile range (IQR); error lines represent +/- 1.5 times the IQR; circles represent outliers).

The United States had the curriculum with the best score of 63 of the 72 possible points followed by Malta and the Netherlands, which each had 59 points. The percentages of schools with patient-centered care foci were also calculated (Table 4.3).

Table 4.3 -Score of the Pharmacy Curriculum and Percentage of Patient-centered Courses in the Curriculum

Country	Score					% Patient-centered Courses
	Clinical Courses	Social Courses	Experiential Courses	Other Courses	Total	
United States	18	13	15	17	63	51.0
Malta	17	6	18	18	59	54.2
Netherlands	11	15	17	16	59	50.3
Estonia	14	17	11	13	55	34.4
France	4	16	14	14	48	36.3
Czech Republic	5	10	16	15	46	36.9
Turkey	16	8	9	12	45	29.5
Iceland	13	18	3	10	44	28.7
Switzerland	6	7	13	11	37	30.9
Belgium	15	2	10	9	36	26.2
Spain	9	12	6	7	34	24.6
Portugal	10	11	2	6	29	23.9
Italy	2	14	7	5	28	23.8
Slovenia	1	4	12	8	25	26.2
Hungary	12	5	4	3	24	22.2
Bulgaria	8	9	1	4	22	22.3
Macedonia	7	3	5	2	17	21.1
Greece	3	1	8	1	13	19.7

In multivariate analysis of the percentages of the three patient-focused areas, we created a model (Nagelkerke R squared=0.89) to predict the geographical origin of each school and found that only the percentage of clinical sciences was significant (p=0.010) with an OR=1.2 (95% IC =1.2 – 3.6) (Hosmer and Lemeshow test p= 0.99).

4.4. Discussion

In this study, we compared curricula by analyzing course content of syllabi as the information source. Syllabi content analysis enables the assessment of what topics are covered in each course. Therefore, this analysis enables course categorization and

curriculum comparisons.[159, 160] Because courses can have different names across countries, and to allow for comparisons of the curricula of different countries, courses were grouped into subject areas. Our study exhibited two strengths: (1) the creation of guidance for data extraction, which resulted in a high concordance as indicated by the high interrater agreement, and (2) the subject areas were based on known standards[37] that were created to define modern pharmacy curricula. Other studies have compared pharmacy curricula across EU member countries and grouped courses for pharmacy degrees into different subject areas (Table 4.4).[99, 100, 161] However, two limitations were present in these studies: the allocation of each course to a subject area seems to have been based on the course names and not on course content analysis and the subject areas were based on the traditional areas of education for pharmacists, more associated with basic sciences, that existed prior to the clinical movement.

According to the 1994 report of the Advisory Committee on Pharmaceutical Training, "chemical subjects" account for more required course hours in the range of 25%-46% across European countries. Physics/mathematics/computing/statistics (3%-13%) and social aspects of pharmacy/law (1%-16%) are subject area minimally focused on in European curricula. Prior to the implementation of the Bologna Declaration, undergraduate pharmacy programs varied significantly in length among European countries, and large differences in the distributions of the total numbers of hours of required courses by subject area were present.[99] In the 2011 PHARMINE report, "medical sciences" represented the main subject area in pharmacy education in the European Union (28%).[100, 161] However, this finding could be misleading because the "medical sciences" subject area included a mix of courses, such as human anatomy and physiology, pharmacology, parasitology, dispensing processes, prescription analysis, and pharmaceutical care. Based on the ACPE course categorization, some of these courses belonged to the clinical sciences, and others belonged to the biomedical/basic sciences (e.g., anatomy and physiology) or pharmaceutical sciences (e.g., pharmacology, Table 4.4). A recent article compared these two stages of European pharmacy curricula and reported a decrease in the number of hours related to the chemical sciences (from 33% to 26%) and an increase in the number of hours related to the medical sciences (from 19% to 28%). It seems that changes in European

curricula increased the load of clinical courses and that pharmacy education is in line with international recommendations.[101] However, our results revealed that the European curricula were still focused primarily on basic sciences.

Table 4.4 -Pharmacy Degree Courses Grouped in Subject Areas

Advisory Committee on Pharmaceutical Training[a]	2011 PHARMINE[b,c]	ACPE[d]	Classification used in this study
I. Chemistry General and inorganic chemistry Organic chemistry Analytical chemistry Pharmaceutical chemistry including analysis of medicinal products Medical physicochemistry Pharmacopeia analysis	I. Chemical sciences "CHEMSCI" General, organic & inorganic chemistry Analytical chemistry Pharmaceutical chemistry / Pharmacopeia analysis Medicinal physicochemistry / SAR / drug design	I. Biomedical sciences Anatomy and Physiology Pathology/Pathophysiology Microbiology Immunology Biochemistry/Biotechnology Molecular Biology/Genetics Biostatistics	I. Social/ behavioral/ administrative sciences Social/ behavioral/ administrative sciences listed in ACPE classification.
II. Physics/ Mathematics/ Computing/ Statistics Physics Mathematics / Computing Statistics	II. Physical and Mathematical Sciences "PHYSMATH" Physics Mathematics, pharmaceutical calculations Information technology, information technology applied to community pharmacy, information technology applied to national health-care Statistics Experimental design & analysis	II. Pharmaceutical sciences Medicinal chemistry Pharmacology Pharmacognosy and Alternative and complementary treatments Toxicology Bioanalysis / Clinical chemistry Pharmaceutics / Biopharmaceutics Pharmacokinetics / Clinical pharmacokinetics Pharmacogenomics / genetics Extemporaneous compounding / Parenteral / Enteral	II. Clinical sciences Clinical sciences listed in ACPE classification.
III. Biology/ Biochemistry/ Pharmacognosy Plant and animal biology General and applied biochemistry Microbiology Pharmacognosy Phytochemistry	III. Biological Sciences "BIOLSCI" Foundation biology Cell biology Botany Mycology Zoology Biochemistry Molecular biology Genetics	III. Social/ behavioral/ administrative sciences Health care delivery systems Economics / pharmacoeconomics Practice management Pharmacoepidemiology Pharmacy law and regulatory affairs History of pharmacy Ethics Professional communication Social and behavioral aspects of practice Informatics	III. Experiential courses Included pharmacy practice experiences, thesis project and courses that integrate in (real or simulated) clinical environment, knowledge related to social/behavioral/administrative and clinical sciences.
IV. Pharmacy/ Technology Pharmaceutical technology Finished medicinal products	IV. Pharmaceutical Technology "PHARMTECH" Galenic formulation / pharmaceutics Drug disposition and metabolism (ADME) / pharmacokinetics	IV. Clinical sciences Pharmacy practice and pharmacist-provided care	IV. Other courses Biomedical sciences and pharmaceutical

Table 4.4 -Pharmacy Degree Courses Grouped in Subject Areas

Advisory Committee on Pharmaceutical Training[a]	2011 PHARMINE[b,c]	ACPE[d]	Classification used in this study
	Novel drug delivery systems Drug design Pharmaceutical R&D Drug production Quality assurance in production Drug/new chemical entity registration and regularization Common technical document (quality (pharmaceutical), safety (safety pharmacology and toxicology) efficacy (preclinical and clinical studies)) Ophthalmic preparations Medical gases Cosmetics Management strategy in industry Economics of the pharmaceutical industry and R&D	Medication dispensing and distribution systems Pharmacotherapy Pharmacist-provided care for special populations Drug information Medication safety Literature evaluation and research design Patient assessment laboratory	sciences listed in ACPE classification. And other courses like general education.
V. Medicine/ Pharmacology/ Toxicology Anatomy, physiology, medical terminology Pharmacology / Pharmacotherapy Toxicology Pathology / Histology Nutrition Haematology / Immunology Parasitology Hygienics Emergency therapy	V. Medicinal and therapeutical sciences “MEDISCI” Human anatomy & physiology Medical terminology Pharmacology Pharmacognosy Pharmacotherapy / Therapeutics Toxicology Pathology, histology Microbiology Nutrition, non-pharmacological treatment Hematology Immunology Parasitology Hygiene Emergency therapy Clinical chemistry / bioanalysis (of body fluids) Radiochemistry Dispensing process, drug prescription, prescription analysis (detection of adverse effects and drug interactions) Generic drugs Planning, running and interpretation of the data of clinical trials Medical devices,	V. Pharmacy practice experiences Introductory pharmacy practice experiences (IPPE) Advanced Pharmacy Practice Experiences (APPE)	

Table 4.4 -Pharmacy Degree Courses Grouped in Subject Areas

Advisory Committee on Pharmaceutical Training[a]	2011 PHARMINE[b,c]	ACPE[d]	Classification used in this study
	Orthopedics		
	OTC medicines, complementary therapy		
	At-home support and care		
	Skin illness and treatment		
	Homeopathy		
	Phytotherapy		
	Drugs in veterinary medicine		
	Pharmaceutical care, pharmaceutical therapy of illness and disease		
VI. Law/ Social aspects of pharmacy	VI. Law and social sciences "LAWSOC"		
Legislation / professional ethics	Legislation, law relating to pharmacy		
Philosophy	Social sciences		
Economics	Forensic science		
Management	Professional ethics		
History of pharmacy	Philosophy		
Public health	Economics, financial affairs, book keeping, economic planning and management		
	Public health/health promotion		
	Quality management		
	Epidemiology of drug use (pharmacoepidemiology)		
	Economics of drug use (pharmacoeconomics)		
	History of pharmacy		
	VII. Generic competences "GENERIC"		
	General knowledge		
	Academic literacy		
	Languages		
	First aid		
	Communication		
	Management		
	Practical skills		

[a] EC Advisory Committee on Pharmaceutical Training. Report and recommendations on pharmaceutical education undergone at higher-education institutions. (XV/E/8341/5/93-EN), (1994).

[b] Atkinson J, Rombaut B. The 2011 PHARMINE report on pharmacy and pharmacy education in the European Union. *Pharm Pract (Granada)*. 2011 Oct;9(4):169-187.

[c] The PHARMINE WP7 survey. http://www.pharmine.org/wp-content/uploads/2014/05/PHARMINE-WP7-survey-of-European-HEIs-0309.pdf. Accessed June 3, 2016.

[d] Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. Version 2.0. Effective February 14, 2011. https://www.acpe-accredit.org/pdf/S2007Guidelines2.0_ChangesIdentifiedInRed.pdf. Accessed November 3, 2014.

Comparison of the USA and EHEA curricula revealed significant differences in all four of the subject areas. In a bivariate analysis, the loads of the three patient-centered care areas were found to be significantly higher in the United States than in the EHEA, while the other/basic sciences were significantly more predominant in the EHEA countries. This resulted in the United States having the highest score of 63 points (out of 72) followed by two countries that had 59 points each (Malta and the Netherlands). In a multivariate analysis, the significant difference appeared to be associated with the higher clinical sciences course load in the United States.

Our results are in line with those of Kostriba et al, who reported a reduced focus on social pharmacy courses in Europe compared with North America. Twenty-six percent of European curricula and 6% of USA and Canadian schools lacked pharmacy management courses, and 47% of European schools lacked an education and research methods course.[162] The focus on clinical aspects in the United States is also confirmed by studies that compare USA curricula to those of New Zealand and China.[163, 164]

The FIP and WHO are attempting to improve the quality of pharmacy curricula via competency-based education.[15, 165-167] Although the definition of a competency framework is important, it may not be sufficient. To achieve the new required professional competencies, disciplines and course contents have to be adapted to patient-centered care practice.[37] Some authors support the revisions of European pharmacy curricula that followed the Bologna Declaration because these revisions intended to emphasize clinical skills to prepare pharmacists to practice effectively in a changing paradigm.[94, 97, 168, 169] Our study demonstrated that there is room to refocus curricula toward more patient-centered practices. To achieve this goal, the limited clinical sciences load must be addressed. Following international recommendations, a reduction in the basic sciences courses load, associated with an increase in clinical sciences courses could be a potential solution to refocus European pharmacy curricula.[58, 101]

In these sense, in order to evaluate the potential increase in clinical sciences courses over the basic sciences courses in European pharmacy curricula, we estimated the value of ECTS per area of the curriculum for European countries and USA (Table 4.5)

and, compared the differences in number of estimated ECTS and the differences in number of courses per area of the curriculum between European countries and USA (Table 4.6).

The representative countries of Europe were selected from Table 4.3 according to the percentage of patient-centered courses in the curriculum, with Malta being the country with the highest percentage and Greece the country with the lowest percentage value.

Table 4.5 shows the mean percentage of each area of the curriculum in USA and European countries and, the ECTS that were estimated from these percentages over the 300 ECTS defined by Bologna for European pharmacy curriculum.[20, 39] Malta was the country with the highest cumulative percentage of patient-centered courses (clinical, social and experimental), mainly boosted by experimental courses, followed by USA, Spain and Greece, respectively. However, with the exception of experimental courses, USA was the country where the highest percentages of patient-centered courses were verified. Spain and Greece were the countries where the lowest percentages in patient-centered courses and the highest percentage in other courses were found.

Table 4.6 analyzes the difference in the number of ECTS per area between each European country and USA and, the difference between these number of ECTS over the value of 6 ECTS, defined as the mean value of ECTS for course in the European countries. The only positive ratio value in patient-centered courses was found in experimental courses in Malta, which meets the results founded in Table 4.5, and means that Malta has more 5.5 courses in experiential courses when compared to the same category in USA. All other ratios in patient-centered courses were negatives indicating a superior number of courses in patient-centered courses in USA. The more obvious cases are observed in Greece in clinical courses (ratio value -7.6) and, in Spain in clinical courses (ratio value -6) and in experimental courses (ratio value -6.5). This means that Greece curriculum had less 7.6 clinical courses than USA curriculum and, Spain had less 6 clinical courses and less 6.5 experimental courses than USA

curriculum. It was also observed that in Spain and in Greece the other courses area had 13 and 15.6 more courses, respectively, when compared with USA reality.

Table 4.5- Mean percentage of course load and estimated ECTS per area of the pharmacy curricula in USA, Malta, Spain and Greece

Country	Clinical Courses		Social Courses		Experiential Courses		Other Courses	
	%	ECTS	%	ECTS	%	ECTS	%	ECTS
USA	16.7	50.1	7.8	23.4	26.4	79.2	49.1	147.3
Malta	12.3	36.9	4.5	13.5	37.4	112.2	45.8	137.4
Spain	4.7	14.1	6.8	20.4	13.4	40.2	75.1	225.3
Greece	1.5	4.5	1.5	4.5	16.7	50.1	80.3	240.9

Table 4.6 - Difference (Dif.) in the number of ECTS and number of courses ratio per area between European countries (Malta, Spain and Greece) and USA

	Malta		Spain		Greece	
	Dif. ECTS	Dif. courses	Dif. ECTS	Dif. courses	Dif. ECTS	Dif. courses
Clinical Courses	-13.2	-2.2	-36	-6	-45.6	-7.6
Social Courses	-9.9	-1.7	-3	-0.5	-18.9	-3.2
Experiential Courses	+33	+5.5	-39	-6.5	-29.1	-4.9
Other Courses	-9.9	-1.7	+78	+13	+93.6	+15.6

One potential limitation of our study is that we excluded 62 (of the 243) EHEA schools of pharmacy because their websites were not a language spoken by the authors. However, these schools might have been excluded for other reasons, i.e., not providing a complete syllabus. Additionally, as professionals' mobility is only ensured across EU countries, after excluding criteria our study covered schools from 13 of the 23 EU members, but covering a population of more than 72% of the roughly 353 million people in EU elective countries.[128] In our study, we excluded elective courses because we intended to establish the profiles of any graduated pharmacist regardless of the elective courses studied. We also underestimated the differences between the United States and EHEA countries regarding the experiential courses because we considered

only countries that included internship periods in the university curriculum. Countries such as the United Kingdom, Ireland, and Austria were excluded because they have the European mandatory 6-month practical training[20] outside of university supervision.

4.5. Conclusion

Despite curriculum revisions that have been completed in EHEA countries following the Bologna Declaration, European pharmacy education has a higher basic science course load and a lower patient-care centered course load than USA pharmacy curricula. Although differences also exist in the social/administrative sciences and experiential courses, the main differences between the USA and EHEA curricula involve the clinical sciences (16.7% in USA vs 4.1% in EHEA) and the basic sciences (49.0% in USA vs 72.0% in EHEA). The use of different subject group categories may have led to erroneous interpretations of the EHEA curriculum revision. European countries should consider revisiting their curricula if they want to meet WHO and FIP recommendations.[52, 55, 58]

5. MISUSE OF COMPETENCIES IN PHARMACY CURRICULUM: THE SPAIN CASE STUDY

5.1. Introduction

Competency-based education is increasingly common among health professionals.[64, 65] The development of competency frameworks for pharmacy education and practice has emerged worldwide, and they have been used especially in the design, development, and revision of pharmacy curricula.[170] During their education and training, pharmacy students must achieve the necessary competencies that allow them to respond to patient and population health-related needs.[62] A competency-oriented curriculum must align the competencies to be achieved with teaching-learning methodologies, educational practices, different contexts and learning settings, assessment methods, and research activities.[65] Pharmacy curricula should also follow this principle.[171]

The International Pharmaceutical Federation (FIP), in partnership with the World Health Organization (WHO) and UNESCO, created the global competency framework with the aim of supporting the educational development of pharmacy practitioners.[7] In Europe, a competency framework for pharmacy education and training has also been developed to be used as a quality assurance system.[66, 67] Australia,[11] Brazil,[68, 69] Canada,[70] Ireland,[71] New Zealand,[72] Portugal,[73] Singapore,[74] Spain,[75] Thailand,[76] the United Kingdom,[77] and the United States[78] are examples of countries that have also established their own competency frameworks.

After signing the Bologna Declaration in 1999, which established the harmonized European Higher Education Area (EHEA), Spain created its own pharmacy education competency framework. The CIN/2137/2008 Ministerial order established the duration of the pharmacy degree, the requirements of the curriculum, and the competencies that qualify pharmacists for the practice of the profession.[75] The curriculum has a duration of 300 European credits (ECTS: European Credit Transfer and Accumulation System), and the students must acquire at least 15 general competencies (Table 5.1) and 67 specific competencies divided by 7 areas of knowledge. A total of 210 ECTS are assigned to the first six areas of knowledge, which correspond to the following: chemistry (54 ECTS); physics and mathematics (12 ECTS); Biology (42 ECTS); pharmaceutical technology (24 ECTS); medicine and pharmacology (66 ECTS); and

legislation and social pharmacy (12 ECTS). The seventh area of knowledge corresponds to the supervised internship and to the final dissertation, with 30 ECTS assigned.[75] The inclusion of elective courses in the curriculum is also possible, which can provide students with other competencies beyond those mentioned in the CIN/2137/2008 Ministerial order.

Table 5.1 - General Competencies Described in the CIN/2137/2008 Ministerial Order

Competency Number	Description
GC 1	Identify, design, collect, analyze, control and produce drugs and medicines, and other products and raw materials of medical interest for human or veterinary use.
GC 2	Evaluate therapeutic and toxic effects of pharmacologically active substances.
GC 3	Learn to apply the scientific method and acquire skills in handling legislation, sources of information, literature, protocol development and other aspects that are necessary considered for the design and critical assessment of preclinical and clinical trials.
GC 4	Design, prepare, deliver and dispense medicines and other health products of interest.
GC 5	Provide therapeutic counseling in pharmacotherapy and diet therapy, as well as in the nutritional and food field in the establishments in which they provide services.
GC 6	Promote the rational use of medicines and health products, as well as acquire basic knowledge in clinical management, health economics and efficient use of health resources.
GC 7	Identify, evaluate and assess drug-related problems, as well as participate in pharmacovigilance activities.
GC 8	Carry out clinical and social pharmacy activities, following the pharmaceutical care cycle.
GC 9	Engage in health promotion activities, disease prevention, at the individual, family and community level; with an integral and multi-professional vision of the health-disease process.
GC 10	Design, apply and evaluate reagents, methods and clinical analytical techniques, knowing the basics fundamentals of clinical analysis and the characteristics and contents of laboratory diagnosis reports.
GC 11	Evaluate the toxicological effects of substances and design and apply the corresponding tests and analyzes.
GC 12	Develop hygienic-sanitary analysis, especially those related to food and the environment.
GC 13	Develop communication and information skills, both oral and written, to deal with patients and users of the center where they perform their professional activity. Promote the capacities of work and collaboration in multidisciplinary teams and those related to other health professionals.
GC 14	Know the ethical and deontological principles according to the legislative, regulatory and administrative dispositions that govern the professional practice, understanding the ethical implications of the health in a social context in transformation.
GC 15	Recognize one's own limitations and the need to maintain and update professional competence, paying special attention to the self-learning of new knowledge based on the available scientific evidence.

Abbreviation: GC = General Competencies

Using Spain and the CIN/2137/2008 Ministerial order as a case study, this study aims to analyze the quality of the competency allocation (i.e., general and specific) to courses in the pharmacy curricula of Spanish universities.

5.2. Methods

A list of colleges of pharmacy in Spain was extracted from the website of the Spanish Pharmacist Association [*Consejo General de Colegios Oficiales de Farmacéuticos*].[172] Each Spanish college of pharmacy website was analyzed to obtain the following information: location; public or private condition; the curricular plan for the academic year 2016/2017 (i.e., the list of all courses, distribution by degree year and ECTS attributed); and a list of the CIN/2137/2008 competencies assigned to each course of the curriculum. Additionally, for each college of pharmacy, the following information about all curriculum courses was collected: the course name; its distribution throughout the degree; whether the course is mandatory or elective; whether the course is related to the internship and final dissertation; the number of ECTS attributed; and the presence of the course syllabus on the college website. Courses without online syllabi, elective courses, and courses that specifically focus on the internship period or final dissertation were excluded.

All courses were analyzed in accordance with the competencies defined by the CIN/2137/2008 Ministerial order: 15 general competencies and 67 specific competencies grouped into the 7 areas of knowledge (chemistry; physics and mathematics; biology; pharmaceutical technology; medicine and pharmacology; legislation and social pharmacy; internship and final dissertation). A database was created, including each course and the general and specific competencies that were paired in the course syllabus. To objectively identify into which of the 7 areas each course should be classified, the proportion of the specific competencies of each the seven areas assigned to that course was calculated. The course was allocated to the area with the highest percentage of specific competencies assigned. In the case of a tie between two areas, the main area of knowledge was classified as non-specific.

For all analyses, a level of 5% or lower was considered significant. Data were analyzed with non-parametric tests using the SPSS version 20 (IBM, Armonk, NY).

5.3. Results

In Spain, 22 universities offer the pharmacy degree required to practice (*Grado en Farmacia*), of which 13 are public and 9 are private institutions. In these 22 pharmacy degrees, 1261 courses are offered, of which 74.7% correspond to mandatory courses (n= 942). The distribution of courses per institution is presented in Table 5.2. The percentage of mandatory courses differs from 79.4% in private universities to 71.3% in public institutions (p=0.001).

Table 5.2 -Distribution of Courses per University (n=1261)

Universities	Mandatory Courses (%)	Elective Courses (%)	Total Number of Courses Offered
University of Pais Vasco (UPV)	74.5 (n=35)	25.5 (n=12)	47
University of Alcala de Henares (UAH)	61.5 (n=32)	38.5 (n=20)	52
University of Barcelona (UB)	53.7 (n=44)	46.3 (n=38)	82
University of Santiago de Compostela (USC)	71.9 (n=46)	28.1 (n=18)	64
University of Granada (UGR)	69.5 (n=41)	30.5 (n=18)	59
University of Salamanca (USAL)	65.1 (n=41)	34.9 (n=22)	63
University Complutense Madrid (UCM)	62.3 (n=38)	37.7 (n=23)	61
University Alfonso X El Sabio (UAX)	73.2 (n=41)	26.8 (n=15)	56
University of Navarra (UN)	70.0 (n=49)	30.0 (n=21)	70
University of La Laguna (ULL)	86 (n=37)	14 (n=6)	43
University Francisco de Vitoria (UFV)	83.6 (n=46)	16.4 (n=9)	55
University Cardenal Herrera CEU (UCH)	92.3 (n=48)	7.7 (n=4)	52
University of Sevilla (US)	73.2 (n=41)	26.8 (n=15)	56
University San Pablo CEU (USP)	67.6 (n=48)	32.4 (n=23)	71
University Miguel Hernández (UMH)	88.9 (n=48)	11.1 (n=6)	54
University of Valencia (UV)	70.9 (n=39)	29.1 (n=16)	55
University San Jorge (USJ)	83.3 (n=45)	16.7 (n=9)	54
University of Murcia (UM)	76.7 (n=33)	23.3 (n=10)	43
University Europea de Madrid (UEM)	91.1 (n=51)	8.9 (n=5)	56
University of Castilla-La Mancha (UCLM)	89.6 (n=43)	10.4 (n=5)	48
University Católica de Murcia (UCAM)	91.8 (n=45)	8.2 (n=4)	49
University Ramán Llul (URL)	71.8 (n=51)	28.2 (n=20)	71

All 22 institutions present on their website the curricular plan as a list of courses and their distribution throughout the degree, as well as the number of corresponding ECTS. The course syllabus is available on the website for 95.5% of the courses (n=1204). Eleven universities (50%) have all syllabi available on the website. Of note are the URL, UAX and UCAM, with only 73.2%, 82.1% and 83.7% of the course syllabi available on the website, respectively. From the 942 mandatory courses, 47 correspond to the internship period outside the university or to the final dissertation, and the other 14 do not have the syllabus available at the website. Thus, a total of 881 courses were analyzed: 394 (44.7%) from private universities and 487 (55.3%) from public universities.

Only 507 (57.5%) courses were paired to a CIN/2137/2008 general competency. In five universities, all courses were paired to a general competency, while two universities had no courses paired to general competencies. Table 5.3 shows the distribution per university of general competencies assigned to courses. Very different allocation patterns are observed, ranging from universities assigning a median of 1 general competency per course to two universities assigning 15 (out of 15) competencies per course. Table 5.4 shows the number of courses assigned to each of the 15 general competencies per university. Overall, general competencies were unevenly allocated to courses, ranging from 32.6% of the courses allocated to competency #15 (self-learning), to only 11.7% of courses allocated to competency #8 (clinical and social pharmacy activities).

Table 5.3 -Distribution of General Competencies (GC) per University

	Courses w/o GC	Courses w/ GC (%)	Number of GC assigned per course			
			Mean	SD	Median	IQR (25 : 75)
UPV	25	8 (24.2%)	2,88	2,03	2	2 : 4.25
UAH	23	7 (23.3%)	4	2	4	2 : 5
UB	8	34 (81.0%)	2,74	1,19	2	1 : 4
USC	21	23 (52.3%)	3,61	2,11	3	2 : 5
UGR	3	35 (92.1%)	4,54	2,42	4	3 : 7
USAL	35	3 (7.9%)	2,67	0,58	3	3 : 3
UCM	1	35 (97.2%)	12,46	4,78	15	15 : 15
UAX	35	4 (10.3%)	5,25	6,55	2,5	1.25 : 12

Table 5.3 -Distribution of General Competencies (GC) per University

	Courses w/o GC	Courses w/ GC (%)	Number of GC assigned per course			
			Mean	SD	Median	IQR (25 : 75)
UN	11	35 (76.1%)	2,37	1,4	2	1 : 3
ULL	0	35 (100%)	3,2	1,64	3	2 : 4
UFV	0	44 (100%)	3,75	2,65	3	2 : 6
UCH	28	18 (39.1%)	3,39	2,45	3,5	1 : 5
US	31	8 (20.5%)	3,63	2,33	2,5	2 : 6
USP	46	0 (0.0%)	-	-	-	-
UMH	43	0 (0.0%)	-	-	-	-
UV	15	22 (59.5%)	2,36	1,97	1,5	1 : 4
USJ	0	43 (100%)	2,19	1,22	2	1 : 3
UM	0	31 (100%)	7,1	4,18	6	3 : 12
UEM	40	3 (7.0%)	1	0	1	1 : 1
UCLM	1	40 (97.6%)	12,78	3,72	15	10 : 15
UCAM	8	31 (79.5%)	5,23	4,21	4	2 : 6
URL	0	48 (100%)	2,69	1,55	2	2 : 3
Total	374	507				

Table 5.4 - Number of Courses (%) per University that Assigned General Competencies (GC)

Univ.	Num. of courses	GC 1	GC 2	GC 3	GC 4	GC 5	GC 6	GC 7	GC 8	GC 9	GC 10	GC 11	GC 12	GC 13	GC 14	GC 15
UPV	33	1 (3,0)	-	1 (3,0)	-	2 (6,1)	-	-	-	1 (3,0)	1 (3,0)	-	2 (6,1)	8 (24,2)	1 (3,0)	6 (18,2)
UAH	30	2 (6,7)	1 (3,3)	6 (20,0)	-	-	2 (6,7)	2 (6,7)	-	3 (10,0)	1 (3,3)	-	1 (3,3)	6 (20,0)	1 (3,3)	3 (10,0)
UB	42	12 (28,6)	6 (14,3)	13 (31,0)	4 (9,5)	4 (9,5)	5 (11,9)	4 (9,5)	1 (2,4)	8 (19,0)	4 (9,5)	2 (4,8)	3 (7,1)	8 (19,0)	1 (2,4)	18 (42,9)
USC	44	8 (18,2)	2 (4,5)	9 (20,5)	3 (6,8)	1 (2,3)	3 (6,8)	2 (4,5)	2 (4,5)	8 (18,2)	7 (15,9)	3 (6,8)	4 (9,1)	16 (36,4)	1 (2,3)	14 (31,8)
UGR	38	16 (42,1)	8 (21,1)	15 (39,5)	7 (18,4)	8 (21,1)	12 (31,6)	11 (28,9)	5 (13,2)	15 (39,5)	11 (28,9)	1 (2,6)	5 (13,2)	19 (50,0)	2 (5,3)	24 (63,2)
USAL	38	1 (2,6)	-	1 (2,6)	1 (2,6)	1 (2,6)	-	-	-	1 (2,6)	-	-	-	1 (2,6)	-	2 (5,3)
UCM	36	30 (83,3)	27 (75,0)	30 (83,3)	30 (83,3)	28 (77,8)	28 (77,8)	28 (77,8)	27 (75,0)	28 (77,8)	27 (75,0)	27 (75,0)	28 (77,8)	32 (88,9)	31 (86,1)	35 (97,2)
UAX	39	2 (5,1)	1 (2,6)	4 (10,3)	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)	1 (2,6)	1 (2,6)	1 (2,6)	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)	1 (2,6)
UN	46	16 (34,8)	7 (15,2)	5 (10,9)	10 (21,7)	5 (10,9)	3 (6,5)	3 (6,5)	2 (4,3)	5 (10,9)	7 (15,2)	1 (2,2)	2 (4,3)	5 (10,9)	4 (8,7)	8 (17,4)
ULL	35	10 (28,6)	6 (17,1)	14 (40,0)	8 (22,9)	5 (14,3)	5 (14,3)	5 (14,3)	1 (2,9)	7 (20,0)	9 (25,7)	1 (2,9)	7 (20,0)	19 (54,3)	1 (2,9)	14 (40,0)
UFV	44	14 (31,8)	6 (13,6)	15 (34,1)	8 (18,2)	6 (13,6)	11 (25,0)	11 (25,0)	4 (9,1)	15 (34,1)	13 (29,5)	1 (2,3)	3 (6,8)	21 (47,7)	4 (9,1)	33 (75,0)
UCH	46	5 (10,9)	3 (6,5)	7 (15,2)	5 (10,9)	2 (4,3)	3 (6,5)	3 (6,5)	2 (4,3)	8 (17,4)	5 (10,9)	-	1 (2,2)	5 (10,9)	1 (2,2)	11 (23,9)
US	39	2 (5,1)	1 (2,6)	2 (5,1)	2 (5,1)	-	2 (5,1)	1 (2,6)	1 (2,6)	1 (2,6)	-	2 (5,1)	1 (2,6)	6 (15,4)	3 (7,7)	5 (12,8)
USP	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UMH	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UV	37	2 (5,4)	2 (5,4)	9 (24,3)	1 (2,7)	1 (2,7)	4 (10,8)	1 (2,7)	2 (5,4)	4 (10,8)	2 (5,4)	-	3 (8,1)	8 (21,6)	1 (2,7)	12 (32,4)
USJ	43	8 (18,6)	6 (14,0)	10 (23,3)	2 (4,7)	4 (9,3)	7 (16,3)	11 (25,6)	4 (9,3)	8 (18,6)	6 (14,0)	2 (4,7)	2 (4,7)	9 (20,9)	2 (4,7)	13 (30,2)
UM	31	15 (48,4)	12 (38,7)	23 (74,2)	12 (38,7)	18 (58,1)	16 (51,6)	16 (51,6)	10 (32,3)	17 (54,8)	20 (64,5)	11 (35,5)	5 (16,1)	18 (58,1)	11 (35,5)	16 (51,6)
UEM	43	-	-	-	-	-	-	-	1 (2,3)	-	-	1 (2,3)	-	-	-	1 (2,3)
UCLM	41	36 (87,8)	30 (73,2)	38 (92,7)	34 (82,9)	32 (78,0)	33 (80,5)	36 (87,8)	30 (73,2)	30 (73,2)	36 (87,8)	33 (80,5)	36 (87,8)	38 (92,7)	30 (73,2)	39 (95,1)
UCAM	39	16 (41,0)	9 (23,1)	8 (20,5)	8 (20,5)	6 (15,4)	7 (17,9)	7 (17,9)	8 (20,5)	10 (25,6)	10 (25,6)	10 (25,6)	6 (15,4)	20 (51,3)	8 (20,5)	29 (74,4)
URL	48	21 (43,8)	10 (20,8)	33 (68,8)	7 (14,6)	4 (8,3)	5 (10,4)	6 (12,5)	2 (4,2)	7 (14,6)	7 (14,6)	5 (10,4)	4 (8,3)	8 (16,7)	7 (14,6)	3 (6,3)
Total	881	217 (24,6)	137 (15,6)	243 (27,6)	143 (16,2)	128 (14,5)	148 (16,8)	148 (16,8)	103 (11,7)	177 (20,1)	167 (19,0)	101 (11,5)	114 (12,9)	249 (28,3)	110 (12,5)	287 (32,6)

Table 5.4 to Table 5.11 shows the number of courses per university that assigned specific competencies presented by the 7 areas of knowledge stated in the CIN/2137/2008 Ministerial order. The pairing of specific competencies greatly varies from university to university. Some universities assign the same specific competency to several different courses (e.g., the ULL assigns SC1 to 10 courses) while others assign that competency to only 1 course (e.g., the UV attributes SC1 to 1 course). Other universities with general competencies assigned to each course do not have specific competencies assigned (e.g., UB). Interestingly, although we have excluded from the analysis the courses associated with the internship and the final dissertation, some mandatory courses of several universities allocate specific competencies to the internship and the final dissertation area.

Of the 881 courses, 560 (63.6%) could be objectively associated with one of the 7 areas of knowledge considered in the CIN/2137/2008 Ministerial order, with only 16 (1.8%) classified as non-specific (because of a tie). The distribution of these 560 courses per areas of knowledge resulted in 133 (23.8%) in chemistry, 38 (6.8%) in physics and mathematics, 92 (16.4%) in biology, 73 (13.0%) in pharmaceutical technology, 166 (29.6%) in medicine and pharmacology, 57 (10.2%) in legislation and social pharmacy, and 1 course (0.2%) in the internship (not provided during the internship period).

Table 5.5 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Chemistry Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Chemistry Knowledge Area										
		SC 1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8	SC 9	SC 10	SC 11
UPV	33	1 (3,0)	2 (6,1)	1 (3,0)	-	-	1 (3,0)	-	-	1 (3,0)	1 (3,0)	1 (3,0)
UAH	30	2 (6,7)	2 (6,7)	5 (16,7)	4 (13,3)	1 (3,3)	1 (3,3)	3 (10,0)	3 (10,0)	2 (6,7)	1 (3,3)	2 (6,7)
UB	42	-	-	-	-	-	-	-	-	-	-	-
USC	44	3 (6,8)	5 (11,4)	5 (11,4)	6 (13,6)	4 (9,1)	3 (6,8)	4 (9,1)	3 (6,8)	3 (6,8)	2 (4,5)	3 (6,8)
UGR	38	7 (18,4)	3 (7,9)	8 (21,1)	8 (21,1)	9 (23,7)	4 (10,5)	4 (10,5)	3 (7,9)	6 (15,8)	2 (5,3)	5 (13,2)
USAL	38	-	-	1 (2,6)	1 (2,6)	-	1 (2,6)	1 (2,6)	1 (2,6)	-	-	-
UCM	36	7 (19,4)	4 (11,1)	8 (22,2)	8 (22,2)	1 (2,8)	3 (8,3)	2 (5,6)	2 (5,6)	2 (5,6)	2 (5,6)	4 (11,1)
UAX	39	1 (2,6)	3 (7,7)	6 (15,4)	6 (15,4)	1 (2,6)	3 (7,7)	1 (2,6)	2 (5,1)	2 (5,1)	3 (7,7)	3 (7,7)
UN	46	7 (15,2)	3 (6,5)	4 (8,7)	4 (8,7)	4 (8,7)	3 (6,5)	3 (6,5)	4 (8,7)	5 (10,9)	1 (2,2)	2 (4,3)
ULL	35	10 (28,6)	7 (20,0)	9 (25,7)	7 (20,0)	6 (17,1)	5 (14,3)	5 (14,3)	5 (14,3)	4 (11,4)	5 (14,3)	2 (5,7)
UFV	44	4 (9,1)	4 (9,1)	7 (15,9)	6 (13,6)	4 (9,1)	3 (6,8)	2 (4,5)	3 (6,8)	4 (9,1)	2 (4,5)	3 (6,8)
UCH	46	-	-	1 (2,2)	-	1 (2,2)	2 (4,3)	3 (6,5)	-	-	-	-
US	39	2 (5,1)	2 (5,1)	2 (5,1)	2 (5,1)	1 (2,6)	1 (2,6)	-	1 (2,6)	1 (2,6)	-	1 (2,6)
USP	46	-	2 (4,3)	-	1 (2,2)	1 (2,2)	-	-	-	-	2 (4,3)	-
UMH	43	-	-	-	-	-	-	-	-	-	-	-
UV	37	1 (2,7)	2 (5,4)	1 (2,7)	3 (8,1)	2 (5,4)	2 (5,4)	2 (5,4)	-	1 (2,7)	1 (2,7)	1 (2,7)
USJ	43	5 (11,6)	5 (11,6)	9 (20,9)	8 (18,6)	5 (11,6)	3 (7,0)	1 (2,3)	1 (2,3)	4 (9,3)	1 (2,3)	2 (4,7)
UM	31	6 (19,4)	8 (25,8)	8 (25,8)	7 (22,6)	7 (22,6)	5 (16,1)	3 (9,7)	4 (12,9)	3 (9,7)	5 (16,1)	5 (16,1)
UEM	43	3 (7,0)	1 (2,3)	7 (16,3)	7 (16,3)	4 (9,3)	2 (4,7)	2 (4,7)	2 (4,7)	2 (4,7)	-	2 (4,7)
UCLM	41	5 (12,2)	4 (9,8)	8 (19,5)	8 (19,5)	2 (4,9)	6 (14,6)	4 (9,8)	2 (4,9)	2 (4,9)	2 (4,9)	3 (7,3)
UCAM	39	2 (5,1)	2 (5,1)	2 (5,1)	5 (12,8)	1 (2,6)	1 (2,6)	2 (5,1)	2 (5,1)	2 (5,1)	1 (2,6)	1 (2,6)
URL	48	4 (8,3)	1 (2,1)	5 (10,4)	5 (10,4)	4 (8,3)	4 (8,3)	2 (4,2)	3 (6,3)	3 (6,3)	2 (4,2)	-
Total	881	70 (7,9)	60 (6,8)	97 (11,0)	96 (10,9)	58 (6,6)	53 (6,0)	44 (5,0)	41 (4,7)	47 (5,3)	33 (3,7)	40 (4,5)

Table 5.6 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Physics and Mathematics Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Physics and Mathematics Knowledge Area				
		SC 12	SC 13	SC 14	SC 15	SC 16
UPV	33	-	1 (3,0)	-	-	-
UAH	30	2 (6,7)	2 (6,7)	1 (3,3)	2 (6,7)	2 (6,7)
UB	42	-	-	-	-	-
USC	44	2 (4,5)	-	-	-	-
UGR	38	2 (5,3)	3 (7,9)	1 (2,6)	4 (10,5)	1 (2,6)
USAL	38	-	1 (2,6)	-	1 (2,6)	1 (2,6)
UCM	36	2 (5,6)	2 (5,6)	2 (5,6)	3 (8,3)	2 (5,6)
UAX	39	3 (7,7)	3 (7,7)	2 (5,1)	5 (12,8)	1 (2,6)
UN	46	2 (4,3)	1 (2,2)	1 (2,2)	2 (4,3)	1 (2,2)
ULL	35	4 (11,4)	2 (5,7)	1 (2,9)	3 (8,6)	1 (2,9)
UFV	44	2 (4,5)	1 (2,3)	1 (2,3)	2 (4,5)	1 (2,3)
UCH	46	1 (2,2)	2 (4,3)	1 (2,2)	-	1 (2,2)
US	39	-	-	-	1 (2,6)	1 (2,6)
USP	46	2 (4,3)	2 (4,3)	1 (2,2)	2 (4,3)	-
UMH	43	-	-	-	-	-
UV	37	-	-	-	-	-
USJ	43	2 (4,7)	2 (4,7)	1 (2,3)	3 (7,0)	3 (7,0)
UM	31	3 (9,7)	5 (16,1)	2 (6,5)	2 (6,5)	2 (6,5)
UEM	43	2 (4,7)	3 (7,0)	4 (9,3)	1 (2,3)	1 (2,3)
UCLM	41	2 (4,9)	1 (2,4)	1 (2,4)	2 (4,9)	1 (2,4)
UCAM	39	2 (5,1)	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)
URL	48	2 (4,2)	2 (4,2)	1 (2,1)	1 (2,1)	1 (2,1)
Total	881	35 (4,0)	34 (3,9)	21 (2,4)	36 (4,1)	21 (2,4)

Table 5.7 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Biology Knowledge Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Biology Knowledge Area									
		SC 17	SC 18	SC 19	SC 20	SC 21	SC 22	SC 23	SC 24	SC 25	SC 26
UPV	33	-	-	-	-	-	-	-	-	-	-
UAH	30	2 (6,7)	2 (6,7)	3 (10,0)	1 (3,3)	1 (3,3)	1 (3,3)	2 (6,7)	1 (3,3)	1 (3,3)	1 (3,3)
UB	42	-	-	-	-	-	-	-	-	-	-
USC	44	3 (6,8)	1 (2,3)	1 (2,3)	3 (6,8)	3 (6,8)	2 (4,5)	1 (2,3)	3 (6,8)	4 (9,1)	2 (4,5)
UGR	38	3 (7,9)	2 (5,3)	1 (2,6)	3 (7,9)	4 (10,5)	2 (5,3)	1 (2,6)	4 (10,5)	1 (2,6)	3 (7,9)
USAL	38	-	-	-	-	-	-	-	1 (2,6)	-	-
UCM	36	3 (8,3)	2 (5,6)	6 (16,7)	3 (8,3)	4 (11,1)	1 (2,8)	2 (5,6)	3 (8,3)	4 (11,1)	1 (2,8)
UAX	39	2 (5,1)	-	3 (7,7)	1 (2,6)	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)	3 (7,7)	-
UN	46	3 (6,5)	4 (8,7)	2 (4,3)	1 (2,2)	2 (4,3)	1 (2,2)	1 (2,2)	1 (2,2)	2 (4,3)	3 (6,5)
ULL	35	3 (8,6)	1 (2,9)	2 (5,7)	5 (14,3)	3 (8,6)	2 (5,7)	6 (17,1)	4 (11,4)	4 (11,4)	2 (5,7)
UFV	44	1 (2,3)	1 (2,3)	1 (2,3)	2 (4,5)	3 (6,8)	1 (2,3)	1 (2,3)	2 (4,5)	1 (2,3)	2 (4,5)
UCH	46	3 (6,5)	2 (4,3)	1 (2,2)	1 (2,2)	2 (4,3)	1 (2,2)	2 (4,3)	1 (2,2)	3 (6,5)	2 (4,3)
US	39	-	-	1 (2,6)	-	-	-	-	-	-	-
USP	46	-	-	-	-	-	-	-	-	-	-
UMH	43	-	-	-	-	-	-	-	-	-	-
UV	37	2 (5,4)	-	-	-	-	-	-	-	2 (5,4)	-
USJ	43	5 (11,6)	1 (2,3)	2 (4,7)	3 (7,0)	1 (2,3)	2 (4,7)	3 (7,0)	2 (4,7)	3 (7,0)	1 (2,3)
UM	31	5 (16,1)	2 (6,5)	2 (6,5)	4 (12,9)	3 (9,7)	2 (6,5)	3 (9,7)	3 (9,7)	3 (9,7)	2 (6,5)
UEM	43	2 (4,7)	-	-	1 (2,3)	-	-	1 (2,3)	1 (2,3)	-	-
UCLM	41	6 (14,6)	3 (7,3)	9 (22,0)	4 (9,8)	8 (19,5)	4 (9,8)	4 (9,8)	6 (14,6)	6 (14,6)	3 (7,3)
UCAM	39	1 (2,6)	2 (5,1)	5 (12,8)	2 (5,1)	2 (5,1)	3 (7,7)	1 (2,6)	4 (10,3)	1 (2,6)	2 (5,1)
URL	48	4 (8,3)	1 (2,1)	4 (8,3)	2 (4,2)	1 (2,1)	2 (4,2)	2 (4,2)	2 (4,2)	2 (4,2)	2 (4,2)
Total	881	48 (5,4)	24 (2,7)	43 (4,9)	36 (4,1)	38 (4,3)	25 (2,8)	32 (3,6)	39 (4,4)	40 (4,5)	26 (3,0)

Table 5.8 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Pharmaceutical Technology Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Pharmaceutical Technology Knowledge Area							
		SC 27	SC 28	SC 29	SC 30	SC 31	SC 32	SC 33	SC 34
UPV	33	-	-	-	-	1 (3,0)	1 (3,0)	-	1 (3,0)
UAH	30	2 (6,7)	1 (3,3)	1 (3,3)	1 (3,3)	4 (13,3)	3 (10,0)	3 (10,0)	1 (3,3)
UB	42	-	-	-	-	-	-	-	-
USC	44	5 (11,4)	1 (2,3)	6 (13,6)	1 (2,3)	6 (13,6)	3 (6,8)	1 (2,3)	2 (4,5)
UGR	38	2 (5,3)	2 (5,3)	1 (2,6)	1 (2,6)	4 (10,5)	3 (7,9)	3 (7,9)	1 (2,6)
USAL	38	-	-	1 (2,6)	-	1 (2,6)	-	-	1 (2,6)
UCM	36	3 (8,3)	3 (8,3)	1 (2,8)	1 (2,8)	5 (13,9)	4 (11,1)	3 (8,3)	1 (2,8)
UAX	39	2 (5,1)	2 (5,1)	4 (10,3)	3 (7,7)	3 (7,7)	2 (5,1)	2 (5,1)	3 (7,7)
UN	46	3 (6,5)	2 (4,3)	2 (4,3)	2 (4,3)	1 (2,2)	1 (2,2)	2 (4,3)	2 (4,3)
ULL	35	3 (8,6)	2 (5,7)	4 (11,4)	2 (5,7)	2 (5,7)	1 (2,9)	2 (5,7)	1 (2,9)
UFV	44	2 (4,5)	2 (4,5)	1 (2,3)	1 (2,3)	3 (6,8)	1 (2,3)	3 (6,8)	1 (2,3)
UCH	46	2 (4,3)	1 (2,2)	1 (2,2)	-	1 (2,2)	1 (2,2)	-	-
US	39	1 (2,6)	1 (2,6)	1 (2,6)	1 (2,6)	3 (7,7)	2 (5,1)	1 (2,6)	1 (2,6)
USP	46	3 (6,5)	1 (2,2)	1 (2,2)	1 (2,2)	-	1 (2,2)	-	1 (2,2)
UMH	43	-	-	-	-	-	-	-	-
UV	37	2 (5,4)	1 (2,7)	3 (8,1)	1 (2,7)	3 (8,1)	1 (2,7)	1 (2,7)	1 (2,7)
USJ	43	1 (2,3)	1 (2,3)	5 (11,6)	2 (4,7)	3 (7,0)	1 (2,3)	1 (2,3)	1 (2,3)
UM	31	2 (6,5)	2 (6,5)	2 (6,5)	2 (6,5)	4 (12,9)	2 (6,5)	1 (3,2)	-
UEM	43	2 (4,7)	-	1 (2,3)	1 (2,3)	2 (4,7)	2 (4,7)	2 (4,7)	1 (2,3)
UCLM	41	4 (9,8)	4 (9,8)	1 (2,4)	1 (2,4)	5 (12,2)	4 (9,8)	4 (9,8)	1 (2,4)
UCAM	39	3 (7,7)	3 (7,7)	1 (2,6)	4 (10,3)	4 (10,3)	4 (10,3)	3 (7,7)	1 (2,6)
URL	48	6 (12,5)	4 (8,3)	2 (4,2)	2 (4,2)	6 (12,5)	4 (8,3)	4 (8,3)	2 (4,2)
Total	881	48 (5,4)	33(3,7)	39 (4,4)	27 (3,1)	61 (6,9)	41 (4,7)	36 (4,1)	23 (2,6)

Table 5.9 - Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Medicine and Pharmacology Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Medicine and Pharmacology Knowledge Area															
		SC 35	SC 36	SC 37	SC 38	SC 39	SC 40	SC 41	SC 42	SC 43	SC 44	SC 45	SC 46	SC 47	SC 48	SC 49	SC 50
UPV	33	-	1 (3,0)	-	-	-	-	1 (3,0)	2 (6,1)	-	1 (3,0)	-	-	1 (3,0)	-	-	1 (3,0)
UAH	30	3 (10,0)	1 (3,3)	2 (6,7)	3 (10,0)	3 (10,0)	1 (3,3)	1 (3,3)	4 (13,3)	1 (3,3)	1 (3,3)	1 (3,3)	2 (6,7)	3 (10,0)	1 (3,3)	3 (10,0)	1 (3,3)
UB	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
USC	44	5 (11,4)	6 (13,6)	5 (11,4)	3 (6,8)	1 (2,3)	3 (6,8)	4 (9,1)	6 (13,6)	3 (6,8)	1 (2,3)	1 (2,3)	-	9 (20,5)	1 (2,3)	5 11,4)	-
UGR	38	6 (15,8)	3 (7,9)	3 (7,9)	7 (18,4)	8 (21,1)	5 (13,2)	9 (23,7)	6 (15,8)	4 (10,5)	2 (5,3)	1 (2,6)	5 (13,2)	10 (26,3)	2 (5,3)	7 (18,4)	1 (2,6)
USAL	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UCM	36	2 (5,6)	4 (11,1)	5 (13,9)	3 (8,3)	5 (13,9)	1 (2,8)	8 (22,2)	5 (13,9)	3 (8,3)	1 (2,8)	1 (2,8)	6 (16,7)	4 (11,1)	1 (2,8)	6 (16,7)	1 (2,8)
UAX	39	1 (2,6)	3 (7,7)	5 (12,8)	1 (2,6)	1 (2,6)	-	-	3 (7,7)	1 (2,6)	-	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)	2 (5,1)	-
UN	46	2 (4,3)	1 (2,2)	2 (4,3)	3 (6,5)	1 (2,2)	2 (4,3)	2 (4,3)	5 (10,9)	3 (6,5)	1(2,2)	2 (4,3)	2 (4,3)	8 (17,4)	1 (2,2)	1 (2,2)	1 (2,2)
ULL	35	4 (11,4)	3 (8,6)	5 (14,3)	2 (5,7)	3 (8,6)	2 (5,7)	6 (17,1)	5 (14,3)	3 (8,6)	1 (2,9)	1 (2,9)	3 (8,6)	4 (11,4)	1 (2,9)	5 (14,3)	1 (2,9)
UFV	44	4 (9,1)	2 (4,5)	3 (6,8)	6 (13,6)	6 (13,6)	1 (2,3)	5 (11,4)	5 (11,4)	2 (4,5)	1 (2,3)	1 (2,3)	5 (11,4)	7 (15,9)	1 (2,3)	6 (13,6)	1 (2,3)
UCH	46	-	1 (2,2)	2 (4,3)	-	-	-	-	-	-	-	-	-	-	-	1 (2,2)	-
US	39	1 (2,6)	-	-	-	-	1 (2,6)	-	-	1 (2,6)	-	1 (2,6)	-	-	1 (2,6)	-	-
USP	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UMH	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UV	37	-	-	-	-	-	-	1 (2,7)	-	1 (2,7)	-	1 (2,7)	-	-	1 (2,7)	1 (2,7)	-
USJ	43	4 (9,3)	5 (11,6)	4 (9,3)	8 (18,6)	3 (7,0)	6 (14,0)	9 (20,9)	7 (16,3)	2 (4,7)	3 (7,0)	1 (2,3)	8 (18,6)	7 (16,3)	3 (7,0)	2 (4,7)	4 (9,3)
UM	31	4 (12,9)	7 (22,6)	8 (25,8)	8 (25,8)	6 (19,4)	4 (12,9)	8 (25,8)	8 (25,8)	2 (6,5)	-	7 (22,6)	4 (12,9)	7 (22,6)	2 (6,5)	4 (12,9)	-
UEM	43	2 (4,7)	-	2 (4,7)	2 (4,7)	-	1 (2,3)	1 (2,3)	1 (2,3)	1 (2,3)	1 (2,3)	1 (2,3)	2 (4,7)	-	1 (2,3)	2 (4,7)	-
UCLM	41	3 (7,3)	6 (14,6)	6 (14,6)	8 (19,5)	8 (19,5)	2 (4,9)	9 (22,0)	6 (14,6)	2 (4,9)	1 (2,4)	1 (2,4)	5 (12,2)	7 (17,1)	1 (2,4)	8 (19,5)	2 (4,9)
UCAM	39	3 (7,7)	1 (2,6)	2 (5,1)	3 (7,7)	3 (7,7)	3 (7,7)	4 (10,3)	5 (12,8)	2 (5,1)	3 (7,7)	2 (5,1)	3 (7,7)	4 (10,3)	-	2 (5,1)	3 (7,7)
URL	48	5 (10,4)	6 (12,5)	3 (6,3)	2 (4,2)	3 (6,3)	-	2 (4,2)	4 (8,3)	4 (8,3)	2 (4,2)	4 (8,3)	4 (8,3)	5 (10,4)	3 (6,3)	3 (6,3)	2 (4,2)
Total	881	49 (5,6)	50 (5,7)	57 (6,5)	59 (6,7)	51 (5,8)	32 (3,6)	70 (7,9)	72 (8,2)	35 (4,0)	19 (2,2)	27 (3,1)	50 (5,7)	78 (8,9)	21 (2,4)	58 (6,6)	18 (2,0)

Table 5.10 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Legislation and Social Pharmacy Area

Univ.	Num. of courses	Specific Competencies Pertaining to the Legislation and Social Pharmacy Knowledge Area							
		SC 51	SC 52	SC 53	SC 54	SC 55	SC 56	SC 57	SC 58
UPV	33	-	1 (3,0)	1 (3,0)	1 (3,0)	1 (3,0)	-	1 (3,0)	-
UAH	30	2 (6,7)	1 (3,3)	5 (16,7)	2 (6,7)	1 (3,3)	2 (6,7)	3 (10,0)	5 (16,7)
UB	42	-	-	-	-	-	-	-	-
USC	44	5 (11,4)	1 (2,3)	2 (4,5)	5 (11,4)	1 (2,3)	3 (6,8)	1 (2,3)	2 (4,5)
UGR	38	1 (2,6)	2 (5,3)	2 (5,3)	2 (5,3)	2 (5,3)	2 (5,3)	2 (5,3)	2 (5,3)
USAL	38	-	-	-	-	-	-	-	-
UCM	36	3 (8,3)	1 (2,8)	2 (5,6)	2 (5,6)	-	1 (2,8)	2 (5,6)	2 (5,6)
UAX	39	1 (2,6)	1 (2,6)	4 (10,3)	2 (5,1)	1 (2,6)	2 (5,1)	1 (2,6)	3 (7,7)
UN	46	2 (4,3)	1 (2,2)	3 (6,5)	2 (4,3)	1 (2,2)	2 (4,3)	4 (8,7)	1 (2,2)
ULL	35	1 (2,9)	1 (2,9)	1 (2,9)	5 (14,3)	-	2 (5,7)	1 (2,9)	5 (14,3)
UFV	44	1 (2,3)	2 (4,5)	1 (2,3)	1 (2,3)	2 (4,5)	2 (4,5)	2 (4,5)	2 (4,5)
UCH	46	-	-	-	-	-	-	-	-
US	39	-	1 (2,6)	1 (2,6)	2 (5,1)	1 (2,6)	2 (5,1)	1 (2,6)	1 (2,6)
USP	46	-	1 (2,2)	1 (2,2)	-	1 (2,2)	1 (2,2)	-	-
UMH	43	-	-	-	-	-	-	-	-
UV	37	-	1 (2,7)	-	1 (2,7)	1 (2,7)	-	1 (2,7)	2 (5,4)
USJ	43	2 (4,7)	3 (7,0)	1 (2,3)	3 (7,0)	3 (7,0)	2 (4,7)	1 (2,3)	4 (9,3)
UM	31	2 (6,5)	2 (6,5)	-	3 (9,7)	1 (3,2)	1 (3,2)	2 (6,5)	3 (9,7)
UEM	43	2 (4,7)	1 (2,3)	1 (2,3)	-	1 (2,3)	1 (2,3)	1 (2,3)	-
UCLM	41	4 (9,8)	2 (4,9)	4 (9,8)	5 (12,2)	2 (4,9)	2 (4,9)	2 (4,9)	5 (12,2)
UCAM	39	1 (2,6)	-	-	3 (7,7)	-	1 (2,6)	1 (2,6)	1 (2,6)
URL	48	1 (2,1)	3 (6,3)	2 (4,2)	4 (8,3)	1 (2,1)	3 (6,3)	3 (6,3)	2 (4,2)
Total	881	28 (3,2)	25 (2,8)	31 (3,5)	43 (4,9)	20 (2,3)	29 (3,3)	29 (3,3)	40 (4,5)

Table 5.11 -Number of Courses (%) per University that Assigned Specific Competencies (SC) of the Traineeship Period and to the Final Dissertation

Univ.	Num. of courses	Specific Competencies Pertaining to the Traineeship Period and to the Final Dissertation								
		SC 59	SC 60	SC 61	SC 62	SC 63	SC 64	SC 65	SC 66	SC 67
UPV	33	-	-	-	-	-	-	-	-	-
UAH	30	-	-	-	-	-	-	1 (3,3)	-	-
UB	42	-	-	-	-	-	-	-	-	-
USC	44	-	-	-	-	-	-	-	-	-
UGR	38	-	-	-	-	-	-	-	-	-
USAL	38	-	-	-	-	-	-	-	-	-
UCM	36	-	-	-	-	-	-	-	-	-
UAX	39	-	-	-	-	-	-	-	-	-
UN	46	-	-	-	-	-	-	-	-	-
ULL	35	-	-	-	-	-	-	-	-	-
UFV	44	-	-	-	-	-	-	-	-	-
UCH	46	-	-	-	-	-	-	-	-	-
US	39	-	-	-	-	-	-	-	-	-
USP	46	-	-	-	-	-	-	-	-	-
UMH	43	-	-	-	-	-	-	-	-	-
UV	37	-	-	-	-	-	-	-	-	-
USJ	43	1 (2,3)	-	-	-	1 (2,3)	3 (7,0)	1 (2,3)	-	-
UM	31	1 (3,2)	1 (3,2)	2 (6,5)	2 (6,5)	1 (3,2)	1 (3,2)	1 (3,2)	-	-
UEM	43	-	-	-	-	-	-	-	-	-
UCLM	41	-	-	-	-	-	-	-	-	-
UCAM	39	-	-	-	-	-	-	-	-	-
URL	48	-	-	-	-	-	-	-	-	-
Total	881	2 (0,2)	1 (0,1)	2 (0,2)	2 (0,2)	2 (0,2)	4 (0,5)	3 (0,3)	-	-

Table 5.12 shows the distribution of the number of courses with each general competency allocated, grouped by the objectively classified area of knowledge. The difference between the total number of courses per general competency (seen in Table 5.12) and the total number of courses with that competency assigned (seen in Table 5.4) is due to the number of courses with no specific competencies assigned, which required us to objectively classify the courses into the CIN/2137/2008 areas of knowledge. Thus, Table 5.12 identifies the proportion of the courses from each area of knowledge that provides each of the general competencies. For instance, 40.4% of the courses paired with general competency #1 (analyze and produce medicines) are from the chemistry area. Other general competencies present a wider range of pairings of courses and areas of knowledge. For instance, general competency #8 (clinical and social pharmacy activities) was assigned to 51.5% of courses from medicine and pharmacology, 20.6% from chemistry, 10.3% from pharmaceutical technology, and only 6.2% from legislation and social pharmacy. General competency #13 (communication and information skills) was assigned to 36.8% of courses from medicine and pharmacology, 17.3% from chemistry, 15.9% from biology, 15.5% from pharmaceutical technology, and only 7.7% from legislation and social pharmacy.

Table 5.12 -Courses divided by areas of Knowledge Assigned to Each of the General Competencies

	Total num. of courses	Num. courses (%) per area of knowledge* (based on specific competencies assigned)							
		Chemistry	Physics and Mathematics	Biology	Pharmaceutical Technology	Medicine and Pharmacology	Legislation and Social Pharmacy	Internship and Final Dissertation	Non-specific
GC 1	198	80 (40.4)	7 (3.5)	28 (14.1)	40 (20.2)	36 (18.2)	1 (0.5)	0 (0)	6 (3.0)
GC 2	125	25 (20.0)	5 (4.0)	14 (11.2)	18 (14.4)	60 (48.0)	1 (0.8)	1 (0.8)	1 (0.8)
GC 3	214	49 (22.9)	15 (7.0)	40 (18.7)	22 (10.3)	62 (29.0)	24 (11.2)	0 (0)	2 (0.9)
GC 4	133	29 (21.8)	4 (3.0)	17 (12.8)	35 (26.3)	38 (28.6)	5 (3.8)	1 (0.8)	4 (3.0)
GC 5	116	20 (17.2)	4 (3.4)	13 (11.2)	9 (7.8)	65 (56.0)	3 (2.6)	1 (0.9)	1 (0.9)
GC 6	133	20 (15.0)	4 (3.0)	14 (10.5)	15 (11.3)	58 (43.6)	18 (13.5)	1 (0.8)	3 (2.3)
GC 7	137	20 (14.6)	5 (3.6)	16 (11.7)	19 (13.9)	66 (48.2)	9 (6.6)	1 (0.7)	1 (0.7)
GC 8	97	20 (20.6)	4 (4.1)	5 (5.2)	10 (10.3)	50 (51.5)	6 (6.2)	1 (1.0)	1 (1.0)
GC 9	152	20 (13.2)	5 (3.3)	20 (13.2)	12 (7.9)	75 (49.3)	15 (9.9)	1 (0.7)	4 (2.6)
GC 10	155	52 (33.5)	8 (5.2)	27 (17.4)	11 (7.1)	53 (34.2)	2 (1.3)	0 (0)	2 (1.3)
GC 11	96	30 (31.2)	4 (4.2)	10 (10.4)	13 (13.5)	37 (38.5)	1 (1.0)	0 (0)	1 (1.0)
GC 12	105	32 (30.5)	4 (3.8)	17 (16.2)	6 (5.7)	40 (38.1)	5 (4.8)	0 (0)	1 (1.0)
GC 13	220	38 (17.3)	7 (3.2)	35 (15.9)	34 (15.5)	81 (36.8)	17 (7.7)	1 (0.5)	7 (3.2)
GC 14	102	20 (19.6)	4 (3.9)	7 (6.9)	9 (8.8)	36 (35.3)	24 (23.5)	1 (1.0)	1 (1.0)
GC 15	242	50 (20.7)	13 (5.4)	41 (16.9)	35 (14.5)	74 (30.6)	21 (8.7)	1 (0.4)	7 (2.9)

* Area of knowledge defined following CIN/2137/2008 Ministerial order

5.4. Discussion

We found that the Spanish competency framework for undergraduate pharmacy education, although legally enforced since 2008 by the CIN/2137/2008 Ministerial order,[75] is not properly used. Competencies are frequently mismatched, with no real alignment between them and the courses' educational content. Despite the legal obligation, only five out of the 22 universities providing the pharmacy degree in Spain have all their courses paired with any of the general competencies of the Spanish competency framework, and two universities have none of their courses paired with any of the general competencies.

The number of competences assigned by course gives also demonstrates very different alignment patterns among Spanish colleges of pharmacy. While some universities pair each course to a median of around two competencies, some others align virtually all their courses to all the 15 general competencies. This excessive pairing may be another way of misusing a competency framework, pretending that each course provides many different competencies, such as #1 (analyze and produce medicines) and #8 (clinical and social pharmacy activities). The use of a competency framework should support the construction and implementation of a competency-based pharmacy education.[30, 173] Therefore, the curriculum must be designed to ensure a perfect alignment between educational outcomes, educational contents, teaching and learning methods, assessment strategies, and educational environment.[30, 62, 65, 173]

Competence mismatching in Spain is most evident in the patient-focused competencies. Among the five universities that have all their courses paired with any general competency (Table 5.4), a variability in the assignment of general competency #7 (drug-related problems and pharmacovigilance activities) exists, ranging from 13% of the URL courses to 52% of the UM courses. In the case of general competency #8 (clinical and social pharmacy activities), its assignment varies from 3% of the ULL courses to 32% of the UM courses. The results of our study show that UM assigned general competency #7 four times more often than URL, and assigned general competency #8 ten times more often than ULL. This finding could lead us to think that

the pharmacy degree in UM is much more patient-focused than in the other two universities, but an in-depth analysis of their syllabi shows very similar courses regarding the declared educational contents. Although there is a great variability in the assignment of competencies, overall, the Spanish universities assign general competency #7 (drug-related problems and pharmacovigilance activities) and general competency #8 (clinical and social pharmacy activities) to only 17% and 12% of the courses, respectively. The low assignment rate of these two competencies reinforces the results of a previous comparison between the USA and European curricula, concluding that USA curricula were more clinically oriented.[174]

Spanish colleges of pharmacy competency alignments demonstrate an attempt to simulate a more clinically oriented pharmacy curriculum. Several of the patient-focused general competencies are provided by courses paired with very different profiles of specific competencies. Table 5.12 shows that 44% of the courses that have assigned general competency #7 (drug-related problems and pharmacovigilance activities) and 40% of the courses that have assigned general competency #8 (clinical and social pharmacy activities) belong to the areas of knowledge of chemistry, physics and mathematics, biology, and pharmaceutical technology. Allocating courses to an area of knowledge based only on the name of the course may mislead curriculum analysis, as has already occurred with the 2011 PHARMINE report.[100] Spanish universities should strive to make a correct alignment between the competencies from the Spanish competency framework and the educational contents taught in each class and not merely creating general pairings based on the courses' names. The US-based Accreditation Council for Pharmacy Education (ACPE) standards and guidelines argue that "the curriculum must define the expected outcomes and be developed, with attention to sequencing and integration of content and the selection of teaching and learning methods and assessments".[37]

Following this rationale, the competencies that are intended to be achieved by the students should be paired with educational content (the description of course content, including the sequence of topics and readings; the learning activities/assignments; and the time spent to reach each competency), and the assessment methods. It is important to bear in mind that the learning activities are used to develop each

competency, and the assessment strategies are used to evaluate if the student achieved each competency.[171] Additionally, competencies should be aggregated into entrustable professional activities (EPAs): "units of professional practice, defined as tasks or responsibilities that trainees are entrusted to perform unsupervised once they have attained specific sufficient competence".[82] Although EPAs should not be considered as an alternative to design curricula,[82] competency assignment should also be analyzed from the EPAs perspective. At the end of the day, courses provide competencies, and competencies support EPAs. A complete curriculum analysis should be able to map all this alignment, especially in core competencies.[85] And different curricula should demonstrate their different orientations by comparing their coverage of specific sets of EPAs.[81]

One potential limitation of our study is that we excluded elective courses and courses related to the internship period or final dissertation. Exclusion of elective courses is based on the idea that mandatory courses are those common to any entry-level graduated, and constitute the core contents taught to every pharmacist. The internship period was not considered for this study because, for the vast of the Spanish students, this period consists of a practice placement with no university-based educational contents.

5.5. Conclusion

Despite the use of the Spanish competency framework, a legal mandate enforced by the CIN/2137/2008 Ministerial order, its quantitative implementation is not complete (i.e., two universities do not assign any general competencies), and very different pairing patterns were found among universities. The quality of competency assignment is poor, with courses objectively assigned to basic science areas (i.e., chemistry, physics and mathematics, biology, and pharmaceutical technology) providing high percentages of practical and patient-focused competencies. In the future, competencies should be paired in the syllabi to each of the course contents (lectures and labs) and not to the course descriptions.

6. EDUCATIONAL CONTENTS FOR A PATIENT-CENTERED UNDERGRADUATE PHARMACY CURRICULUM

6.1. Foreword

The focus of the pharmacy profession has shifted from products to a patient-centred practice. Worldwide pharmacy education has attempted to adapt to this change in the profession. In countries such as Australia, Canada, New Zealand, and the United States, curriculum changes are focused on clinical models, allowing pharmacy graduates to become more competent professionals in patient-centred care. This shift could be why these countries have been more successful in the implementation of pharmaceutical services, some of which are reimbursed. In Europe, with the Bologna Declaration and the creation of the European Higher Education Area, there was an attempt to change the pharmacy curriculum. However, an analysis of European undergraduate pharmacy curricula indicates that such curricula continue to include a heavy load of basic sciences, but few courses have educational contents that prepare students for a patient-centred practice.

This work's primary objective is to create a catalogue of educational contents for the undergraduate pharmacy curriculum that focuses on preparing students for a patient-centred practice. This catalogue was not intended to be a catalogue of courses but instead a compilation of contents taught in countries that have widely implemented pharmaceutical services.

The catalogue of educational contents was created through a qualitative analysis of syllabi from schools of pharmacy in Australia, Canada, New Zealand and the United States. The line-up of categories and educational contents did not have a hierarchical order of importance, and the authors are open to collaborative work to further develop the catalogue.

This catalogue of educational contents can assist in the creation of a pharmacy curriculum that prepares students for a more patient-centred practice. Therefore, it is necessary to rigorously align the competencies to be achieved and the corresponding contents to be taught. The relationship between competencies and educational contents must be bi-directional, i.e., the need to achieve new competencies generates

new contents, and the emergence of new contents can lead to the acquisition of new competencies.

6.2. Introduction

6.2.1. Evolution of the profession and pharmacy education

6.2.1.1. Context

In 1993, the second meeting of the World Health Organization (WHO) on the pharmacist's roles in the healthcare system highlighted the importance of the more active participation of pharmacists in evaluating not only the results of taking medicine but also other aspects related to healthcare.[52] In 2001, the resolution of the Committee of Ministers of the Council of Europe also stressed the need for pharmacist involvement in evaluating the results achieved through the use of medicines.[54] Since then, and with the rise of the concept of pharmaceutical care, pharmacists have made an increasing commitment to improve patient health by achieving concrete pharmacotherapy results.[175] Thus, in the late twentieth century, the global pharmacy profession shifted from a product-oriented to a patient-centred practice. With these changes in the profession, pharmacy education has also attempted to adapt to this new reality.[50, 142]

Schools of pharmacy, guided by World Health Organization recommendations, have taken steps to provide students with the necessary education and training to qualify them for the responsibility of this new role. WHO recommended an appropriate balance of the curricular components of basic sciences, pharmaceutical sciences, biomedical and clinical sciences, socioeconomic and behavioural sciences with practical experience. It also recommended the introduction of courses related to the implementation of patient-centred care (e.g. communication skills).[52] In addition to these curricular changes, teaching methodology has become more oriented towards problem solving and practice issues, and a continuous review of undergraduate curriculum outcomes, content and process is essential to ensure their consistency with the profession's needs. Additionally, the International Pharmaceutical Federation (FIP)

supports the improvement of pharmacy education to emphasize both clinical education and patient-centred care curricula.[58]

6.2.1.2. The role of the pharmacist and pharmacy practice

In 1997, WHO "agreed that contemporary and future pharmacists must possess specific knowledge, attitudes, skills and behaviours in support of their roles". To summarize these roles, the concept of a "seven-star pharmacist" was created. Each star corresponds to a function: caregiver, decision-maker, communicator, leader, manager, lifelong-learner, and teacher.[55] The pharmacist's function as a researcher was added later.[5]

As a caregiver, the pharmacist should integrate the healthcare team responsible for patient care. The pharmacist plays an important role in this respect, adapting the team's knowledge, skills and attitudes to provide high-quality pharmaceutical services.[55]

In the nineties, WHO recognized the evolution of pharmacy practice by promoting the concept of "pharmaceutical care," which it states provides optimum therapeutic results in the use of medication through the active participation of the pharmacist as a member of the healthcare team.[52]

Pharmaceutical care represents an extensive concept that involves the "active participation of the pharmacist in the assistance of the patient through the dispensing and monitoring of pharmacological treatment in co-operation with doctors and other healthcare staff, in order to achieve results that improve the patients' quality of life". This concept also includes involvement in activities that promote good health and prevent disease.[176]

Currently, the scope of pharmacy practice covers all activities that are carried out by the pharmacist and directed to the patient with the aim of improving the drug-use process and minimizing the negative outcomes associated with medication. Dispensing prescriptions, advising on symptoms and self-care related to common ailments, managing drug therapy, counselling and patient education, pharmacovigilance, etc. are

some examples of pharmaceutical services that contribute to the rational and economic use of medicine.[5, 177]

With the evolution of the pharmacy profession, new clinical pharmacy services were created. Australia, Canada, the United States, the United Kingdom and New Zealand are examples of countries in which services not only have been implemented but also (in some cases) have begun to be reimbursed by healthcare systems or insurance. However, the successful implementation of pharmaceutical services was not significant in other countries. For years, the barriers to the implementation of services in different settings have been studied. In these studies, the perceived barriers include not only the usual lack of time, payment and institutional support but also the lack of clinical pharmacist education and training. Surprisingly, these barriers appeared to be common to developed and developing countries for different pharmaceutical services.[178-181] One recent study of barriers has been clear in its conclusions: the main barrier to the implementation of clinical pharmacy services is the pharmacist's mind-set. The truth is that discussing clinical training and discussing mentality are two sides of the same coin.[182]

It appears obvious that pharmacy education must be in line with pharmacy-training needs to prepare professionals for clinical practices that involve these new services.

6.2.2. Changes in pharmacy education

Worldwide, pharmacy education has seen changes associated with the evolution of the pharmacy profession. Australia, Canada, the United States and New Zealand lead the list of countries that have adapted their curricula to accommodate such changes in the pharmacy profession as it moves towards clinical and patient-centred care.[38, 144, 183] The need to educate students in direct patient care has been discussed.[184] Efforts to improve the pharmacy curriculum have focused on areas such as clinical pharmacy or social, administrative and behavioural pharmacy.[147, 149, 185]

6.2.2.1. Pharmacy studies in the United States

In the United States (USA), organizations such as the American Pharmacists Association (APhA), the American Association of Colleges of Pharmacy (AACP), and the Accreditation Council for Pharmacy Education (ACPE) have defined the skills and outcomes that enabled the provision of optimal pharmaceutical care and adopted principles, skills and standards for teaching this new practice of pharmacy.

The main change in pharmaceutical education was marked by the creation of the doctor of pharmacy (PharmD) degree as the sole degree required to enter practice.[90, 151] The ACPE, the agency for the accreditation and quality of professional degree programmes in pharmacy, adopted the first accreditation standards and guidelines for the professional programme in pharmacy in 1997. Since then, the standards that lead to the doctor of pharmacy degree have been refined and adapted to ensure that pharmacy graduates are prepared to satisfy patient-centred practice requirements in collaboration with other healthcare professionals.[37, 186, 187] Colleges and schools of pharmacy initiated the implementation of the PharmD in the 2000/2001 academic year, and the transition was completed in the 2004/2005 academic year.[37] To meet the needs of patient-centred care, colleges changed their PharmD curriculum based on the ACPE standards. The ACPE requires a minimum of 2 academic years or the equivalent college-level course work prior to admission into a PharmD programme (4 academic years).[37] Pre-professional education was to be the foundation of the professional programme by providing basic sciences, liberal and general education and a general view of pharmacy as a health sciences profession.[188] In the professional program, the curriculum was established to include an appropriate balance of biomedical, pharmaceutical, social/behavioural/administrative, and clinical sciences, all of which are essential to pharmacists' development. Furthermore, pharmacy experience must be integrated into the curriculum to ensure that the students have opportunities to engage in patient-centred care activities in various settings. The training period is in the 4th year of the PharmD programme and takes place through a series of "advanced pharmacy practice experiences" (APPE) in different settings. The duration of the APPE must be at least 1440 hours (i.e., 36 weeks) and should primarily involve direct patient care. The required APPE must include primary, acute, chronic, and preventive care

among patients of all ages and develop pharmacist-delivered patient care competencies in a community pharmacy, hospital or health-system pharmacy, ambulatory care and inpatient/acute care general medicine. In addition, the student is allowed to choose different elective experiences based on his or her individual interests, such as research, management, drug information, education, managed care, long-term care, hospice care, and home healthcare. Beyond the APPE, students must have at least 300 hours of "introductory pharmacy practice experiences" (IPPE). The IPPE introduces students to the profession and allows them to assume direct patient care responsibilities under proper supervision. The time spent in these experiences should be balanced between community pharmacy and institutional health-system settings.[37, 189]

This curriculum reform decreased the number of courses related to the basic sciences and increased the number of courses related to clinical care.[152] The curriculum was changed to provide clinical experimental models and has improved the competencies relating to evidence-based practice and patient-centred care.[153]

Over the years, the ACPE standards have been revised to respond to the needs of the pharmacy profession and to continue to respond to the Institute of Medicine's (IOM) recommendations for improving medication safety and patient outcomes. This institute suggested 5 competencies that healthcare professionals should attain during their education: the provision of patient-centred care; the employment of evidence-based practice; the use of interprofessional work teams; the application of quality improvement; and use of informatics.[187]

The American College of Clinical Pharmacy sets Standards of Practice for Clinical Pharmacists that "serve as a reference for those designing and assessing clinical pharmacy education and training programs".[6]

6.2.2.2. Pharmacy studies in Europe

6.2.2.2.1. The Bologna Process: creation of the European Higher Education Area

With the aim of creating a harmonized European Higher Education Area (EHEA), in June 1999, European ministers of education from 29 countries signed the Bologna Declaration.[18] The main idea was to allow students from any higher education institution to begin, continue and complete their education and obtain a European diploma that would be recognized in any university of any Member State. To do so, it was necessary for European institutions of higher education to work in an integrated and harmonized way. In this context, higher education institutions should create an identical base structure, offering courses and specializations that are similar and comparable in terms of content and duration and confer diplomas that are recognized as equivalent both academic and professionally. The Bologna Declaration aimed to increase the competitiveness of the European system of higher education and the promotion of the mobility and employability of graduates in Europe. To achieve these general objectives, the following objectives were defined:

- The adoption of a system of easily readable and comparable degrees;
- The adoption of a system essentially based on two main cycles — undergraduate and graduate;
- The establishment of a system of credits (ECTS—European Credit Transfer and Accumulation System);
- The promotion of mobility and the free movement of students, teachers and researchers in a European context;
- The promotion of European co-operation in quality assurance with a view towards developing comparable criteria and methodologies;
- The promotion of the European dimensions in higher education, particularly with regard to curricular development, interinstitutional co-operation, mobility schemes and integrated programmes of study, training and research.[18]

Currently, 48 Member States[a] participate in the Bologna process after having fulfilled the condition and accession procedures.[154]

6.2.2.2.2. Training for pharmacists

In Europe, pharmacy education is recognized by Directive 2005/36/EC of the European Parliament and the Council of the European Union, which replaced Directives 85/432/EEC and 85/433/EEC of the European Communities Council.[39] Subsequently, Directive 2013/55/EU of the European Parliament and the Council amending Directive 2005/36/EC regarding the recognition of professional qualifications was released.[20]

In accordance with the implementation of the Bologna Process, it was established that the pharmacy degree would be organized in two training cycles with a duration of at least five years, composed of at least "(a) four years of full-time theoretical and practical training at a university or at a higher institute of a level recognized as equivalent, or under the supervision of a university; (b) during or at the end of the theoretical and practical training, six-month traineeship in a pharmacy which is open to the public or in a hospital under the supervision of that hospital's pharmaceutical department."[20]

Sixty European credit transfer and accumulation system (ECTS) credits are required to complete each academic year, and 300 ECTS credits are required at the end of the five years of study. Each ECTS credit corresponds to approximately 25-30 hours of study.[20]

[a] Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom (since 1999), Croatia, Cyprus, Liechtenstein, Turkey (since 2001), Albania, Andorra, Bosnia and Herzegovina, the Holy See, the Russian Federation, Serbia, The Former Yugoslav Republic of Macedonia (since 2003), Armenia, Azerbaijan, Georgia, Moldova, Ukraine (since 2005), Montenegro (since 2007), Kazakhstan (since 2010), and Belarus (since 2015).

6.2.2.3. Pharmacy studies in other countries

In Australia and New Zealand, before becoming registered pharmacists, students normally complete a four-year bachelor of pharmacy degree or a graduate-level master of pharmacy (MPharm) degree, a three-year programme that has been offered since 2003 by some universities. After completing one of these university degree programmes, graduates must participate in an approved intern training programme accredited by the Australian Pharmacy Council (APC).[190] This internship is composed of 12 months of supervised practice in a hospital or community pharmacy.[144] As of 1998, pharmacy programmes must be accredited by the APC and approved by either the Pharmacy Board of Australia or the Pharmacy Council of New Zealand. This accreditation ensures both the quality of the education and training and that the pharmacy programme meets the approved accreditation standards for the profession. The Accreditation Standards for Pharmacy Programs aim to reflect pharmacists' initial training, which should provide the foundation for graduates to work in different settings. These standards assist in the design and delivery of pharmacy programmes and are regularly reviewed to keep pace with changes in the profession, e.g., with a review of the curriculum content. According to the standards, "the curriculum of the pharmacy programme demonstrates congruency with contemporary pharmaceutical sciences, pharmacotherapeutics and pharmacy practice and the pharmacy learning domains".[190] The pharmacy learning domains, based on the Indicative Syllabus for UK pharmacy degrees,[191] consist of a list of items grouped into six domains that are to be taught in the pharmacy curriculum to focus on clinical education.[144] In New Zealand, the Health Practitioners Competence Assurance Act 2003 (HPCAA), which regulates the pharmacy profession, states that clinical competence, cultural competence, and ethical conduct must be integrated into the learning objectives of pharmacy programmes.[192] As in the pharmacy curriculum in the USA, curricula in Australia and New Zealand balance and integrate the basic sciences, applied pharmaceutical sciences, social sciences, and clinical sciences. In these two countries, it is expected that at the end of the internship, graduates achieve the competency standards that are critical to the practice of contemporary pharmacists.[11, 72, 193]

In Canada, pharmacy education has undergone changes to keep pace with the evolution of the profession. In some Canadian universities, the entry-level degree for the profession is the Bachelor of Science in Pharmacy (B.Sc. Pharm.), whereas others are changing the entry-level degree to the PharmD The programmes require a minimum of 5 years of education in a 1+4 or 2+4 model.[38] Both programmes are accredited by the Canadian Council for Accreditation of Pharmacy Programs and must comply with the standards established by this entity. The accreditation standards establish the goals to be achieved with the pharmacy curriculum to prepare students for the clinical responsibilities of a patient-focused practice. Like in the USA, the pharmacy curriculum in Canada must offer a balance of coursework in biomedical sciences, pharmaceutical sciences, behavioural, social and administrative sciences, clinical sciences, and practical skills. Practical experience helps the student develop the necessary clinical skills to assist patients in different clinical environments.[194] In Canada, the Association of Faculties of Pharmacy of Canada (AFPC) established the educational outcomes for first professional degree programmes in pharmacy programmes with the aim of emphasizing the pharmacist's patient care responsibilities.[195]

The United Kingdom (UK) signed the Bologna Declaration, and its pharmacy curriculum is based on the European-required syllabus. However, the UK curriculum has some differences from the curricula in other European countries: it is necessary to complete a master of pharmacy degree (MPharm), a 4-year programme (in other countries, pharmacy programmes are 5-6 years); complete one year of practical training in a community or hospital pharmacy (this workplace training is independent of the degree); and pass a registration exam before entering practice.[196, 197] MPharm programmes in the UK are accredited by the Royal Pharmaceutical Society. This body establishes an indicative syllabus for the UK pharmacy degree courses and lists 51 items that should appear in a syllabus in six domains (the patient; medicines: drug action; medicines: the drug substance; medicines: the medicinal product; healthcare systems and the roles of professionals; and the wider context).[191]

6.2.3. The pharmacy curricula

6.2.3.1. The importance of the curriculum

There are many definitions of what a curriculum is, but in general, the term refers to the set of experiences and objectives to be achieved by students during their educational process.[28] The curriculum aims to provide students with the knowledge, skills, behaviours, and attitudes that prepare them for professional practice,[28] all of which play an important role in professional identity formation.[198] Therefore, to prepare students to practice patient-centred care, it is important to increase the connection between the curriculum content and how it relates to students' future practice. Noble *et al.* suggested that pharmacy educators consider including significant interactions with patients throughout the curriculum using simulations, actors, or real-life patients, enabling the students to perform the role of a pharmacist..[198]

6.2.3.2. Designing a curriculum and syllabus

According to UNESCO, a curriculum is a systematic and intended packaging of competencies (i.e., knowledge, skills and attitudes that are underpinned by values) that learners should acquire through organized learning experiences in both formal and non-formal settings.[9] Curriculum development must meet society's needs; in this sense, the university should be able to identify the educational objectives and competencies that a graduate must acquire to practice his or her chosen profession. In the case of pharmacy, the curriculum should prepare students to enter a pharmacy practice with the necessary competencies that enable them to respond to health-related needs.[62] These needs are constantly changing, making the design of a curriculum a process that is always in progress.

Koster *et al.* offer suggestions for designing a pharmacy curriculum: use a competency framework; consult stakeholders ("consultation of the outside world is necessary to align the competencies of recent graduates to the local professional and healthcare needs"); think ahead; integrate content and skills; appoint curriculum coordinators; avoid overburdening; use authentic learning activities and assessment tasks; adopt frameworks for cognitive and skill development; use curriculum mapping for internal

quality enhancement; ensure management continuity; develop educational expertise and specialization; and develop scholarship in teaching and learning.[30]

The curriculum should "be expressed in comprehensive and user-friendly documents, such as curriculum frameworks; subject curricula/syllabuses, and in relevant and helpful learning materials, such as textbooks teacher guides; assessment guides".[31]

A course syllabus is the principal outcome of curriculum development.[16] A syllabus is a document that includes descriptions and course plans. This instrument enhances student learning, assists faculty teaching, increases communication between faculty members about courses, and improves curricular quality.[33, 138] A syllabus should be created as a manual and a type of contract between the professor and the student.[16, 34, 36] A learning-centred syllabus should be designed to ensure that students, when reading this document, understand what is required to achieve the course educational objectives.[35]

There are several components that a course syllabus must include:[16, 33, 36, 199]

- General course information (course title and course code; term/quarter/semester; location and time of class; credits/units/time and student workload required; pre-requisites/co-requisites; course description)
- Course instructional team (instructor names; office hours and contact information; additional information)
- Course goals (general aims for the course/course purpose)
- Course objectives (skills, knowledge and attitudes that students need to acquire). Specific learning outcomes (competencies)
- Course content (description of course content including the sequence of topics/readings; learning activities/assignments)
- Time schedule/course plan (schedule/course plan; lecture and lab topics; landmark events, assessments, due dates; daily assignments linked to the calendar)
- The learning environment (learning and teaching methods; a list of required and recommended texts; course materials and attire)

- Student assessment and grading (grading procedure; grading scale and method; missed assessments; grade posting; the consequences of a failing grade; additional grading information)
- Technical, classroom, and academic policy information (syllabus changes; last course revision date; students with disabilities and special needs; rights and responsibilities of the student and faculty)
- Expectations of professionalism (ethics and professional conduct; behaviour; work habits)
- Additional information (e.g., charts, study suggestions, information on how to access the course website, advice for preparing for assessments/exams, appendices)

The syllabus can be used as an instrument to demonstrate that a course prepares the student for the objectives established in the curriculum.[36] To do so, the syllabus should also include a summary on how the course content relates to the competencies, which means an alignment between the learning outcomes, learning activities/assignments and assessment.[200, 201] The learning activities are used to develop each outcome, and the assessment tasks are used to assess each outcome.

Curriculum mapping is used for the evaluation and the continuous quality improvement of undergraduate pharmacy programmes.[202-205] Curricular mapping allows for the identification of “courses that needed content revision and renewed alignment with program outcomes”. Curriculum review and mapping is a process that “increases communication and collaborative efforts regarding instructional strategies, course content, assessment methods, and expected program outcomes among faculty members and other stakeholders.” However, “this process ensures that the curriculum reflects the goals not only of the academic institution but also of the profession, making the endpoints of the professional program visible to all involved.”[204] Articles on mapping pharmacy curricula around the world have emerged in the literature.[206-208]

6.2.3.3. Structure of the pharmacy curriculum

The curriculum and course content taught in the pharmacy programme vary from country to country. Some studies have compared pharmacy curricula across the European countries and grouped courses for pharmacy degrees into different subject areas. According to the 1994 report of the Advisory Committee on Pharmaceutical Training, before the implementation of the Bologna Declaration, undergraduate pharmacy degrees varied significantly in length among European countries. For example, the total number of hours of instruction (excluding practical training/internship) ranged from 2141 in Ireland to 4670 in the Netherlands. Another consideration is the substantial differences in the distributions of the total number of hours of required courses by subject area. "Chemical subjects" assume the greater number of hours of required courses, ranging from 25-46% across European countries, with Germany's degree more focused on chemistry. Physics/mathematics/computing/statistics (3-13%) and social aspects of pharmacy/law (1-16%) were the subject areas that had a minimal focus on the European curricula.[99]

In the 2011 PHARMINE report, the courses of the undergraduate pharmacy curriculum were categorized into 7 subject areas. "Medical sciences" represented the main subject area (28%), followed by "chemical sciences" (24%), "pharmaceutical technology" (15%), "biological sciences" (11%), "physics/mathematics" (6.4%), "generic subjects" including traineeship (6.4%) and "law/society/ethics" (6.2%). The report stated that countries with more industrial pharmacists have pharmacy degrees that are more oriented towards the chemical sciences and pharmaceutical technology. Similarly, countries with more hospital pharmacists have pharmacy degrees that are more oriented towards the medical sciences.[100] This finding could erroneously lead the reader to believe that many pharmacy degrees in Europe have a clinical focus. For this report, the "medical sciences" subject area included a mix of courses such as human anatomy and physiology, pharmacology, toxicology, parasitology, bio-analysis (of body fluids), radiochemistry, the dispensing process, drug prescriptions, prescription analysis, over-the-counter (OTC) medicines, skin illness and treatment, homeopathy, phytotherapy, drugs in veterinary medicine, pharmaceutical care, pharmaceutical therapy of illness and disease, etc. According to the ACPE course categorization, some

of these courses are part of the clinical sciences, whereas others belong to biomedical/basic sciences (e.g., anatomy and physiology) or pharmaceutical sciences (e.g., pharmacology).[37]

A study of the evolution of the European pharmacy curriculum was conducted by comparing the results from the 1994 study with the 2011 PHARMINE report.[101] A decrease in the number of hours related to the chemical sciences (from 33% to 26%) and an increase in the number of hours related to the medical sciences (from 19% to 28%) were found. According to these results, it appears that changes in the European curriculum have led to more clinical courses and that the pharmacy education is in line with international recommendations.[101] However, a recent study comparing the patient-centred care in pharmacy curricula in the USA and the EHEA showed that higher education institutions in European countries, despite curricular revisions after the Bologna Declaration, maintain a greater focus on basic sciences and a lower load of clinical sciences in pharmacy curricula than those in the USA. In this study, the course contents in the syllabi were analysed and each course was classified into one of four categories: social/behavioural/administrative pharmacy sciences, clinical sciences, experiential, or other/basic sciences. The 4-area categorization system was created based on the "Curricular Core – Knowledge, Skills, Attitudes, and Values" section of the ACPE standards. According to this study, although there are also differences in the social/administrative sciences and experiential courses, the main differences between the USA and the EHEA curricula involve the clinical sciences (16% in the USA versus 4% in the EHEA) and the basic sciences (49% in the USA versus 72% in the EHEA).[174]

Some authors claim that the pharmacy profession relies on the basic sciences, demanding a high load of these courses in the curriculum.[209, 210] However, professional bodies demand that pharmacists, as health professionals, must possess the clinical skills that allow them to have a patient-centred practice. For this purpose, a proper balance between basic sciences, pharmaceutical sciences, and sciences that prepare students for a patient-centred practice (such as clinical sciences and social, behavioural, and administrative aspects associated with pharmaceutical practice) is necessary. Although there was a reduction of the basic sciences and an increase in clinical sciences in some schools of pharmacy,[152] the curricular change in European

countries maintained their focus on the basic sciences.[174] To be in line with WHO and FIP recommendations, schools need to review their curricular content to ensure that graduates are competent in patient care.

In an attempt to achieve an appropriate balance between educational content from various areas and following the ACPE standards,[187] some USA schools of pharmacy have adopted an integration of the curricular content. In these schools, the courses are linked to each other, and the content taught in one course is related to the information provided in another. Curricular integration can occur with content from courses that are taught at the same time in the programme (horizontal integration) or that are taught in different stages of the curriculum (vertical integration). The curriculum integration consists of the integration of contents from the basic sciences with clinical sciences and the integration of theory and practice.[211-214] Pharmacy curricula with a complete integration of biomedical, pharmaceutical, social/behavioural/administrative, and clinical sciences are also being developed.[215]

6.2.3.4. Creating competency frameworks for pharmacy

Competency-based education frameworks are increasingly common among health professionals.[64, 65, 216] The development of competency frameworks for pharmacy education and practice has grown worldwide; such frameworks have been used in the design, development, and review of the pharmacy curricula.[170]

In 2007, the Competency Development and Evaluation Group (CoDEG) published the second edition of its General Level Framework (GLF), a Framework for Pharmacist Development in General Pharmacy Practice used in the United Kingdom. This framework can be used by pharmacists working in hospital, community pharmacy, and primary care and provides guidance on a competency framework that supports the development of pharmacists as safe and effective general-level practitioners.[3, 217] The GLF has been adapted for use in Australia,[218] Singapore,[74, 219-221] Croatia,[222-224] and Serbia[225, 226].

With the aim of supporting the educational development of pharmacy practitioners, the FIPEd (FIP Education Initiatives and partnerships with WHO and UNESCO) created a

global competency framework (GbCF).[7] This framework, which works as a mapping tool and changes with the evolution of the profession, contains a core set of competencies included in the standards of practice for pharmacists from countries such as Australia,[11] Canada,[70, 227] New Zealand,[72] Thailand, the United Kingdom,[40, 77] and the USA[78, 79]. In the FIP framework, competencies are described using behavioural terminology. One hundred behavioural competencies are categorized into the main domains of Pharmaceutical Public Health, Pharmaceutical Care, Organization and Management, and Professional/Personal topics.[7]

In Europe, several projects are sponsored by the European Union and European Association of Faculties of Pharmacy (EAFP) with the goal of creating a European competency framework for pharmacy (e.g., PHARMINE, PHAR-QA, PHAR-IN).[228] Inspired by the FIP global competency framework and other competency frameworks, the PHAR-QA project (Quality Assurance in European Pharmacy Education and Training) has been developed.[66] This project aimed to create a harmonized competency framework for pharmacy practice that can be used as the basis for a quality assessment system of university pharmacy education in Europe. Initially, this project produced a list of 27 major competences[b] that reflect a pharmacist's activities, grouped into three domains: Patient Care Competences, Personal Competences, and Management and Organizational Structure Competences. For each of the 27 major competences, an average of five supporting competences resulted, totalling 140 proposed competences for pharmacy practice. After an evaluation of the proposal competences by an expert panel, there were 68 competences for pharmacy practice, grouped into 13 domains.[229] The PHAR-QA project asked European academics, students, and practicing pharmacists (community, hospital, industrial, and pharmacists working in other professions) to rank the competences required for pharmacy practice. The results of PHAR-QA show that competences in the areas of "drug interactions", "need for drug treatment" and "provision of information and service" were ranked highest, whereas those in the areas of "ability to design and conduct research" and "development and production of medicines" were ranked lower.[230] Overall, there is a high level of agreement on the importance of competences among the various areas of

[b] We maintained the terms used by the PHARM-QA project, although we might not agree with them.

pharmacy. There is mainly a consensus between hospital and community pharmacists regarding "patient care".[231] The competences were rearranged in a second round of the project, resulting in 50 competences organized into 11 domains (Personal competences: learning and knowledge; values; communication and organizational skills; research and industrial pharmacy. Patient care competences: patient consultation and assessment; need for drug treatment; drug interactions; drug dose and formulation; patient education; provision of information and service; monitoring of drug therapy).[67, 232] The European Pharmacy Competences Framework defined and ranked the competences required for pharmacy practice in line with the European directive on the recognition of professional qualifications.[20, 232]

Several countries have established or are working to create their own competency frameworks for pharmacists. In Ireland, the aims of the competency framework for pharmacists, inspired by the FIP global competency framework, are to state the educational standards, curriculum development, and learning outcomes for undergraduate students. This framework organizes competencies into six domains: professional practice; personal skills; supply of medicines; the safe and rational use of medicines; public health; organization and management skills). One hundred and seventy-eight behavioural statements are given for each competency to demonstrate how individuals who have a given competency will behave in practice.[71]

In Spain, the CIN/2137/2008 Ministerial order is the Spanish transposition of the European directives, establishing the requirements of the curriculum and competencies that students should acquire for the practice of pharmacy.[75]

In Portugal, the *Ordem dos Farmacêuticos* (the body that regulates the pharmacy profession) has recently created a competency framework to promote excellence in pharmaceutical interventions in various professional areas: community pharmacy, hospital pharmacy, pharmaceutical industry, and regulatory affairs. To acquire each of these competencies, the contents of the programmes are to be taught so that students achieve these competencies.[73]

A recent study compared the Australian, Canadian, British and American pharmacy learning outcome frameworks with the global competency framework from the FIP.

The main finding of that work was an alignment of the same basic elements of public health, pharmaceutical care, and personal attributes described within the GbCF, with the learning outcomes described in each country's framework. Elements such as communication with patients, personal behaviour, safe and effective practice and the updating/renewing of practice and continuing professional education/development appear in all educational learning outcomes frameworks and in the GbCF. The pharmacy curriculum in these countries appears to be in line with the concept of pharmacists as patient-oriented medicines experts. Interestingly, teamwork and leadership, including in the Australian, Canadian and American learning outcome statements, were not mentioned in the GbCF.[10]

Several competency frameworks have been developed for pharmacy practice at the national and international levels, and their implementation and use in pharmacy education has been reported in numerous articles.[30, 80, 170, 233-236] Although the development of a competency framework is important to ensure the acquisition of competencies by graduates, it is necessary that curricula be designed to ensure that students acquire these competencies.[62]

6.2.3.5. Use and misuse of competencies

There is no doubt that education should be based on the acquisition of competencies and that a competency framework may assist in the development of pharmacy curricula. However, it is also important to note that a competency-based education must align "teaching strategies, educational practices, learning opportunities and settings, evaluation system, and research activities with this organizational principle in the curriculum".[65] For that reason, a perfect alignment between competencies and learning contents is crucial for graduates to acquire the necessary competencies for pharmacy practice. However, an ongoing review of undergraduate pharmacy curricula revealed the existence of three different situations. The first of these situations, which is the expected, is an appropriate alignment between competencies and contents. One example of this situation is that of a Canadian university (CAN_0363)[c], in which there is

[c] The authors preferred to keep the identity of the universities used as examples in this chapter hidden and refer only to their internal codes.

an alignment with the AFPC educational outcomes for Canada's entry-to-practice pharmacy programmes.[195] For example, in the "Pharmacy Practice Management" syllabus, there is an alignment between the content of "key concepts related to operational management, strategic planning and marketing strategies and methods to incorporate these concepts into pharmacy practice" and the 4.5 AFPC outcome ("Manage to maintain the sustainability of the practice"). In one Australian university (AUS_0042), there is a perfect alignment between learning outcomes, learning activities and assessment tasks. However, at that university, the learning outcomes used are not exactly the same as those established in the National Competency Standards Framework for Pharmacists in Australia.[11] Instead, this university created its own pharmacy curriculum outcomes.

The second situation is the lack of alignment between competencies and educational contents. Although a given country might have developed a competency framework, the curriculum of a university in that country might not be aligned with it. For example, one Irish university (IRL_1285) ignores the existence of a core competency framework for pharmacists[71] and does not report any alignment between competencies and contents. A similar situation was identified at a New Zealand university (NWZ_1534) that ignores the competence standards for the pharmacy profession.[72]

The third and probably the most worrying situation is the deliberately misleading alignment between competencies and contents. A paradigmatic example of this situation can be seen in Spain. In 2008, an officially approved ministerial order established the competencies that students must acquire for the practice of pharmacy.[75] However, most Spanish universities' syllabi report a misleading alignment between the competencies and their educational contents.[237] For example, a Spanish university (ESP_1741) aligns the "Parasitology" course with competencies such as "learn to apply the scientific method and acquire skills in handling legislation, sources of information, literature, protocol development", "design, prepare, deliver and dispense medications and other health products of interest", "identify, evaluate and assess the problems related to drugs and medications, as well as participate in pharmacovigilance activities", and "develop communication and information skills, both oral and written, to deal with patients and users". Another example is the

frequent alignment of "Biochemistry" with competencies such as "develop communication and information skills, both oral and written, to deal with patients and users" (e.g., in ESP_1737, ESP_1738, ESP_1739, ESP_1741, ESP_1748, ESP_1996), "design, prepare, deliver and dispense medications and other health products of interest" (e.g., in ESP_1737, ESP_1739, ESP_1996), "identify, evaluate and assess the problems related to drugs and medications, as well as participate in pharmacovigilance activities" (e.g., in ESP_1737, ESP_1739, ESP_1996). The most extreme case of this misleading alignment occurs in two Spanish universities (ESP_1737 and ESP_1739) that align "Biochemistry" with all of the general competencies included in the Spanish ministerial order.

Although the definition of a competency framework is necessary for curriculum design, it might not be sufficient. Unfortunately, the previous examples cited here show that some universities do not use the competencies properly. A perfect situation would consist of a robust competency framework produced by the profession, with disciplines having all their course contents perfectly aligned with each topic in the competency framework and having this alignment clearly stated in the course syllabi. To properly create this perfect scenario, competencies and educational content must be mapped into competency frameworks.

6.3. Creating a catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum

6.3.1. Method for creating a catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum

According to the FIP, educational programmes must be designed (curricular content, teaching and learning methodologies, educational outcomes, etc.) to ensure that the competencies needed to enter pharmacy practice are achieved by all graduates. Additionally, "all courses and elements of the curriculum should be 'mapped' (cross-referenced) to the expected competencies and educational outcomes."[62]

From a theoretical point of view, there are three methods of presenting the definition of a curriculum's educational contents. In the first method, a limited number of people

decide what should be taught in the curriculum based on their knowledge, interests and way of thinking. A second method would involve creating an expert panel composed of individuals appointed by professional bodies and employers to determine the necessary profile and job characteristics for pharmacists — that is, the competencies that must be acquired and the educational contents that should be taught to achieve these competencies. A third method is the benchmarking method, which involves analysing what others have done and attempting to adapt their methods with adjustments and improvements.[238]

After more than 40 years of experience in the world of pharmacy practice, it would not be logical to design a curriculum from scratch, and using the benchmarking method to define the educational contents appears to be a more rational method. Thus, we aimed to create a catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum with a method that is free of any bias associated with individual interests, compiling the experiences of countries that have extensively implemented pharmaceutical services.

To create a catalogue of educational contents for a patient-centred pharmacy practice, we used the benchmarking method with the educational contents of pharmacy curricula from Australia, Canada, New Zealand and the USA through a qualitative analysis of the educational contents included in these countries' syllabi for courses in the area of pharmacy practice.

6.3.1.1. Location of educational contents

6.3.1.1.1. Selection of the countries and schools of pharmacy

The selection of Australia, Canada, New Zealand and the USA was based on a) their wide implementation of pharmacy services; b) the official language in these countries is English, the academic *lingua franca*;[136] and c) the fact that these countries' curricula have been transformed consistent with more clinical models, integrating courses from clinical pharmacy and social, behavioural and administrative sciences.

The websites of all schools of pharmacy in Australia, Canada, the USA and New Zealand extracted from FIP Official World List of Pharmacy Schools were searched.[123] Our analysis included schools with curricula in English whose course syllabi were all available online.

6.3.1.1.2. Selection of the courses

For the content analysis, all courses with educational contents in the area of pharmacy practice were included in the study. A course was considered to be in the area of pharmacy practice if its topics were listed under the clinical sciences and social/behavioural/administrative sciences, according to the ACPE "Guidance on the Science Foundation for the Curriculum" (Table 6.1).[37] Courses whose content involved exclusively pharmacology or pharmacotherapy were excluded from the analysis.

Table 6.1 -Foundation in sciences for the pharmacy curriculum suggested by ACPE

Basic Biomedical Sciences	**Pharmaceutical Sciences**
- Anatomy and Physiology - Pathology/Pathophysiology - Microbiology - Immunology - Biochemistry/Biotechnology - Molecular Biology/Genetics - Biostatistics	- Medical Chemistry - Pharmacology - Pharmacognosy and Alternative and Complementary Treatments - Toxicology - Bioanalysis/Clinical Chemistry - Pharmaceutics/Biopharmaceutics - Pharmacokinetics/Clinical Pharmacokinetics - Pharmacogenomics/genetics - Extemporaneous Compounding/Parenteral/Enteral
Social/Behavioural/Administrative Pharmacy Sciences	**Clinical Sciences**
- Healthcare Delivery Systems - Economics/Pharmacoeconomics - Practice Management - Pharmacoepidemiology - Pharmacy Law and Regulatory Affairs - History of Pharmacy - Ethics - Professional Communication - Social and Behavioural Aspects of Practice - Informatics	- Pharmacy Practice and Pharmacist-Provided Care - Medication Dispensing and Distribution Systems - Pharmacotherapy - Pharmacist-Provided Care for Special Populations - Drug Information - Medication Safety - Literature Evaluation and Research Design - Patient Assessment Laboratory

6.3.1.2. Data extraction

For each of the schools, complete programme content for each course was collected regardless of the course title listed on the website (syllabus, course schedule, course

content, course description, etc.). To complete the set of documents provided on the Internet, the email addresses of the professors responsible for each of the courses were found, and they were asked to collaborate by submitting any additional information that would complete the material posted on the Web. If there was no response, the email was resent up to three times at intervals of 7 days.

6.3.1.3. Analysis of the programme content

Using the ACPE "Guidance on the Science Foundation for the Curriculum" as a coding framework, an initial coding tree was created with possible categories in which the educational contents of the evaluated courses could be grouped. A thematic analysis of the educational contents described in the syllabus of the courses included for analysis was performed. Using an iterative process and based on the grounded theory,[239] knowledge was built as the speech information content was evaluated, leading to repeated modification of the coding tree and subsequent re-coding of the content. In the process of encoding, the NVivo programme version 8, 2008 (QRS International Pty Ltd. Melbourne, Australia) was used. Subsequently, MS Excel was used to organize and classify the coded topics.

6.3.1.4. Quality assessment of the coding

To evaluate the completeness of patient-centred educational contents in the undergraduate pharmacy curriculum, a quantitative analysis was performed for 8 schools of pharmacy that provide complete, rich syllabi for all of their courses on their webpage for the academic year 2016/2017 (AUS=2, CAN=2, USA=4). A complete and rich syllabus was defined as one that in addition to describing course content provides information about course goals (competencies) and course objectives (skills, knowledge and attitudes that students need to acquire), units/time required and pre-requisites/co-requisites, instructor contact information, the learning environment (facilities and teaching methods, required and recommended texts, and materials and attire), time schedules/course plans, assessment methods, technical classrooms, and college policy information.[33]

The percentage of patient-centred educational contents in the undergraduate pharmacy curriculum taught at each of these universities was calculated using the final version of the catalogue, which was obtained after cleaning the results of the coding process.

6.4. Findings

6.4.1. Creating a catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum

From the 149 schools of pharmacy included in the list of the FIP for the four countries selected, 110 schools were found appropriate for the study (Australia = 15; Canada = 5; USA = 89; and New Zealand = 1). Of the 8,733 courses that appeared in the teaching programmes of those schools, 1,703 (19.5%) were listed as part of the pharmacy practice area and presented syllabi with detailed information about programme content. The distribution of this percentage was not homogeneous: Australia, 33.2%; Canada, 35.2%; the USA, 18.0%; and New Zealand, 29.6%. In addition, in 595 of these courses, the email address of the professor appeared; that professor was then asked for additional information. Following those requests, 61 (36.1%) of the professors responded to the first email sent, 83 (49.1%) responded after the second request, and 25 (14.8%) responded after the third request. Ultimately, 28.4% (n=169) professors answered the request, and 20% (n=119) sent additional information.

The initial coding tree, created following our interpretation of the ACPE guidelines, had 39 categories organized into 3 hierarchical levels. Given that the qualitative approach allows the addition or modification of the categories during the process of reading the information analysis, the categories were adapted. Following the analysis of the 1,703 syllabi and 119 sets of additional information sent by the professors, a final coding tree with 4 hierarchical levels and 355 content topics was obtained.

The first hierarchical level consists of four large groups in which the area of pharmacy practice, divided as follows: Clinical Sciences Aspects, Social and Behavioural Pharmacy Sciences Aspects, Administrative Pharmacy Sciences Aspects, and Miscellaneous (Table 6.2).

Table 6.2 -Two higher hierarchical levels to code the educational contents for a patient-centred pharmacy curriculum

1.	**Clinical Sciences Aspects**
	1.1. Pharmacy Practice
	1.2. Pharmacist-Provided Care
	1.3. Medication Dispensing and Distribution Systems
	1.4. Patient Assessment
	1.5. Medication and Patient Safety
	1.6. Drug Information and Literature Evaluation
2.	**Social and Behavioural Pharmacy Sciences Aspects**
	2.1. Sociological Aspects of Pharmacy Practice
	2.2. Patient-Reported Outcomes
	2.3. Professional Communication
	2.4. Ethics
	2.5. Public Health
3.	**Administrative Pharmacy Sciences Aspects**
	3.1. Healthcare Systems
	3.2. Economics/Pharmacoeconomics
	3.3. Practice Management and Leadership
	3.4. Pharmacy Law and Regulatory Affairs
	3.5. Informatics and Health Technology
4.	**Miscellaneous**
	4.1. Research Design
	4.2. History of Pharmacy

The “Clinical Sciences Aspects” block is the largest with 6 groups and 29 subgroups, covering topics related to patient care, the processes associated with patient care, and clinical health outcomes. The “Social and Behavioural Pharmacy Sciences Aspects” block, with 5 groups and 18 subgroups, contains topics on the relationship with the patient and society (in the role of public health). The “Administrative Pharmacy Sciences Aspects” block, with 5 groups and 16 subgroups, provides the procedural and technological aspects that support the role of the pharmacist as a health professional. The “Miscellaneous” block includes cross-sectional contents for the blocks above, such as the design and interpretation of research and the history of pharmacy (Table 6.3 to Table 6.6).

Within the subgroups, 355 topics were taught in some of the schools of pharmacy in Australia, Canada, the USA and New Zealand (Appendix 2).

Table 6.3 -Categories of the Clinical Sciences Aspects block

1.	**Clinical Sciences Aspects** (total number of content topics= 154)
1.1.	**Pharmacy Practice**
1.1.1.	Profession of Pharmacy and Contemporary Practice (number of content topics= 8)
1.1.2.	The Role of the Pharmacist on the Healthcare Team (number of content topics= 4)
1.1.3.	Areas of Practice and Career Paths (number of content topics= 3)
1.2.	**Pharmacist-Provided Care**
1.2.1.	Introduction to Pharmacist-Provided Patient Care and Patient-Centred Pharmacy Services (number of content topics= 5)
1.2.2.	Counselling and Patient Education (number of content topics= 8)
1.2.3.	Advising Symptoms and Self-Care (number of content topics= 6)
1.2.4.	Health Promotion and Preventive Care Services (number of content topics= 6)
1.2.5.	Disease State Management - Follow up (number of content topics= 5)
1.2.6.	Medication Management Service (number of content topics= 4)
1.2.7.	Improving Adherence (number of content topics= 7)
1.2.8.	Clinical Interventions Service (number of content topics= 3)
1.2.9.	Medication Use Process and Quality Use of Medicines (number of content topics= 4)
1.3.	**Medication Dispensing and Distribution Systems**
1.3.1.	Prescription Process (number of content topics= 3)
1.3.2.	Preparation and Dispensing of Prescriptions (number of content topics= 7)
1.3.3.	Distribution Systems (number of content topics= 8)
1.3.4.	Drug Administration (number of content topics= 2)
1.4.	**Patient Assessment**
1.4.1.	Obtaining a Patient History (number of content topics= 5)
1.4.2.	Patient Screenings (number of content topics= 8)
1.4.3.	Physical Assessment (number of content topics= 6)
1.5.	**Medication and Patient Safety**
1.5.1.	Medication Errors (number of content topics= 11)
1.5.2.	Patient Safety (number of content topics= 5)
1.6.	**Drug Information and Literature Evaluation**
1.6.1.	Drug Information Concept and Applications to Clinical Practice (number of content topics= 3)
1.6.2.	Drug Information Resources (number of content topics= 6)
1.6.3.	Asking and Answering Drug Information Questions (number of content topics= 5)
1.6.4.	Drug Literature Evaluation (number of content topics= 5)
1.6.5.	Evidence-Based Clinical Practice (number of content topics= 5)
1.6.6.	Professional Writing (number of content topics= 4)
1.6.7.	Pharmacy and Therapeutics Committee (number of content topics= 3)
1.6.8.	Health Information (number of content topics= 5)

Table 6.4 -Categories of the Social and Behavioural Pharmacy Sciences Aspects block

2.	**Social and Behavioural Pharmacy Sciences Aspects** (total number of content topics= 83)
	2.1. Sociological Aspects of Pharmacy Practice
	2.1.1. Sociological, psychological, and behavioural aspects of pharmacy practice (number of content topics= 7)
	2.2. Patient-Reported Outcomes
	2.2.1. Patient Humanistic Outcomes (number of content topics= 6)
	2.3. Professional Communication
	2.3.1. Communication Concepts (number of content topics= 6)
	2.3.2. Patient Communication (number of content topics= 4)
	2.3.3. Interprofessional Communication (number of content topics= 4)
	2.3.4. Active Listening and Empathic Responding (number of content topics= 2)
	2.3.5. Assertiveness and Resolving Conflicts (number of content topics= 2)
	2.3.6. Special Communication Situations (number of content topics= 4)
	2.3.7. Presentation Skills (number of content topics= 3)
	2.4. Ethics
	2.4.1. Ethical Concepts (number of content topics= 8)
	2.4.2. Personal and Professional Conduct (number of content topics= 5)
	2.4.3. Ethical Problems and Dilemmas (number of content topics= 4)
	2.4.4. Privacy of Health Information (number of content topics= 3)
	2.4.5. Ethics in Research (number of content topics= 2)
	2.5. Public Health
	2.5.1. Public Health Pharmacy (number of content topics= 11)
	2.5.2. Epidemiology and Pharmacoepidemiology (number of content topics= 5)
	2.5.3. Pharmacovigilance (number of content topics= 4)
	2.5.4. Infection Prevention and Control (number of content topics= 3)

Table 6.5 - Categories of the Administrative Pharmacy Sciences Aspects block

3.	**Administrative Pharmacy Sciences Aspects** (total number of content topics= 100)
3.1.	**Healthcare Systems**
	3.1.1. Healthcare Delivery Systems (number of content topics= 11)
3.2.	**Economics/Pharmacoeconomics**
	3.2.1. Economic Principles (number of content topics= 5)
	3.2.2. Health Economics (number of content topics= 5)
	3.2.3. Concepts of Pharmacoeconomics (number of content topics= 7)
3.3.	**Practice Management and Leadership**
	3.3.1. Pharmacy Management and Leadership Concepts (number of content topics= 9)
	3.3.2. Pharmacy Business (number of content topics= 9)
	3.3.3. Pharmacy Practical Operations (number of content topics= 11)
	3.3.4. Accounting and financial management (number of content topics= 5)
	3.3.5. Human Resources (number of content topics= 4)
	3.3.6. Personal and Professional Management (number of content topics= 6)
	3.3.7. Marketing and Promotion (number of content topics= 5)
	3.3.8. Professional Effectiveness (number of content topics= 4)
3.4.	**Pharmacy Law and Regulatory Affairs**
	3.4.1. Health and Drug Policy (number of content topics= 6)
	3.4.2. Pharmacy Law (number of content topics= 6)
3.5.	**Informatics and Health Technology**
	3.5.1. Pharmacy and Health Informatics (number of content topics= 4)
	3.5.2. Health Technology (number of content topics= 3)

Table 6.6 - Categories of the Miscellaneous block

4.	**Miscellaneous** (total number of content topics= 18)
4.1.	**Research Design**
	4.1.1. Introduction to medical research (number of content topics= 6)
	4.1.2. Biomedical studies (number of content topics= 4)
	4.1.3. Statistical principles and data analysis (number of content topics= 3)
4.2.	**History of Pharmacy**
	4.2.1. History of pharmacy profession (number of content topics= 5)

The catalogue of contents presented in this book should not be viewed as a curricular plan, and the categories presented do not represent disciplines. The topics presented here resulted from an extraction, coding, and synthesis process of the educational contents included in the course syllabi analysed.

The categories and educational contents presented in this catalogue do not correspond to a list of topics in hierarchical order of importance.

To create a pharmacy curriculum that prepares students for a patient-centred practice, it would be necessary to allocate the educational contents in this catalogue to the courses and to align that content with corresponding competencies. For each course, a complete syllabus should be created presenting general course information; the instructional team; the course purpose; the course objectives and specific learning outcomes (competencies); a description of educational contents to achieve these competencies (topics and learning activities), a time schedule or course plan; information about the learning environment; student assessment and grading; technical, classroom, and academic policy information; and ethical and professional conduct.

6.4.2. Quality assessment of the process

To obtain a proxy for assessing the quality of the catalogue-compilation process, a quantitative analysis was performed to determine the proportion of the 355 topics that were taught in each of the 8 schools of pharmacy and whether they were taught in a superficial or in-depth manner. We considered a topic to be superficially taught if only the name of the topic was mentioned in the syllabus. Another criterion that helped us decide whether a topic was covered superficially or in-depth was the number of hours dedicated to each theme. If the syllabus included good coverage of the details described in the catalogue of contents for each of the 355 topics, the content was considered in-depth. For example, if a particular topic was taught for 5 minutes in one university and 2 hours in another university, we would conclude that the second university taught the topic in more depth.

The results show that although the four countries have a curriculum that prepares students for a patient-centred practice, all of them could still be improved (Table 6.7).

This analysis is subject to a reporting bias because it was based only on what has been reported through the course syllabus of all disciplines of the undergraduate pharmacy curriculum. Contents not clearly described in the course syllabus may have led to an underestimation of the amount of educational contents taught.

It is also important to consider that the curriculum analysis of these 8 schools of pharmacy may have overestimated the percentage of patient-centred content provided to an individual student because we analysed the syllabi of all courses, including the syllabi of electives courses. Since it is not possible for students to choose all of the elective courses, none of them could complete all of the patient-centred topics taught at their university.

Table 6.7 -Percentage of topics included in the catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum taught at the analysed universities[d]

	AUS_0028	AUS_0038	CAN_0363	CAN_0366	USA_1884	USA_1923	USA_1941	USA_1951
Number of contents taught superficially	104	132	167	168	158	190	160	179
Number of contents taught in depth	55	30	54	94	94	65	126	59
Total	159	162	221	262	252	255	286	238
%	44,78	45,63	62,25	73,8	70,98	71,83	80,56	67,04

6.5. Recommendations

- Pharmacists are healthcare professionals, and their education and training must be patient-centred. The entry-level degree for the profession is limited in duration, so it is necessary to ensure an adequate balance between the basic sciences and clinical sciences.
- Education should be based on the acquisition of competencies, and a competency framework assists in the development of pharmacy curricula. Competency frameworks should not be created by universities alone but in collaboration with professional societies and employers. Employers and regulators should define job profiles and corresponding competencies required for a pharmacist position.

[d] The authors preferred to hide the identity of the universities analysed by using only their internal codes.

- Universities must follow competency-based education, but each competency must be perfectly aligned with the educational contents that are necessary for students to achieve it.

Future works:

- The content catalogue resulting from this benchmarking exercise could be considered a contribution to the creation of a pharmacy curriculum that prepares students for a patient-centred practice. It is now necessary for a panel of experts in each of the major categories to develop the contents, align them with the corresponding competencies, estimate the workload required for instruction, assign tasks to be completed by the students, and stipulate in which courses should be taught.
- This catalogue of educational contents can also be used as an instrument to check the completeness of patient-centred educational contents in any university's undergraduate pharmacy curriculum.

7. TEACHING PHARMACEUTICAL CARE AT UNIVERSITY LEVEL

Text submitted to the book chapter entitled “Teaching Pharmaceutical Care at University Level”

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Abstract: The practice change and needs of the pharmacy profession has created a shift in pharmacy education. Schools of pharmacy globally attempt to respond to the recommendations issued by the WHO and FIP, by modifying their curricula, especially with the introduction of clinical and social content. However, it appears that pharmacy education in Europe, compared to the USA, maintains a greater focus on basic sciences. Competency frameworks for pharmacy education and practice have emerged. Their use in curriculum development is extremely important, but to ensure that the competencies are achieved by graduates to enter pharmacy practice, the syllabi must align competencies, educational contents, learning activities and assessment tasks. The teaching of pharmaceutical care benefits from the use of active learning methods, such as problem-based learning and team-based learning, allowing students to develop skills of communication, teamwork, and critical thinking. Although curriculum integration presents some implementation difficulties, its use allows students to integrate concepts from different areas throughout the curriculum. The use of assessment methods based on student performance, such as OSCE and OSATS, is most appropriate to evaluate students regarding the development of competencies in relation to pharmaceutical care and technical skills.

Keywords: Pharmaceutical care; Education pharmacy; Academic education; Competency framework; OSCE.

7.1. Pharmaceutical care in the academic pharmacy education

Following the shift from a product-centered to a patient-centered practice, international organizations such as the World Health Organization (WHO) and International Pharmaceutical Federation (FIP), recommended pharmacy education should mirror these changes. In 1993, at the second meeting on "The role of the pharmacist: quality pharmaceutical services – benefits for governments and the public", the WHO established a list of recommendations that the profession and educators should follow to provide pharmacists with pharmaceutical care skills.[52] The first recommendation emphasized the continuous review of the outcomes, content, and process of the undergraduate curriculum, to ensure pharmacy education prepares graduates to practice pharmaceutical care. For this, it is necessary to ensure an adequate balance of curricular contents of basic sciences, pharmaceutical sciences, biomedical and clinical sciences, socioeconomic and behavioral sciences with practical experience. The introduction of courses related to the implementation of patient-centered care, such as communication, was also recommended. In addition to these curricular changes, it was also suggested more practical and problem-oriented teaching methods, interprofessional education, and a clinical internship period was necessary for achieving competencies in pharmaceutical care. In the field of continuing education and postgraduate studies, the WHO also recommended adopting the philosophy of pharmaceutical care.[52]

7.1.1. WHO and FIP pressure

In 1997, the WHO continued emphasizing the need for an education that allows students to obtain the knowledge, skills, attitudes, and behaviors for the practice of pharmaceutical care. Although each country has its own educational needs, related to its own context, the WHO recommended that there are common core elements essential to all pharmacy curriculum. For example, educational results can be related to the concept of the seven-star pharmacist (caregiver, decision-maker, communicator, leader, manager, lifelong-learner, and teacher), educational methods should become

student-centered, and educators should continually update the curriculum as a dynamic process to meet the changing needs of the profession.[55]

FIP also recommended improvement of pharmacy education, stressing the importance of clinical education and patient-centered care curricula. In the curriculum design, FIP proposed that educators ensure that the competencies required to enter pharmacy practice are attained by all graduates. For that, schools of pharmacy should: "systematically evaluate and validate its curricular structure, content, organization, teaching and learning methodologies, and outcomes".[62]

7.1.2. Changes in pharmacy education around the world

Pharmacy schools around the world attempted to respond to WHO and FIP recommendations through changes in pharmacy education. The curricula of countries such as Australia, Canada, the United States and New Zealand have undergone notable changes with the introduction of disciplines from the clinical pharmacy and social, administrative and behavioral pharmacy areas.

In the United States the main change in pharmacy education was the creation and implementation of the doctor of pharmacy (PharmD). This program is the sole degree required to enter professional practice, and should follow the Accreditation Council for Pharmacy Education (ACPE) standards and guidelines. The ACPE requires at least two academic years or the equivalent college-level course work prior to the admission into a PharmD program (4 academic years). The pharmacy curriculum was designed to comprise an appropriate balance of biomedical, pharmaceutical, social/behavioral/administrative, and clinical sciences, and an integration of pharmacy practice experiences in different settings.[37] Currently, only some Canadian pharmacy schools offer a PharmD degree. However, the Association of Faculties of Pharmacy of Canada recommended that all pharmacy schools change the entry-to-practice degree for pharmacy from the Bachelor of Science in Pharmacy to the PharmD by the year 2020. Other countries such as Japan, Saudi Arabia and Thailand have also adopted the PharmD as their entry-level degree for the profession.

In Europe, the ministers of education from 29 countries signed the Bologna Declaration in 1999, creating the European Higher Education Area (EHEA).[18] With the Bologna Declaration the European higher education institutions work in an integrated and harmonized way, allowing students from any European university to begin, continue, and complete their education and obtain a European diploma that would be recognized in any of the EHEA universities. To make this possible, a system that encompasses easily comparable degrees was adopted among the EHEA Members States. This system was based on two main cycles (undergraduate and graduate) and a system of credits (ECTS - European Credit Transfer and Accumulation System) was established.[18] Presently, 48 Member States participate in the Bologna process. As a result of the Bologna process, the European Parliament and the Council of the European Union has approved legislation on the recognition of pharmacist professional qualifications, defining knowledge, skills, and core competencies that pharmacy students must achieve to become pharmacists.[39] The pharmacy degree became organized into two training cycles with the duration of at least five years, including a six-month traineeship at a community or hospital pharmacy during or at the end of the program. At the end of the five years of study, a total of 300 ECTS is required to complete the pharmacy degree. Following the Bologna Declaration, the European pharmacy schools conducted curricular revisions, including the introduction of some clinical sciences and social aspects associated with pharmaceutical practice. However, despite these changes, European pharmacy education maintains a greater focus on basic sciences and a lower emphasis on patient-care centered course load compared to the United States pharmacy curricula.[174] This suggests that European countries should consider reviewing their pharmacy curriculum so as to comply with the WHO and FIP recommendations.

7.1.3. Competency frameworks in pharmacy education

A curriculum must be developed taking into account the needs of society as to prepare students with the necessary competencies to respond to the individual patient and to population health-related needs.[55] When developing a curriculum, these competencies must be expressed in course curricula or discipline syllabi. The syllabus is an important document that includes the course plan, and works as a tool that improves student

learning, assists faculty teaching, promote communication between faculty members about courses, and increases curricular quality. A course syllabus should contain information such as general course information, course instructional team, course goals, course objectives (skills, knowledge and attitudes that students need to acquire), description of course content including the sequence of topics/readings and learning activities/assignments, time schedule, learning and teaching methods, student assessment and grading, and academic policy information. Competencies should direct the syllabi that in turn inform the alignment of learning outcomes, learning activities and assessment.

The development of competency frameworks for pharmacy education and practice has emerged worldwide, and is established in countries such as Australia, Canada, Ireland, New Zealand, Portugal, Singapore, Spain, Thailand, the United Kingdom, and the United States. The global competency framework created by FIPEd (FIP Education Initiatives and partnerships with WHO and UNESCO), contains a core set of competencies that can be used to indicate the achievement by graduates to enter pharmacy practice. This framework serves as a mapping tool and undergoes changes with the evolution of the pharmacy profession.[7] Other competency frameworks for pharmacy education and training have also been developed, for example, the PHAR-QA project in Europe that is used as a quality assurance system of pharmacy education.[229]

Competency frameworks are extremely important in guiding curriculum development, but it is critical to ensure that students' actually achieve these competencies. However, the translation of frameworks into practice competencies does not always occur, and there are reports of competencies misuse.[171] Ideally, the competency framework should be created by the profession, and disciplines should have their programmatic content perfectly aligned with each topic of the competency framework.[171]

7.1.4. Pharmaceutical care educational contents in the pharmacy curriculum

With the aim of assisting in the creation of an undergraduate pharmacy curriculum, which focuses on preparing students for a patient-centered practice, a catalog of educational contents was created through a qualitative analysis of the educational

contents included in the syllabi of the disciplines from undergraduate pharmacy curriculum in Australia, Canada, New Zealand and the United States.[171] The selection of these countries was based on the fact that they have a wide implementation of pharmacy services and have undergone a curriculum change to incorporate more clinical models. All courses with patient-centered educational contents (topics described under clinical sciences and social/behavioral/administrative sciences) were included for content analysis. Educational content related to pharmacy practice were analyzed and extracted from 1703 syllabi belonging to 110 pharmacy schools in Australia, Canada, New Zealand and the United States. Using the ACPE "Guidance on the Science Foundation for the Curriculum"[37] as a coding framework, a final coding tree with 4 hierarchical levels and 355 topics of educational contents for a patient-centered undergraduate pharmacy curriculum was created. The first hierarchical level comprises four main groups in which the area of pharmacy practice could be divided: 1) Clinical Sciences Aspects, covering topics related to patient care, the processes associated with patient care, and clinical health outcomes; 2) Social and Behavioral Pharmacy Sciences Aspects, includes topics on the relationship with the patient and society (in the role of public health); 3) Administrative Pharmacy Sciences Aspects, covering procedural and technological aspects that support the role of the pharmacist as a health professional; 4) Miscellaneous, including cross-sectional educational contents for the groups above, such as the design and interpretation of research and the history of pharmacy. Table 6.2 shows the two higher hierarchical levels of educational contents for a patient-centered pharmacy curriculum.[171] Universities should follow competency-based curriculum design, but each competency must be scrupulously aligned with the corresponding educational contents.

7.2. Teaching and learning methods

Teaching methods are the principles and strategies used by instructors to promote student learning. In addition to facilitating the achievement of learning outcomes, teaching methods can help students engage in the learning process, support their responsibility for self-directed learning, and promote peer interaction and collaboration.

Teaching philosophies can be divided into teacher-centered approaches and student-centered approaches. A teacher-centered instruction model emphasizes the lecturer taking a more authoritarian role and assuming control of the classroom, while students act as passive subjects who receive information provided by the professor through lectures, with a final aim of assessing their knowledge. In teacher-centered education the student engagement in the learning process, participation in the class, and the development of communication and teamwork skills is low. The transition to a student-centered teaching model has several advantages, beginning with responsibility for the learning process. The role of the instructor changes from authoritarian to facilitator leading to an increase in student participation, responsibility for self-directed learning, and involvement in the assessment process. In a student-centered model, teaching and assessment are linked since student learning is measured continuously during the teaching process. The use of a student-centered approach to learning, with the use of active learning strategies, seems to be more appropriate for the patient-centered education aimed for in pharmaceutical care.

7.2.1. Different teaching methods

Different teaching methods relate to different contexts, and the chosen teaching method (or mix of methods) depends mainly on the subject area being taught and the characteristics of the learners. Additionally, the educational philosophy and beliefs of the teacher, the teaching context, the resources available, and the school mission are several factors that influence the choice of a particular teaching method.

Higher education institutions and teaching methods have evolved according to the social, economic and political context. Until the nineteenth century, the lecture was the most traditional method used in the classroom teaching. In the late twentieth century with the rise of the digital age, new teaching methods began to emerge. The presence of technology in the classroom for teachers and learners has become commonplace, including laptops, tablets, mobile phones, and digital projection of content (e.g. PowerPoint®). The focus of teaching has changed from the simple transmission of information to knowledge management, “where students have the responsibility for finding, analyzing, evaluating, sharing and applying knowledge, under

the direction of a skilled subject expert".[240] The use of active learning strategies engages and motivates learners and assists them in understanding and retaining information. These new strategies include laboratory experiences, case studies, small-group discussions, brainstorming of ideas, games, peer teaching, role-plays and other practice-based exercises. In active learning the instructor must carefully structure the activities in which the learner will be involved, such that regardless of the methods used, the student is actively engaged in the educational process.

With the educational evolution from basic sciences to clinical and integrated courses, the use of active learning strategies in pharmacy education was essential to provide pharmacy graduates with the necessary integration of knowledge, skills, attitudes, values and behaviors to a patient-centered practice. According to the Standards for Curriculum published by ACPE, the pharmacy curriculum should promote lifelong professional learning through an emphasis on active, self-directed learning.[37] The integration of active learning strategies in the didactic and practice-based coursework is fundamental to the development of critical thinking, problem-solving skills, communication, and teamwork; all which construct the foundation of the effective delivery of pharmaceutical care.

There are numerous studies that address the implementation of active learning methods in pharmacy education such as problem-based learning, team-based learning, case-based learning, cooperative learning, project-based learning, simulation-based learning, ability-based education and assessment-as-learning, game-based learning, and blended-learning. The next section will focus on the most widely used teaching methods in pharmacy education that prepare students for a patient-centered practice.

7.2.1.1. Lecture-based learning

Lecture-based learning (LBL) is a traditional method where the instructor is in the center of the teaching approach. In this passive learning method, the instructor delivers the information to students who receive and attempt to memorize the content. During the lecture, the students can take notes while they are listening to the instructor, but there is less opportunity to interpret and use concepts. There tends to be poor engagement with the students with LBL and student attention and retention

of information decline progressively after the first 10 minutes of lecture. Although this teaching method is not the most appropriate to provide pharmaceutical care skills to graduates, it is one of the oldest methods and is still widely used in pharmacy education. It is a highly effective and efficient method of transmitting information to a large group of individuals, does not involve a large investment in material resources, and if the instructor is a good speaker, can captivate the audience. To make the LBL method more effective, the instructor can incorporate some active learning strategies during the lecture. For example, the use of question-and-answer techniques and group discussions increases feedback between the teacher and students, and helps to absorb and understand the information. In addition, if the instructor introduces real-life examples during the class, it may be easier for students to understand the information and relate to practice.

7.2.1.2. Problem-based learning

The problem-based learning (PBL) model emerged in 1969 in the medical education at McMaster University in Canada. Since then, this method has been used among health sciences education programs successfully. An example of the student-centered PBL approach is the case-studies model where a small group of learners, usually less than ten, are guided through a patient encounter by a faculty facilitator. A typical scenario of PBL is as follows: In the first class of the week, a case is presented to the students. During this week the students discuss the case and research the issues that arise, then present their interpretation in the second class of the week. Each week a new case is presented to the students along with a list of learning objectives which align with the corresponding educational content. The purpose of PBL is not to simply focus on problem solving, but also for students to recognize their own learning needs as they make efforts to understand the problem. At the same time they gather and synthesize information and deepen concepts related to the problem, they apply a self-directed learning approach and enhance while enhancing group collaboration and communication skills, ultimately assuming responsibility for their learning.

Schools of pharmacy have implemented PBL in their curricula to be in line with the demand of the pharmacy profession, producing graduates that may be better

prepared to provide quality pharmaceutical care. In the literature there are several reports of the implementation and use of the PBL method in pharmacy education to supplement the traditional learning approach. For example, the University of Mississippi employs the PBL model in the third year of the professional degree in a course called “Pharmaceutical Care”. In this course series, the educational contents previously covered in different courses were integrated into clinical case scenarios and discussed by students in small groups oriented by a faculty facilitator.[241]

Although the inclusion of the PBL method in the curriculum has several advantages, there are some barriers and limitations to its implementation and use. This method requires more human resources and more time invested by faculty in the preparation of patient cases. There needs to be a transition amongst the faculty to move from a traditional teaching method to a more innovative and active teaching approach, which may be opposed by faculty who have successfully instructed their students for decades through LBL. Also, students are not always receptive to PBL because of their comfort as a passive learner. PBL also requires educational institutions to be well equipped with the necessary resources of books, journals, computers, and internet access which allows students to research effectively. However, if the students are not properly resourced or guided by the instructors, they could be overwhelmed with the information they identify. The use of PBL also requires instructors to change the student assessment, which usually requires lengthy grading of cases, redirecting learning and research, and incorporating the evaluation of non-content characteristics such as participation, team-work, and communication.

7.2.1.3. Team-based Learning

Team-based learning (TBL) is an active teaching method originally developed by Larry Michaelsen in the late 1970s when he was a professor of business at the University of Oklahoma and later adopted by health professions education.

TBL strategically organizes students into teams of 5 to 7 students with diverse backgrounds that remain fixed throughout the entire term. Furthermore, the educational course content is structured into main units or course blocks (6-10 hours of coursework) with the goal of developing team learning simultaneously as students

achieving course objectives. TBL consists of three phases: the preparation, the readiness assurance process (RAP), and the application. In the first phase, prior to class, the students read and study the assigned materials related to the unit of study. The second phase occurs in the classroom where students are assessed, usually by multiple-choice quiz, about the material studied previously provided. The students may then initiate an individual readiness assurance test (RAT) and subsequently answer the same RAT as a team where they reconcile their individual answers with the team. The instructor provides immediate feedback on their performance and clarifies doubts that have arisen during assessment with both individual and team RAT contributing to the final grade. In the last phase of the TBL method, students apply concepts and content that they have learned and tested to real-world problems through discussions, team activities and exercises. The engagement of students with the TBL is higher, since the students spend more time in the preparation of the class and take more accountability for their own learning.

Several pharmacy schools in the United States have incorporated the TBL method into their curriculum to be in line with the ACPE Standards, which recommend active learning strategies that develop critical thinking, problem-solving, communication and teamwork skills. The incorporation of TBL in pharmacy education provides for self-directed learning and allows students to solve clinical problems while they build teamwork skills, essential to the delivery of patient-centered care as a member of the health care team.

The limitations to the implementation and use of the TBL method are similar to PBL and include faculty resistance, lack of training, increased workload, and the costs of the resources needed to facilitate. As an economical alternative to the digital learning management systems, paper can be used to respond to the RATs, although it takes more time for the instructor to give feedback to the students and to grade them.

TBL with PBL have been compared extensively in academic literature, however, the main differences of the TBL method are the four essential principles: (1) creation and management of heterogeneous teams; (2) students are responsible for their individual and team work; (3) students should receive frequent and immediate feedback; and (4)

group application activities must be designed to promote learning and team development. The TBL requires that students to attain knowledge before the class, while in PBL a new 'problem' is presented to the students during the class where only after they apply a self-directed study to resolve it. In TBL, the instructor facilitates the discussion after all teams have submitted solutions (one instructor per classroom); in PBL the instructor facilitates each team during the discussion (one instructor per group). Although the application of these two teaching methods differs, they both highlight critical thinking, communication skills and student responsibility and engagement in their learning.

7.2.1.4. Game-based learning

The use of educational games as a teaching method in pharmacy education is progressively increasing. Two different systematics reviews have been conducted with the aim of analyzing educational games adopted in pharmacy schools and to evaluate the effects of implementing games in the pharmacy curriculum.[242, 243] Different games have been used to introduce active learning into the curriculum to engage and motivate student learning. The literature identifies and describes the implementation of games such as bingo, Clue®, crossword puzzles, quiz shows, card/board games, and simulation games. For example, the University of Florida College of Pharmacy has created an educational tool, called Medication Mysteries Infinite Case Tool, for teaching pharmacy students to conduct medication history interviews and to perform medication reconciliation.[244]

Although more studies are needed to prove that the use of games as a teaching method improves students' learning, the literature shows that students enjoy these strategies and their motivation, interaction and participation in the class are stimulated. While playing, students develop critical thinking, communication skills, and social collaboration, fundamental to the practice of pharmaceutical care. Another advantage of the game-based learning is that the instructor could use real-world situations but in a safe environment, being less stressful to the students.

The main limitations to the implementation and use of educational games as a teaching method relate to the challenge of designing an effective game, the time

consumed, and the costs involved. Additionally, some games are difficult to apply in large classrooms, they may require the presence of more than one instructor for facilitation and moderation of the game, and some students may take the competition too seriously, increasing their anxiety and conflict.

7.2.1.5. Blended-learning

Internet-based learning (e-learning) has emerged as an innovative method in which teaching is conducted online through internet-based tutorials, online reading materials, virtual patients, e-mail, online forums, videoconferences, online chat, and instant messaging. Through this method the communication between instructor and students can be synchronous, involving real-time interaction between participants over the internet (e.g. videoconference), or asynchronous, where instructor and student are not online at the same time (e.g. e-mail). The main advantage of the e-learning method is the access to educational content can occurs anytime and anywhere, depending only on internet access and the equipment necessary to access the internet.

In pharmacy education this distance method is widely used for continuing education programs. However, the lack of interaction between students and instructor makes this method less appropriate to obtain the skills needed for patient-centered practice. As an alternative to e-learning, the blended-learning (b-learning) method emerged. Blended learning is a student-centered learning approach that combines online resources with face-to-face classroom methods. With this model, also known as the 'flipped classroom', the instructor makes the educational content available online. The students study the lecture material at home before class and during the class they apply the knowledge through work assignments.

Some studies have described the implementation and use of b-learning in pharmacy education. For example, in the University at Buffalo School of Pharmacy and Pharmaceutical Sciences, a b-learning model that combines online videos with TBL, case-based learning and clinical skills laboratory was integrated into a "patient assessment" course sequence in the first-professional year. This approach was well received by students and related with improved academic performance.[245] A list of

best practices for the use of blended learning in pharmacy education was recently published, containing advice such as: the inclusion of a schedule of the course activities on the syllabus, including a length of time for out-of-class activities; availability of materials on the online platform at least two weeks prior to the classroom lesson; review of the difficult content topics at the beginning of each class.[246]

Although the b-learning method offers the advantages described above for the active methods, the main disadvantages are the high costs related to the preparation of online materials, costs of maintaining an electronic learning platform, and faculty online time. It should also be taken into account that technological resources should be affordable, reliable, up to date, and easy-to-use for students and instructors. Finally, the impact of blended learning on the student's ability to deliver pharmaceutical care has not been evaluated and creates opportunities for future academic research.

7.2.2. Integrative teaching and learning in pharmacy education

The ACPE standards state that graduates must develop, integrate, and apply basic sciences knowledge to solve clinical problems, which has led to most colleges of pharmacy in the United States to develop some approach to integrate their curriculum. This educational strategy allows for the integration of contents from the basic sciences with clinical sciences, subsequently combining theory and practice, enabling a better assimilation and application of concepts by the students. Also a pharmacy curriculum with a complete integration of biomedical, pharmaceutical, social/behavioral/administrative, and clinical sciences was developed.[215] Evidence from the literature suggests that by integrating curricular content, students learn and understand concepts more quickly and easily by identifying connections from various areas across the curriculum. Additionally, curricular integration supports the development of problem-solving skills where students can apply basic science concepts to solve drug-related problems.

A curriculum can have 'horizontal integration', when related educational content from different courses are taught at the same time, or 'vertical integration', when content

are taught at different stages of the program. A 'spiral curriculum' model occurs when horizontal and vertical integration are adopted. Following this approach, at the beginning of the program, content and concepts are taught in a simpler way, increasing complexity over time. In curricular integration, it can be useful if the educational contents are organized by themes, such as discipline, organ system, chronological, and problem-based themes. Durham University in the United Kingdom has applied curriculum integration where modules are organized according to body systems, where each module does not correspond to a specific discipline, but is rather organized around the management of diseases specific to an organ system. For example, in studying the cardiovascular system, the student addresses hypertension taking into account pathology, public health, pharmacology, therapeutic drug monitoring, drug formulation and clinical therapeutics. The modules are linked to each other, and material is recurrently reintroduced throughout the program in more complex clinical situations. The curriculum works as a whole instead of the sum of the parts.[247]

Despite the benefits of curricular integration in pharmacy education, the implementation of an integrated curriculum presents some limitations. The main barriers are the complex design process, the need to develop integrative pedagogical and evaluation strategies, and the time and resources consumed. Other obstacles to curricular integration are that traditionally, academic institutions are discipline-based, instructors from basic sciences and clinical sciences express different interests in this teaching model, and student's resistance to a new pedagogy.

7.3. Assessment methods

The students' assessment process and the methods of reporting students' results is a fundamental part of the teaching and learning process. Assessment methods are strategies and instruments used to determine whether students have achieved the desired course learning objectives and is characterized by being a systematic and continuous process, which enhances student learning, and focuses on the improvement of curricular programs.

According to ACPE standards, every pharmacy school must develop and implement a plan to assess the attainment of educational outcomes to ensure that graduates are fit for practice. This assessment plan should combine systematic, valid, and reliable knowledge-based and performance-based formative and summative assessments. The assessment of student learning must comprise “student self-assessments and faculty and preceptor assessments of student development of the professional competencies and demonstration of professional behaviors”. In addition, the instructor may document, for example, in student portfolios that graduates have achieved the desired competencies.[37]

In 1990, George Miller responded with the article “The assessment of clinical skills/competence/performance”. Miller presented a framework for clinical assessment, which consists of a pyramid describing clinical competence with four hierarchical levels (Figure 7.1). At the base of the pyramid is the knowledge (knows), followed by competence (knows how), performance (shows how), and action (does).[248] The “knows” represents the knowledge that a student must achieve, and the “knows how” is the interpretation and application of this knowledge. These two base levels are within the scope of cognitive knowledge, and could be assessed using traditional assessment methods with written tests, multiple choice questions and oral exams. The “shows how” level is where students can demonstrate what they have learned and can be assessed in controlled situations through lab practicals, simulations, objective structured clinical examinations (OSCE), and objective structured assessment of technical skill (OSATS). The “does” corresponds to what happens in real life practice and assessing the performance in the work environment. The upper two levels of the pyramid are related to behavioral components. Research shows that the cognition area (“knows” or “knows how”) and the behavior area (“shows how” or “does”) have a weak correlation. For example, a pharmacy student who knows how to do a certain task does not automatically mean that they will perform as a competent pharmacist in practice. In order to help students to apply their knowledge in real life – to be competent – it is critical to select methods that allow them to "show" and "do".

There are several methods to assess student learning outcomes and the selection of the assessment method depends on the learning outcome supposed to be tested. The

use of multiple methods in the student evaluation process could be useful to ensure that all student learning outcomes are assessed, sometimes termed as 360 degree assessment. There are direct and indirect methods of assessment. While in the first, the students are asked to demonstrate their learning (e.g., tests and presentations), in the second, the students are asked to reflect on their learning (e.g., course evaluation survey and syllabus review).

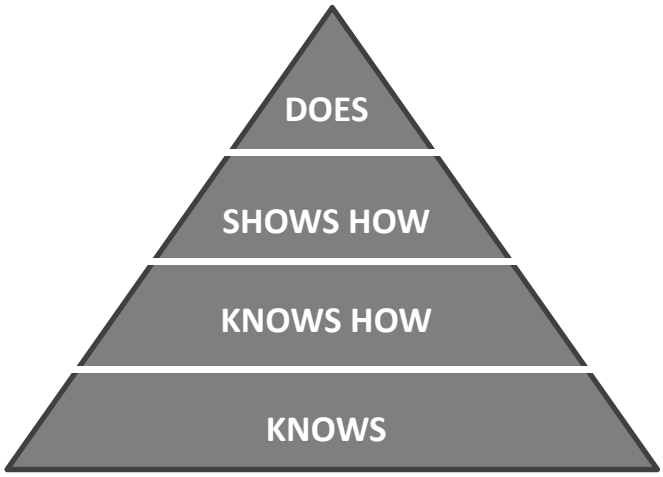

Figure 7.1 - Miller´s pyramid of clinical competence

The students' assessment could be formative or summative. The formative assessments observe and help inform the student learning during the teaching-learning process, while the summative assessments occur at the end of a program or course. Formative assessments (also known as "low-stakes") are used for collected information and feedback about the students' progress in the course, such as what they know and can do, if they have misunderstandings or any learning needs, and if some gap on the educational process exists. This type of information allows the teacher to adopt strategies that improve the students learning. There are several examples of formative assessment techniques such as: prior knowledge assessment; written reflections such as minute paper or muddiest point; "wrappers" (set of reflective questions); case studies; and checks for understanding using audience response systems (used for quizzes, voting, and active learning). The summative assessments ("high-stakes") are used with accountability purpose to check what

students have learned and what they are able to do at the end of the teaching-learning process, resulting in the assignment of a score or determining the progression of the student in the program. Tests and exams, portfolios, OSCE, papers, projects, and presentations are examples of summative assessment techniques.

7.3.1. Traditional assessment methods

The most widely used traditional assessment methods are written examinations. These examinations may include mid-term exams, final exams, pop-quizzes and mini-tests, depending on the intention of the assessment (formative/summative). The content of the exam may include any combination of question types allowing students to demonstrate their knowledge, and fall in the categories of short answers, true/false questions, multiple-choice questions (MCQs), matching questions, or essays.

The main advantages of traditional evaluation methods are that they are easy to prepare, administer and evaluate, consume less time and resources, and are economical. In addition, it is a standard approach that evaluates the student's knowledge in an objective, reliable and valid way. However, interpersonal skills, lifelong learning, professionalism, and integration of fundamental knowledge into decision-making can be underestimated. Since the traditional approach typically only evaluates the “knows” and “knows how” in the Miller’s pyramid, these methods are not the most appropriate for assessing students abilities for practicing pharmaceutical care. Also, with this type of assessment, students are generally encouraged to memorize knowledge in producing the right answers, and in the particular case of MCQs or true/false questions, the correct answer is suggested to the students, reflecting the student’s ability to take a test rather than the knowledge acquired.

7.3.2. Simulation-based assessment

The integration of simulation methods in pharmacy education arose from the need to assess whether students were able to translate their knowledge into practice. Simulation-based assessment includes role-plays with colleagues, standardized patients or clients, clinical skills-based assessment (e.g., prescription filing and checking), virtual patients, and human patient simulation (high-fidelity mannequin

models). Simulation attempts to imitate real practice, but without resorting to real patients, since the use of real patients has some limitations such as patient accessibility and wellbeing, and the necessity to provide a controlled student assessment. Standardized patients or clients may be trained as actors that perform a specific role repetitively and systematically, being able to interpret a patient, caregiver or healthcare provider.

Simulation activities allow students to apply their knowledge into practice, and developing patient-care skills such as communication, history taking, information-gathering, professionalism, active listening, counseling, problem-solving, and decision making. Assessment in the simulated environment has the advantages of reflecting real life, being immediate, reliable and consistent, and applied to formative feedback or summative evaluations. However, the use of isolated and poorly structured simulations does not allow students to be evaluated in a standardized, objective valid, reliable and feasible, as with the objective structured clinical examinations.

7.3.3. Objective structured clinical examinations

Objective structured clinical examinations (OSCE) are an example of competence-based evaluation introduced in 1975 by Ronald Harden *et al.* at the University of Dundee, Scotland, with the aim of avoiding the disadvantages of the traditional clinical examination in medical education.[249] The OSCE method was designed to assess student's clinical competence in a systematic and objective way, and is still employed today in various health care disciplines to assess student performance.

During the OSCE, the students typically rotate through a series of 12 to 16 stations and spend between 5-10 minutes at each station. The number of stations and the time spent at each one can vary depending on the OSCE design. There are procedure stations, where student must perform a real-world task such as history taking, physical examination, or interpretation of laboratory analysis and the examiner uses a checklist to score student performance. There are also question stations, where students must answer questions related to the information and findings attained from the prior station with evaluations usually consisting of multiple choice questions. After the examination, the examiners' checklists and the students' multiple choice answer tests

are marked according to an established rubric. With this method, the use of a simulated patient (trained actors representing patients) can be substituted in the place of a real patient, since the OSCE is repeated a large number of times according to the number of students in the discipline.[250]

In the assessment of competence in the history taking, a brief description of the patient is given to the student. During the student performance, the examiner listens and scores their performance on a checklist made previously in the examination, and the result must be reliable and objective. Examiners make notes on the student performance regarding their relationship with the patient, history taking technique, and inquiring about the key points in the history. The examiner marks with a tick on the checklist whether the student, during their performance, asked the patient certain key points. After the student performance on the procedure station, they must complete an MCQ test about the patient history. In assessing competence on physical examination, the student examines a limited area and the examiner evaluates his or her performance using a checklist with previously established topics. After that, the student also answers MCQs related to their findings about the physical examination. With the OSCE, in addition to being able to assess the student's competences in taking a patient history or doing a physical examination, the examiner can evaluate other situations such as inspection of a patient or images, interpretation of patient charts or laboratory data, and provision of health education to the patient.[250]

The use of the OSCE as a method to assess pharmacy student performance has become more common in pharmacy schools worldwide. In Canada, it used as an assessment component of entry-to-practice examination for pharmacists, in the United States it is commonly employed as an evaluation method in pharmacy education, and it has been adopted globally in countries including the United Kingdom, Switzerland, Malaysia, Japan, and Australia. The use of the OSCE in pharmacy education parallels that described previously in medical education, but with the focus of the evaluation on the delivery of pharmaceutical care. Stations may include a scripted simulated interaction with a patient, caregiver, or health care provider aimed at assessing communication skills, patient counselling or demonstrating use of a medical device, where other stations may have students performing pharmaceutical calculations or

checking prescriptions for errors.[251] Furthermore, the OSCE methodology has been recognized as a valid, reliable and feasible assessment tool through the use of specific checklists for scoring performance, increasing agreement among examiners.[252, 253]

Ultimately, the logistics of employing the OSCE are complex and require significant human and financial resources, yet, when well planned and effectively executed, becomes a feasible assessment method, whether formative or summative, in different stages in the education of a variety of health care professions.[252]

7.3.4. Objective structured assessment of technical skills

The objective structured assessment of technical skills (OSATS) is a reliable and valid method that has been used to evaluate technical skills. This method has been developed and used to measure technical skills of surgical trainees, but it can be adapted to evaluate students from other areas of health, namely pharmacy. In pharmacy education, OSATS is useful to assess competencies relative to isolated techniques and complete procedures, such as administration of vaccines, inhaler devices techniques, glucometer usage, blood pressure assessment, and individual medication preparation. Students' technical skills are evaluated according to task-specific checklists that should be performed during the procedures. In the student performance evaluation the examiner also use a global rating scale and a pass/fail judgement. Although this method is costly both in terms of time and resources, it allows students' technical skills to be assessed in a feasible and effective way.

8. CONCLUDING REMARKS

With the shift in the focus of the pharmaceutical profession to a patient-centered practice, many changes have also occurred in pharmacy education. The duration and structure of the pharmacy curriculum have undergone many changes, namely with the introduction of clinical and social courses, and with the increase in the number of hours dedicated to a practical component. Different studies addressing curriculum modifications were published. However, in some countries, these changes were not enough to respond to the recommendations issued by the FIP and WHO. The present research aimed to assess whether the pharmacy curricula prepares students for a patient-centered practice. For this purpose, we conducted a series of studies aiming at four different and complementary specific objectives.

Firstly, we compared the information available on the websites of the universities with undergraduate pharmacy degree programs across the globe from the perspective of international students. We began this study by collecting information about all colleges of pharmacy in the world that were available on the FIP Official World List of Pharmacy Schools in 2014. The creation of a database with all these colleges of pharmacy proved to be essential for conduct our subsequent studies. Through a Google search, the existence of a pharmacy college website for each college was investigated. A web content analysis was performed, and a scoring method was created to compare the websites. Academic information deemed important by international students has been collected, including syllabus, admission requirements, program costs, and faculty directory.

The results of this study revealed that although we live in a technological era and, a university website is considered the main source of information researched by international students, there were still 13.4% of colleges of pharmacy worldwide that did not have a website. This percentage varies greatly according to the region of the world, with Europe and Oceania presenting all pharmacy colleges with websites, while in South Asia and Africa, 30.5% and 18.8%, respectively, of pharmacy colleges did not have a website. This means low efforts in e-recruitment in South Asia and Africa, meaning that these regions are less likely to attract international students, discourage their college choice.[106, 113] Curiously, approximately half of the colleges of pharmacy with website do not have a complete English version, including a few colleges of

pharmacy in countries where English is a co-official language. In an increasingly globalized world where English is the *lingua franca*,[136] colleges of pharmacy need to strive to provide complete versions of their website in English, making them more accessible to international students. Also surprising was the fact that 73% of colleges of pharmacy did not make available on their website the course's syllabus. The course syllabus is considered by several authors as a contract between the teacher and the students,[16, 32, 34, 36] and a source of information about what is expected by the students during the course, what contents are taught and what competencies are expected to reach.[33, 34] In a retrospective evaluation carried out by Noel-Levitz, the course content was the most valued issue for international students.[26] It is therefore crucial that the courses syllabi are accessible on the website so that students make an informed choice about the university with the pharmacy curriculum that best serves their interests.

Additionally, we created a scoring method to compare the colleges of pharmacy websites quantitatively. We concluded that Europe, North America, and Oceania were the regions of the world with websites providing more academic information, meaning they are better prepared to attract international students. The 2014 International Association of Universities Global Survey found that Asia, Pacific and North America are most likely to have quantitative international student recruitment targets.[133] However, our results showed that the websites of pharmacy colleges located in Asian regions had lower scores, going against the intention of attract international students.

As stated earlier, in the literature there are numerous articles about the curricular changes that have occurred toward a clinical education in pharmacy in order to respond to the WHO and FIP recommendations. The main change in pharmacy education in the USA was marked by the creation of the PharmD degree as the sole degree required to enter practice. While in Europe, the curricular change took place with the signing of the Bologna Declaration and the creation of the EHEA. The curricular reforms efforts were made to improve areas of the pharmacy curriculum, such as clinical pharmacy, social and behavioral sciences, and practical experiences. However, it was not known if these curricular changes were enough to respond to international recommendations. To try to answer this question, we compared the USA and EHEA undergraduate pharmacy curricula in terms of patient-centered care

courses. The curricula comparison was made by analyzing course content of syllabi as the information source. The availability of syllabi on the colleges of pharmacy websites was crucial to the analysis of what contents were covered in each course.

As mentioned in the introduction of this work, in the literature there are studies that compare the pharmacy curriculum in European countries.[99, 100, 161] The results of an article comparing the evolution of the European curriculum from 1994 to 2011 lead one to think that curricular changes have undergone a shift towards more clinical courses, with an increase in the number of hours related to the medical sciences (from 19% to 28%).[101] Though, in these studies, the allocation of each course to a subject area seems to have been based on the course names and not on course content analysis, and the subject areas were based on the traditional areas of education for pharmacists, more associated with basic sciences, that existed prior to the clinical movement. In our study, however, in order to classify the courses by subject area we analyzed each course contents in the respectively syllabus. For this, we created a guidance for data extraction and classification based on the "Curricular Core – Knowledge, Skills, Attitudes, and Values" section of ACPE's Standards.[37] The contents of a course described in each syllabus were analyzed, and each course was classified into the following categories: social/behavioral/administrative pharmacy sciences, clinical sciences, experiential courses, or other/basic sciences. The first three areas were considered related to patient-centered care. For a global comparison of the countries from these two regions (USA and EHEA) with different course-credit systems, we have created a scoring method. The percentage of patient-centered courses in each country's curriculum has also been calculated. The results of our study showed that, despite the curricular changes following the Bologna Declaration, the European pharmacy curriculum maintains a greater focus on basic sciences and a lower emphasis on patient-care centered when compared to the USA pharmacy curricula. The main differences between the USA and EHEA curricula involve the load of clinical sciences courses (16.7% in USA vs 4.1% in EHEA) and the basic sciences courses (49.0% in USA vs 72.0% in EHEA). When comparing our results with the PHARMINE report,[100] we found a significant difference between the load of clinical sciences courses in Europe (4.1%) and the load of medical science courses (28%), respectively.

When analyzing the percentage of patient-centered courses in the curriculum, we found that Malta was the country with the highest percentage (54.2%) followed by the USA (51.0%) and the Netherlands (50.3%). All other European countries presented a percentage of patient-centered courses in the curriculum less than 37.0%, with Greece with the lowest value (19.7%). These differences suggest that European countries, in order to comply with international recommendations to educate future pharmacists focused on patient care, should consider reviewing their pharmacy curriculum.

For the design, development, or review of a pharmacy curriculum it is essential to use a competency framework. The competencies that pharmacists must acquire must meet the society health-related needs, and, ideally, should be defined by professional bodies and employers. While universities should establish an alignment between competencies, educational contents, learning activities, and assessment methods, to ensure that students acquire the necessary competencies for a patient-centered practice. The development and implementation of competency frameworks for pharmacy education and practice has emerged worldwide. FIP in partnership with WHO and UNESCO have created the global competency framework that support the educational development of pharmacy practitioners.[7] In Europe, a competency framework for pharmacy practice, that can be used as a quality assurance system of pharmacy education, was also developed.[232] Several countries, including Spain, have established or are working to create their own competency frameworks for pharmacists. The Spanish competency framework has established the minimum competencies that qualify pharmacists for the practice of the profession.[75]

Given the importance of competency-based education, we were interested in analyze whether there was an alignment between the competencies defined in the Spanish competency framework and the educational contents taught in pharmacy courses in Spain. To carry out the study, we analyzed the syllabi of all pharmacy courses taught at colleges of pharmacy in Spain, in accordance with the 15 general competencies and, 67 specific competencies defined in the Spanish competency framework. The specific competencies are categorized into seven areas of knowledge: chemistry; physics and mathematics; biology; pharmacy and technology; medicine and pharmacology; legislation and social pharmacy; and supervised internship and the final dissertation.

The results of our study revealed that almost 30% of the courses with specific competencies assigned belong to the medicine and pharmacology area of knowledge. Similar to what happened in the 2011 PHARMINE report,[100] this result could mislead us to think that Spanish pharmacy degrees provide students with many competencies related to pharmacy practice. However, when we analyze in detail the specific competencies of this area, we see that competencies such as "develop hygienic-sanitary analyzes (biochemical, bromatological, microbiological, parasitological)" are mixed with competencies such as "carry out clinical and social pharmacy activities, following the pharmaceutical care cycle". Our study also shows that most Spanish universities' syllabi report a misleading alignment between the competencies and their educational contents. We found very different assignment patterns among the Spanish universities, with universities assigning a median of 1 general competency per course to two universities assigning all of the 15 general competencies per course. The results show that Spanish colleges of pharmacy do not appropriately use the official Spanish competency framework that is legally enforced since 2008 by the CIN/2137/2008 Ministerial order.[75] We suggest that competencies should be paired in the syllabus to each of the course contents and not to the course descriptions. We also think that there is still room for improvement in Spanish Competency Framework regarding competencies that prepare students for a patient-centered practice. It seems to us that more importance should be given to educational contents for a patient-centered undergraduate pharmacy curriculum, once we verified that only 24.6% of pharmacy degree courses in Spain are patient-centered compared to 51.0% in USA curriculum. This idea is reinforced by the higher basic sciences courses load in the Spanish pharmacy education, that have more 13 basic sciences courses than USA curriculum, to the detriment of less 13 patient-centered courses.

International recommendations suggest that competency-based education is essential to ensure prepared pharmacists for a patient-centered practice. The competency-based approach to curriculum development has been used in pharmacy education for the last two decades, and more recently the use of entrustable professional activities to evaluate if pharmacy students graduates are practice-ready was also used. EPAs translate competencies into clinical practice, and it is necessary multiple competencies

to perform EPAs.[82] However, in the curriculum design, it is crucial to ensure that the competencies are perfectly aligned with the corresponding learning outcomes, educational contents, learning activities, and assessment tasks. In Spain, the creation of EPAs for pharmacy education is still a mirage. At the moment, it is imperative to start using the Spanish competency framework correctly, and only then will it be possible to create and implement EPAs.

The results of our studies showed that on the one hand, the pharmacy curriculum in Europe still maintains a great focus on basic sciences, on the other hand, competency frameworks are not being used properly, particularly in Spain. In this sense, we felt the need to create a catalog of educational contents for the undergraduate pharmacy curriculum that prepares students for a patient-centered practice. In Spain, the Forum of Pharmaceutical Care in Community Pharmacy [Foro de Atención Farmacéutica en Farmacia Comunitaria AF-FC (Foro AF-FC)] has established that for the provision of professional pharmaceutical care services, it is necessary to ensure that pharmacists, during undergraduate studies, acquire the competencies defined in the Spanish competency framework. In order to facilitate the reach of these competencies, Foro AF-FC has also developed a document that deals specifically with each of the contents that have been agreed as essential to teach during the pharmacy degree.[254] In this document, specific contents were defined for 37 topics related to pharmaceutical care, as a possible proposal of contents for the creation of a discipline of "pharmaceutical care". However, in order to respond to international recommendations in the creation of a curriculum that prepares pharmacists for a patient-centered practice, it is not enough to create a discipline. There is a need for a whole curriculum restructuring in which patient-centered contents are perfectly aligned with the competencies that are intended to be achieved.

To construct a catalog of educational contents for a patient-centered undergraduate pharmacy curriculum, we used a benchmarking method with the educational contents of pharmacy curricula from Australia, Canada, New Zealand and the USA. The choice of these countries was based on the fact that they have a wide implementation of pharmacy services and have undergone a curriculum change to incorporate more clinical models. A qualitative analysis of the educational contents included in the syllabi

of all courses in the area of pharmacy practice was performed. The educational contents were analyzed and extracted from 1703 syllabi belonging to 110 pharmacy schools. Using the ACPE "Guidance on the Science Foundation for the Curriculum"[37] as a coding framework, a final coding tree with 4 hierarchical levels (Clinical Sciences Aspects; Social and Behavioral Pharmacy Sciences Aspects; Administrative Pharmacy Sciences Aspects; and Miscellaneous) and 355 topics of educational contents for a patient-centered undergraduate pharmacy curriculum was created. This catalog of educational contents can be considered a contribution to the creation of a pharmacy curriculum that prepares students for a more patient-centered practice. And can also be used as an instrument to check the completeness of patient-centered educational contents in any undergraduate pharmacy curriculum.

If universities aspire to respond to the recommendations issued by international organizations, it is suggested that a curriculum revision is made so that pharmacy education actually follows the needs of the profession. This thesis showed that regardless of the curricular changes that took place after the Bologna Declaration, European pharmacy degrees should make an additional effort to align competencies with the educational contents that really prepares graduates for a patient-centered practice. The catalog of educational contents resulting from this thesis was not intended to be a catalog of courses but instead a compilation of contents for the undergraduate pharmacy curriculum that focuses on preparing students for a patient-centered practice. Now, it is necessary for a panel of experts in each of the major categories to develop the contents, align them with the corresponding competencies, estimate the workload required for instruction, assign tasks to be completed by the students, and stipulate in which courses should be taught.

Overall, despite European pharmacy colleges' websites provided more academic information, being more attractive for international students, the analysis of the courses syllabi of pharmacy degree, showed that curricular changes in Europe were not yet enough to respond to the international recommendations. Future curricular revisions should have in account patient-centered recommendations issued by FIP and WHO. The work resulting from this dissertation can make an important contribution to the creation of a pharmacy curriculum that prepares students for a patient-centered

practice. We should always keep in mind that pharmacists are healthcare professionals, and their education and training must be patient-centered.

9. FINAL CONCLUSIONS

Final conclusions:

- There are still a high proportion of colleges of pharmacy around the globe without website. Quality of pharmacy colleges' websites is unequally distributed across the continents. To fulfill the information needs of the international students an English version of the website should exist and include, at least, a complete syllabus of all the courses, financial aspects, complete faculty directory, and all the administrative requirements.
- Institutions in EHEA countries maintain a greater focus on basic sciences and a lower load of clinical sciences in pharmacy curricula compared to the USA. These differences may not be in accordance with international recommendations to educate future pharmacists focused on patient care.
- Spanish colleges of pharmacy do not appropriately use the official Spanish competency framework. Its quantitative implementation is not complete and very different competencies pairing patterns were found among universities.
- It was created a catalogue of educational contents for the undergraduate pharmacy curriculum that aims to prepare students for a patient-centered practice.
- In order to guide pharmacy colleges in the teaching of pharmaceutical care at university level, a toolkit was design. This tool provide vital tips for a patient-centered pharmacy curriculum, addressing topics such as competency frameworks, educational contents, teaching and learning methods, and assessment methods.
- This dissertation showed that there is still room for universities, especially in Europe, to improve the education of pharmacy students for a patient-centered practice, and to better adapt the pharmacy curricula to the needs of the profession.

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11. APPENDICES

Appendix 1

Example of a course syllabus

Note: This appendix contains a course syllabus merely illustrative. Some of the information presented in the different sections of the syllabus was extracted from different real syllabus. But this document does not correspond to a real "Pharmaceutical Care" course syllabus.

School of Pharmacy University X

PHARMACEUTICAL CARE II

PHARM 1234

Spring Semester, 2018

This document provides key information about PHARM 1234 Pharmaceutical Care II.

COURSE DESCRIPTION: This course will teach the student to formulate a focused clinical question, to improve the student's literature critical appraisal skills, to determine the appropriateness of various biostatistical analyses, to interpret research outcomes, and to apply pharmacoeconomic techniques in order to inform drug product selections.

CREDITS: 3 Credits

TIME: Mondays 10:00-11:30 am

PLACE: Room 333

PRE-REQUISITES:

PHARM 1200 CONCEPTS IN PHARMACY PRACTICE

PHARM 1233 PHARMACEUTICAL CARE I

COURSE INSTRUCTIONAL TEAM:

Role	Name	Phone	Email	Office	Office hours
Coordinator	John Smith	999-9999	jsmith@upharm	PH 123	Tuesday 9-10 am
Instructor	Mary Parker	999-9998	mparker@upharm	PH 124	Friday 3-4 pm
Lab Instructor	Rose Martin	999-9997	rmartin@upharm	PH 125	Monday 9-10 am

COURSE GOALS:

1. To understand the process of establishing a new patient care practice and to develop a professional practice plan that allows the student to provide pharmaceutical care after graduation.
2. To understand the practice of pharmaceutical care well enough to teach others.

COURSE LEARNING OUTCOMES

At the completion of the course the student shall be able to:

010 Explain the transition of pharmacy from product-focused to patient-focused practice and the difficulties in managing this change.
023 Explain the current and possible future roles of the pharmacist.
094 Use appropriate non-verbal, verbal, questioning and listening skills when communicating with patients, caregivers and other health care professionals (HCPs)
099 Identify the challenges in communicating with people of diverse social, cultural and racial backgrounds, and outline strategies to overcome these.
105 Communicate with patients and other HCPs in a non-judgemental, non-discriminatory and respectful manner.
107 Communicate health and medication management information to patients and health care professionals in a useful and context-relevant way.
140 Accurately dispense prescription medicines using commercial dispensing software.
188 Employ quality assurance processes that minimize the potential for dispensing errors.

COURSE CONTENT

Evolution of pharmacy practice

- The transition of pharmacy from product-focused to patient-focused practice and the difficulties in managing this change
- Events and factors internal and external to pharmacy that drive change in practice (e.g. health systems, political, socio-economics, and cultural diversity)

Areas of practice and career paths

- Professional pharmacy practice in different settings
- The diversity of pharmacy and related areas in a modern healthcare system in which pharmacists practice
- Pharmacy practice career paths
- Emerging career opportunities within the pharmacy profession

The clinical role of the pharmacist as a provider of patient-centred care

- Role of the pharmacist in optimizing the use of medicines and improving health outcomes
- The roles, rights and responsibilities of the pharmacist in providing healthcare in a variety of practice settings

Introduction to communication

- What is communication?
- Basic principles, skills and techniques of good communication
- Communication models and styles
- Design, preparation, delivery, and critique of educational, informative, and persuasive communication methods
- Barriers to effective communication and strategies to overcome those barriers

Communication with Patients and Caregivers

- Strategies involved in educating patients regarding medications.
- The importance of health literacy in patient communication.
- The qualities that pharmacists should demonstrate in collaboration with patients and caregivers.
- Cultural competence in pharmacy practice.
- Societal, ethical, professional, and legal rationale for cultural competence.
- Key steps to becoming culturally competent.

Communication with Health Care Professionals

- Strategies to clarify the information needed to answer drug information questions.
- Ability to retrieve information from tertiary drug information services.
- The qualities that pharmacists should demonstrate in collaboration with other health professionals.

Process and procedure of dispensing medication

- The main stages in the dispensing process (e.g. the initial patient encounter, accepting a prescription, identifying if a prescription contains all legally required components, the patient profile review, processing the prescription, preparing/compounding the medication, labelling and packaging for extemporaneous preparation, checking the dispensed medication/checking the final product, counseling the patient or care-giver on the appropriate use and storage of the prescription)
- Processes in dispensing to minimize the making of errors and maximize the detection of errors

Dispensing technologies

- Technology and automation commonly found in practice settings in order to accurately and efficiently dispense medications
- Computer software functions to process prescriptions
- Integration of dispensing software with the electronic health record
- Automated dispensing stations

CLASS SCHEDULE

Week	Date	Type	Topic	Reading	Instructor
1	05/03/2018	Lecture	• Introduction/Welcome • Review of course syllabus • Evolution of pharmacy practice	1	John Smith
2	12/03/2018	Lecture	• Areas of practice and career paths	2, 3, 4	Mary Parker
3	19/03/2018	Lecture	• The clinical role of the pharmacist as a provider of patient-centred care	1, 5	Mary Parker
4	26/03/2018	---	• Spring Break (Easter)	---	---
5	02/04/2018	Lecture	• Introduction to communication	6, 7, 8	John Smith
6	09/04/2018	Assessment	• Test 1		John Smith
7	16/04/2018	Laboratory	• Communication with Patients and Caregivers	6, 7, 9	Rose Martin
8	23/04/2018	Laboratory	• Communication with Patients and Caregivers (cont.)	6, 7, 9, 10	Rose Martin
9	30/04/2018	Laboratory	• Communication with Health Care Professionals	11, 12, 13	Rose Martin
10	07/05/2018	Assessment	• Test 2		John Smith
11	14/05/2018	Lecture	• Process and procedure of dispensing medication	14	Mary Parker
12	21/05/2018	Laboratory	• Process and procedure of dispensing medication	14	Rose Martin
13	28/05/2018	Laboratory	• Dispensing technologies		Rose Martin
14	04/06/2018	Assessment	• Final Exam (OSCE)		All
15	11/06/2018	Assessment	• Final Exam (OSCE)		All

TEACHING AND LEARNING METHODS:

The class will employ a number of instructional tools in order to assist students in their understanding of course content:

1. Lecture and discussion
2. Viewing of instructional videotapes
3. Assignments/Exercises/Cases
4. Group work, role playing, and presentations

Students are expected to assume significant responsibility for their own learning: communicating with standardized patients, collecting and synthesizing pertinent information and developing and implementing individual care plans; participating in case discussions with peers and health professionals.

ASSESSMENT SCHEDULE

	Task	Value %	Date	Learning Outcome Assessed
1	Test 1	20	09/04/2018	010; 023; 094
2	Test 2	20	07/05/2018	094; 099; 105; 107
3	Participation	10	During labs	094; 099; 105; 107; 140
4	OSCE oral exam	50	04 - 11/06/2018	094; 099; 105; 107; 140; 188

Test 1 and Test 2

These assessments will be a 60 minutes test each on topics that have been covered to that time. The exact content of the test will be communicated to the students nearer the time of the tests. The tests will comprise of multiple choice questions and short-answer questions.

Participation and Contribution: communication and dispensing

Labs will be presented in a case-based learning format. Students are expected to participate in and contribute to discussions both within their small groups and the class as a whole. Individual student participation marks will be allocated by professor following each lab.

OSCE

This is a 30 minutes oral examination which will take place during the 2 weeks exam period. The students will be rotated through six different stations with different cases. Examples include cases where the students will be required to diagnose a minor condition in a patient presenting with certain complaints. Other cases may be constructed so that students are required to question the patient to elicit a history of the presenting symptom. Some cases may require the student to show product knowledge with regards to indications, dosage, side-effects, contraindications etc.

A pharmacist examiner will mark the student's responses according to the competency standards provided by the unit coordinator.

Activity Evaluation	**Value**
Drug Information Activity	7.5%
Drug Interactions Activity	7.5%
Immunization and Injection Station	7.5%
Physical Assessment Station	10%
Ordering and Interpretation of Lab Values	7.5%
Comprehensive Pharmacy Interview	10%
TOTAL	**50%**

PASS REQUIREMENTS

To obtain a pass in this unit, students MUST achieve a mark of at least 50% in the OSCE examination. In addition students must achieve a pass mark (50%) overall for the unit.

ALIGNMENT

Learning Outcome	Learning Activity	Assessment
Explain the transition of pharmacy from product-focused to patient-focused practice and the difficulties in managing this change.	Lecture 1	Test 1
Explain the current and possible future roles of the pharmacist.	Lecture 2	Test 1
Use appropriate non-verbal, verbal, questioning and listening skills when communicating with patients, caregivers and other health care professionals (HCPs)	Lecture 5 Communication lab week 7-9	Test 2 Final Exam (OSCE)
Identify the challenges in communicating with people of diverse social, cultural and racial backgrounds, and outline strategies to overcome these.	Lecture 5 Communication lab week 7-9	Test 2 Final Exam (OSCE)
Communicate with patients and other HCPs in a non-judgemental, non-discriminatory and respectful manner.	Lecture 5 Communication lab week 7-9	Test 2 Final Exam (OSCE)
Communicate health and medication management information to patients and health care professionals in a useful and context-relevant way.	Lecture 5 Communication lab week 7-9	Test 2 Final Exam (OSCE)
Accurately dispense prescription medicines using commercial dispensing software.	Lecture 11 Dispensing lab week 12-13	Final Exam (OSCE)
Employ quality assurance processes that minimize the potential for dispensing errors.	Lecture 11	Final Exam (OSCE)

ACADEMIC POLICY INFORMATION

Syllabus changes: Changes in the syllabus regarding policies for this course may be made throughout the semester. Any changes that occur will be communicated by the course coordinator verbally announcing in class, via email, or by a paper revision handed out during class.

Last course revision date: February 27, 2018

Students with disabilities and special needs: Any student with a documented disability (e.g. physical learning, psychiatric, vision, hearing etc.) who needs to arrange reasonable accommodations must contact course coordinator at the beginning of the semester. All discussions will remain confidential.

Student conduct and classroom policies:

1. Cell phones shall not be used in class (either to receive or send calls, text messages, electronic mail, or other uses). Please have it on silent or vibrate. If you decide you must use your phone, please leave the room and not return until the next session.

2. Computers may be used for taking notes, but other uses are not acceptable. If you should decide to use your computer for other uses, please leave the room.

3. Leaving the room during the class session can be done, but you may not return during that session. If more than 20 minutes of class remains, you will be considered absent.

4. Talking in class is permitted if you are willing to share with the entire class.

5. Class will start on time. You may enter the class session late (up to 10 minutes) once during the semester.

6. All assignments and examinations must be completed on the due date unless prior arrangements are made with the instructors.

REQUIRED READINGS

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8. Barriers to Communication. In: Robert S. Beardsley, Carol L. Kimberlin and William N. Tindall., editors. Communication Skills in Pharmacy Practice. Maryland, Pennsylvania: Lippincott Williams & Wilkins; 2003 p 49-60.
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Appendix 2

Catalogue of educational contents for a patient-centred undergraduate pharmacy curriculum

1. Clinical Sciences Aspects

1.1 Pharmacy Practice

1.1.1 Profession of Pharmacy and Contemporary Practice

Introduction to the profession and practice of pharmacy

- Foundational concepts of pharmacy practice
- The role of the pharmacy profession
- The philosophy, socialization, and practice of the profession of pharmacy
- The definition and important of professionalism as it relates to modern-day pharmacy practice
- What is professional practice?
- The eight star pharmacist (WHO)

Evolution of pharmacy practice and industry trends and developments

- The transition of pharmacy from product-focused to patient-focused practice and the difficulties in managing this change
- Events and factors internal and external to pharmacy that drive change in practice
  (e.g. health systems, political, socio-economics, and cultural diversity)

Contemporary pharmacy practice

- Factors that influence contemporary pharmacy practice, roles, responsibilities and expectations within the healthcare system
- The principles of and skills, attitudes and behaviours required for contemporary pharmacy practice
- The "languages and tools" used in contemporary pharmacy practice with emphasis on medical terminology

Different pharmacy practice models

- The factors that have led to the types of pharmacies found in different parts of the world
- Practical aspects of pharmacy practice in developing countries

The different pharmacy organizations

- The roles and objectives of relevant professional pharmacy organizations and bodies and their relevance to contemporary pharmacy practice

Professional practice guidelines and standards

- World Health Organization (WHO) and International Pharmaceutical Federation (FIP) guidelines, protocols or statements on the practice of pharmacy
- Professional standards of pharmacy practice, their place in practice, intention and use

Pharmacy education and practice around the globe

- The education, training, and professional licensure requirements to become a pharmacist
- The gap between what is taught in pharmacy school and the knowledge needed to practice community pharmacy in the 21st century
- The similarities and differences in nursing, pharmacy and medical education

Future of the pharmacist and pharmacy practice

- The future direction of the profession

1. Clinical Sciences Aspects

1.1 Pharmacy Practice

1.1.2 The Role of the Pharmacist on the Healthcare Team

Introduction to health professions

- The professional health practitioner
  - Basic competencies and skills needed to function as a healthcare provider
- The distinct roles and functions of nurses, pharmacists, doctors, and other professional members of the healthcare team

Working in multidisciplinary teams

- Building interprofessional healthcare teams
  - Concepts: team building, team interaction, interpersonal teamwork, team based decision-making
- What is interdisciplinary practice?
  - Relationship-building values and the principles of team dynamics
- The importance of the multidisciplinary approach to patient care
  - Activities centred around interprofessional teams and how a team can provide optimal care to patients
  - Collaborate proactively with other healthcare professionals
- Role of the pharmacist related to interaction with other healthcare providers

The clinical role of the pharmacist as a provider of patient-centred care

- Role of the pharmacist in optimizing the use of medicines and improving health outcomes
- The roles, rights and responsibilities of the pharmacist in providing healthcare in a variety of practice settings
  (e.g. community, acute, assisted, and long-term care health systems)

Patient and other healthcare provider perceptions of pharmacists' capabilities

1. Clinical Sciences Aspects

1.1 Pharmacy Practice

1.1.3 Areas of Practice and Career Paths

Professional pharmacy practice in different settings

- Current issues, operations and procedures in different pharmacy settings
- Structure of the pharmacy sector

The diversity of pharmacy and related areas in a modern healthcare system in which pharmacists practice

- Ambulatory
  (e.g. community pharmacy, primary care, compounding)
- Institutional
  (e.g. hospital, residential care/home health pharmacy)
- Industrial
  (e.g. production, quality, wholesale)
- Academic
  (e.g. research institutions)
- Others
  (e.g. army, professional pharmacy organizations, nuclear pharmacy)

Pharmacy practice career paths

- Introduction to professional identity and career planning
- Variety of career pathways and emerging career opportunities within the pharmacy profession

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.1 Introduction to Pharmacist-Provided Patient Care and Patient-Centred Pharmacy Services

The professional aspects of pharmacy in delivering a patient-centred care

- Who are our patients and what their needs are

The pharmaceutical care practice

- The nature and evolution of pharmaceutical care
- The values, principles and goals of pharmaceutical care
- Different models, strategies and processes utilized in the provision of pharmaceutical care
- The varieties of pharmaceutical care practice opportunities available for pharmacists today

Patient-centred pharmaceutical care services

- Concept of pharmacist-managed/patient-oriented pharmacy services directed at providing effective, safe, and cost effective drug therapy via outcomes monitoring and assessment
- Justifying, planning, development, implementation, management and evaluation of patient care services
  - Conduct a thorough needs assessment for the proposed service
  - Methods and requirements to implement patient care services
  - Tools and resources to conduct a patient care service
    (e.g. physical space requirements for a service, professional requirements)
  - The economic, clinical and humanistic outcomes of a clinical pharmacy service
- Barriers and facilitators of providing pharmaceutical care
  - Strategies to address barriers without compromising service quality
- The provision of pharmacy services in multiple environments
  - Innovative and emerging value-added pharmacy services
- Payment for pharmacy services
  - Success stories from practicing pharmacists who have implemented pharmaceutical care services and have received reimbursement for their efforts

Quality assessment and improvement of pharmaceutical care services

- Quality improvement and their impact on patient outcomes
- Selection of quality improvement strategies and plans for implementation
  (e.g. screening/recruitment of high-risk patients, process measures for monitoring, design of an evaluation plan)
- Monitoring the quality of professional services
  (e.g. clinical audits, evaluation of interventions)

Continuum of patient care

- Responsibility of providing continuing care to the patient
- Strategies to improve the continuity of patient care as patients move between healthcare settings

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.2 Counselling and Patient Education

Introduction to the clinical counseling

- Patient counselling concepts
- Clinical counselling techniques
- Counselling in pharmacy practice
  - Development and delivery of patient counselling to optimize health outcomes
- Technology employed to promote patient counseling
  (e.g. telephone counselling)

Pharmacist as patient educator and health information provider

- How educating and empowering patients
- Access, analyse and apply relevant educational strategies and the best method to provide counseling/education
- Develop population-based patient education programs
- Design and develop appropriate educational materials for patients, caregivers, and health professionals

Process of patient counseling

- Interactive patient counseling technique using open-ended questions when dispensing prescriptions
- Gather, organize, and summarize information to the patient
  - Delivery of patient information using consumer medicine information leaflets

Assess patient understanding

- Assess patient's existing understanding of therapeutic goals and regimen demands
- Apply patient education techniques to help ensure that information is provided in an understandable way
  (e.g. emphasize important points; give reasons or tell why key pieces of advice should be followed; use terms the patient can understand)
- Assess patient understanding of information provided by the pharmacist using a teach back process

Counsel and educate patients and caregivers regarding medication use, disease-state management, and health maintenance

- Counseling on the treatment and prevention of diseases and medical conditions
- Counseling about the appropriate use of medications and health products using a patient-centred approach
  - Patient information and counseling on new and refill prescription, over-the-counter (OTC) medicines, compounded medications, nutritional and dietary supplements, natural products, sterile products, etc.
  - Provide information and educate the patient about medications
    (e.g. explain the purpose/indication for drug therapy; contraindications and precautions; potential adverse effects and their management; potential drug interactions; appropriate administration regarding drug usage, dosage, frequency and duration, route, technique, dose adjustments, and missed doses; and storage)
  - Counselling on the correct use of various drug delivery devices
    (e.g. eye drops, ear drops, transdermal patches, nasal sprays, inhaler devices, devices for nebulization, self-administered subcutaneous medications)
  - Counselling on the use of home monitoring kits and point-of-care testing devices

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.2 Counselling and Patient Education (cont.)

Motivational Interviewing

- The basic concepts and principles of motivational interviewing, its spirit and essential strategies
- Skills of motivational interviewing (OARS: Open-ended questions, Affirmation, Reflective listening, Summarizing; and elicit change talk)
- Common therapeutic pitfalls in the consultation process and understand the nuances of using motivational interviewing techniques in community practice

Involving patients in decisions in their care

- Building a therapeutic relationship with the patient
- Help patients identify and voice values and concerns they have that affect their choices about their care
- The pros and cons of choices relevant to patient values and concerns
- Shared decision-making
  - Definition and classification of the key components of shared decision-making
  - Involvement of patients in informed shared decision-making
  - Identify relevant information that must be understood by patients if they are to make informed decisions about medication use and be able to use medications appropriately

Drug Utilization Review (DUR)/ MedsCheck

- Characteristics of DUR program
- How to develop a DUR programme to identify unsafe, abusive, or inappropriate medication prescribing and patient drug use patterns that require intervention
- The process and methods for Drug Utilization Review/Drug Utilization Evaluation
- Retrospective and prospective Drug Utilization Review

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.3 Advising Symptoms and Self-Care

Introduction to self-care

- Concepts of self-help, self-care, self-limiting health problems
- Economic, social, cultural and professional aspects of self-care
- The factors that lead patients to self-diagnose and self-treat their medical conditions
- The principles and strategies of self-care

The role of the pharmacist in the management of self-limiting illnesses and self-care

- Professional responsibilities and technical requirements for the dispensing of self-care medications and products
- Assist patients in making self-care decisions

Medical conditions that are appropriate for self-care

- Common medical conditions that are appropriate for self-care

  (e.g. self-care for dermatologic, Head, Eyes, Ears, Nose, and Throat (HEENT), gastrointestinal disorders, allergy, cough and cold, pain, fever, oral health, topical parasites, nutrition)
- Identification, interpretation and differentiation the signs and symptoms of common self-treatable conditions

Categories of self-care medications and products

- Nonprescription drugs or over-the-counter medicines
- Complementary and alternative medicine

  (e.g. nutraceutical products, dietary supplements, natural and herbals products, homeopathic remedies)
- Home testing and monitoring devices
- Durable medical equipment

Patient assessment and consultation

- Assessment of a patient seeking nonprescription medications
  - Systematic approach to gather, interpret, and assess patient information in order to provide appropriate patient advice for common self-treatable conditions
  - Identification of situations where self-treatment is not indicated and provision a referral to the appropriate healthcare practitioner
- Product selection and recommendation for treatment and prevention of diseases
  - Appropriate self-care therapies selections and recommendation based on patient characteristics, disease, and drug specific information
  - Justify recommendations with supporting evidence from appropriate sources

Non-pharmacologic therapy recommendations

- Non-pharmacologic treatment options for commonly encountered disease states and patient complaints
- Recommend appropriate non-pharmacologic therapy based upon patient-specific information (age, weight, height, lifestyle, occupation, etc.) and disease-specific information (pathophysiology, disease severity)

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.4 Health Promotion and Preventive Care Services

Prevention, health promotion and wellness theory and practice applied to the role of pharmacy

- Concepts of health promotion, preventive medicine, health maintenance
- The role and responsibility that pharmacists can play in promoting health and wellness and preventing disease, and how such roles relate economically to contemporary health system models
- Principles of health promotion and the historical context in which health promotion has evolved
- Health promotion and health education as a strategy to reduce illness and improve health outcomes

Educate patients about wellness and disease prevention

- The ability of patients to assume active roles and function effectively on their own behalf in health promotion and disease prevention, detection, and treatment

Health promotion strategies and methods

- Health promotion and disease prevention initiatives/programs
  (e.g. handwashing)
- Processes of health promotion programme planning, implementation, evaluation and sustaining
- Evaluate the need, progress, outcome, and efficiency of a health promotion intervention
- The use of health promotion materials

Lifestyle education

- What constitutes a healthy lifestyle and how it contributes to the prevention of chronic disease
- Lifestyle modification strategies and methods
- Strategies to prevent and treat risk factors associated with diseases
- Primary and secondary prevention strategies
- The essential elements of wellness and major areas of lifestyle modifications for all patients
  (e.g. nutrition, physical activity, weight control, tobacco cessation, sleep success, stress management, emotional health and health behaviour change, management of lifestyles in chronic diseases)

Disease prevention services

- Disease prevention services as part of patient or population specific care
  (e.g. pharmacy-based immunization program, pharmacy-based smoking cessation program, weight control program, substance abuse treatment programs, travel medicine recommendations)
- How pharmacists contribute to the delivery of effective, quality health and disease prevention services

Public health guidelines

- National and international guidelines for the contribution of health professionals to the prevention and management of health problems

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.5 Disease State Management - Follow up

Principles of basic disease states

- The effect of a disease on the patient

Introduction to disease state management

- Epidemiology and concepts of disease state management including management of various types of patients
  (e.g. pediatrics and geriatric patients)
- The role of the pharmacist in management of patients with multiple diseases
  - Optimizing the role of patients in self-management of the disease
- Models and processes of disease state management
- New strategies for disease management
  (e.g. care plans, ambulatory care clinics)

Pharmaceutical care plans

- The value of pharmaceutical care plans, counseling, and identification of therapeutic problems
- The components of a care plan
- The pharmaceutical care planning process
- Design, implement, monitor, evaluate, and adjust pharmaceutical care plans that are patient-specific and evidence-based which ensure effective, safe, and economical care
  - Follow-up with patients to evaluate their response to therapy
- Document a care plan using a concise, standardized process (data, assessment, intervention and monitoring plan)

Disease state management models

- Disease state management programs
  (e.g. women's health; pediatrics health; cardiovascular system; respiratory system; dermatological system; allergic and immunologic disorders; gastrointestinal system; endocrine system; renal; neurology; mental health patients; infectious disease syndromes; palliative and manage end-of-life care)
- Disease state management in special populations and special situations
  (e.g. pre and post-natal care/infant care, pregnant and breastfeeding women)
- Interpret laboratory findings, clinical data and physical assessment to patient-specific disease management

Disease management protocols in the delivery of pharmaceutical care

- Guidelines for the evaluation and treatment of commonly encountered diseases

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.6 Medication Management Service

Medication management

- Medication management and drug optimization in response to the needs of individual patients
- The basic principles of medication management
- Differences between the levels of medicines management services
- The pharmacist's role in managing drug therapy for patient populations in a variety of practice settings

Medication Therapy Management (MTM)

- Overview of the MTM Service Model
  - Concepts and principles of MTM
  - The history and need for MTM services
- The development and implementation of MTM services in a clinic or community pharmacy setting
- The clinical and administrative aspects of providing MTM services
- How to provide MTM service in a safe, timely, efficient, effective, equitable and patient-centric manner
- The essential elements of MTM
  (e.g. conducting the comprehensive medication review, creating a personalized medication list, medication action plan and physician communication document)
- Management of different MTM programs

Medication reconciliation

- Compare reconciled list with patient containers
- Perform and document medication reconciliation
- Creating the best possible medication list

Medication review

- Implicit and explicit criteria to identify inappropriate prescribing
  (e.g. Beers' criteria)
- Medication review process: steps for conducting a medication review
- Provision of comprehensive medication review in different practice settings
  (e.g. Home Medication Review; Residential Medication Management Review; Hospital Medication Management Review)

1.2.7 Improving Adherence

Definitions of medication adherence, medication compliance, concordance, polypharmacy and medication persistence

- The problems of medication non-adherence
  - The incidence of and problems associated with drug overuse, underuse, and misuse

Potential barriers to adherence and causes of non-adherence

- Patient-related barriers to adherence and factors affecting non-compliance with drug and non-drug therapy
  (e.g. cultural and religious influences on patient compliance and disease management)
- Healthcare system and provider-related barriers to adherence

Medication taking behaviour

- The concepts of medication taking behaviour that are measured by commonly used instruments
- Instruments that measure patient beliefs and attitudes towards medication

Assessing non-adherence

- How to detect inappropriate medication use
- Technology identifying non-adherence
- Assess patient adherence to medication regimens
  (e.g. Morisky-8 Adherence scale)
  - Compare and contrast self-reported medication taking behaviour with other methods of determining adherence, such as claims data, electronic surveillance, pill counts
  - The limitations of self-reported medication taking instruments

Creating an adherence service

- Process of defining, planning, implementing and evaluating an adherence service
- Develop a patient-specific plan to overcome barriers to medication adherence

Enhancing medication adherence/adherence activity

- Strategies to encourage patient adherence to therapeutic interventions
- Patient-related and program-related behaviour change strategies that can improve adherence
  - Influencing behaviour
  - The impact of the health belief model on medication adherence
  - The factors which are important in influencing patient compliance
- The ways in which pharmacists can improve medication compliance
  - Motivational cues to enhancing patient compliance
  - Solutions to patients with poor adherence
    (e.g. administration and reminder systems that meet regimen requirements and that the patient feels able to manage)
  - Patient care plans for improving compliance and healthy behaviours

Adherence Research

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.8 Clinical Interventions Service

Drug-related problems

- The etiology and risk factors for drug-related problems
- Assess medication appropriateness and identify drug-related problems based on indication, effectiveness, safety, and convenience (IESC)
- Process to predict, identify, prioritize, solve and prevent actual or potential drug-related problems

  (e.g. duplication, dosage, drug interactions, adverse drug reactions, frequency, dosage form, indication mismatches, incompatibilities, allergies)
- Documentation of drug-related problems: classification, standards of practice and research

Drug-related needs

- Assessing a patient's drug-related needs, including patient medication experience and patient-specific goals of therapy

Clinical intervention programs

- Intervention strategies and practical interventions that pharmacists can perform in order to resolve drug-related problems

  (e.g. provide additional information on medications if misunderstanding exists, tailor medication schedules if problem is forgetting doses, develop cues to taking medications, teach self-monitoring techniques, teach use of compliance aids, use motivational interviewing principles and techniques, refer to appropriate providers of care or other sources of assistance, confer with prescriber about simplifying regimen)
- Documentation and evaluation the effect of the intervention
- Technology for dealing and recording clinical interventions

1. Clinical Sciences Aspects

1.2 Pharmacist-Provided Care

1.2.9 Medication Use Process and Quality Use of Medicines

The medication use process

- Patient-centred model of the medication use process
- The steps of the medication use process and the role of pharmacy and other disciplines in the process
- Mechanisms and approaches in improving medication use process in pharmacy practice
- Policies and processes used to effect change in the drug use process
  (e.g. drug use evaluation, pharmacy and therapeutics committee functions, and medication therapy management services)
  - National and global changes in drug use

The rational use of medication

- Rational use of drugs in caring for patients
- The principles and practices of safe, appropriate, and effective medication use
- The role of the pharmacist in optimizing the use of medicines and improving health outcomes

The medication use evaluation

- The importance of drug utilization evaluation in pharmacy practice
- What is being used: an assessment of specific medications being used in certain situations and settings
- How is it being used: an assessment of the patterns of use (including how much, where, when, and by whom)
- Why is it being used: assessment of the reasons for medication use and the functions that drug products serve in society

Quality use of medicines

- Principles of quality use of medicines
- Clinical governance as it relates to the quality use of medicines
  (e.g. drug utilization review and evaluation, formularies, therapeutic guidelines)
- The role of the pharmacist in ensuring quality use of medicines in the individual patient with multiple medications
- Concepts of quality improvement and how these concepts can be used to improve the quality of medication use in collaboration with patients, physicians, pharmacists, administrators and regulators
- Medication quality assurance programs
  (e.g. monitoring adverse drug reactions, drug and herbal product interactions, and medications errors)

1. Clinical Sciences Aspects

1.3 Medication Dispensing and Distribution Systems

1.3.1 Prescription Process

Introduction to prescription medicines

- The prescription practice
- Medical and prescription terminology (standard abbreviations and symbols used on prescriptions and institutional medication orders)
- Principles, function and legal requirements of a prescription within the supply of medicines
  - Prescription requirements
    (e.g. types, language, measures, patient data and profiles)
  - The format and components of a typical prescription and institutional medication order
  - Assess and prescribe as appropriate, with supporting documentation, including initiating pharmacotherapy, prescribing medications, adapting and modifying prescriptions, and refilling prescriptions
- Different methods of prescribing
  (e.g. hand-written, electronic, faxed and phoned prescriptions)
- Prescription documentation

Healthcare professionals with prescriptive authority

- Independent and dependent models of prescribing authority
- Pharmacist authority to adapt, modify and prescribe; Prescription transfers

Reimbursement for prescribing services

1.3 Medication Dispensing and Distribution Systems

1.3.2 Preparation and Dispensing of Prescriptions

Pharmaceutical calculations relevant to the practice of pharmacy

- The pharmaceutical application of calculations in order to accurately interpret, prepare and dispense a physician's order of prescription
- Dose calculations and adjustments necessary to compound, dispense, and administer medications

Introduction to the medication dispensing process

- The service of dispensing prescription medicines
- Pharmacist's dispensing rights and responsibilities
- Legal, technical and professional aspects of dispensing prescriptions
- Dispensing medications in outpatient and inpatient settings
  (e.g. in community, hospital, home healthcare, long-term care settings)

Process and procedure of dispensing medication

- The main stages in the dispensing process
  (e.g. the initial patient encounter, accepting a prescription, identifying if a prescription contains all legally required components, the patient profile review, processing the prescription, preparing/compounding the medication, labelling and packaging for extemporaneous preparation, checking the dispensed medication/checking the final product, counseling the patient or care-giver on the appropriate use and storage of the prescription)
- Processes in dispensing to minimize the making of errors and maximize the detection of errors

Read and interpret/evaluate the prescription

- Knowledge needed to interpret prescription and medication orders (verbal and written)
- Basics of prescription validation
- Evaluate the appropriateness of a given prescription or medication order based on patient and disease-specific factors. Evaluate prescriptions for indication, effectiveness, safety, convenience (IESC)
- Evaluate new prescription orders, and consider how these new orders will impact on current therapy, prepare the new order, and address any and all potential problems that are identified
- Analyse a prescription/medication order for potential errors and omissions

Dispensing different types of drugs/products

- Dispensing different types of drugs/products
  (e.g. dispensing extemporaneous and non-extemporaneous medicines; dispensing alternative brands (drug product selection and generic substitution); aseptic and cytotoxic dispensing; dispensing controlled drugs)
- Prescription and non-prescription medication alterations specific for special population patients

Dispensing technologies

- Technology and automation commonly found in practice settings in order to accurately and efficiently dispense medications
  - Computer software functions to process prescriptions
  - Integration of dispensing software with the electronic health record
  - Automated dispensing stations

1.3.2 Preparation and Dispensing of Prescriptions (cont.)

The development and maintenance of patient medication profiles

- Legal requirements of patient medication profiles
- Retrieve and assess information regarding medical conditions and drug treatments

1. Clinical Sciences Aspects

1.3 Medication Dispensing and Distribution Systems

1.3.3 Distribution Systems

Access to medications

- The role of the pharmacist in medicines supply

Drug distribution systems

- The drug supply/distribution chain
  - Supply of prescription medications
  - Unusual supply
  - Factors influencing the supply and availability of medicines
- Aspects of medication distribution process
- Managing drug distribution services
- The legal requirements for usual drug distribution
- How principles of pharmacoeconomics impact the medication distribution system
- The role of professional staff and support personnel in medication distribution

Pharmacy technology and medication distribution models

- The evolution of pharmacy drug distribution systems and the impact on pharmacy services over time
  (e.g. floor stock, unit dose, dispensing cabinets)
- Humanistic and technological factors involved in medication distribution processes
- Tools and technologies related to the drug distribution process in various practice settings
- Automation and central vs satellite pharmacies
- Automated systems for distribution and the role of automation in the practice setting
- Care of patients in pharmacy drug distribution and control systems
- IV admixture systems, chemotherapy and parenteral nutrition, unit-dose, pre-packing systems
- Unit dose distribution and advantages of its use

Pathways medications take from the manufacturer, through various distribution channels, to the consumer

- The process of drug distribution through community pharmacy channels
- Channels of drug distribution
  (e.g. distribution chain for pharmaceuticals; distribution channels for biopharmaceuticals; distribution of medical devices; distribution of dietary supplements and cosmetics; the closed system of controlled substance distribution)
- Alternative channels of distribution and vulnerabilities of the system

How the medication distribution system supports the safe and effective use of medication

- Issues associated with safe and appropriate drug distribution in various practice settings
- Methods to identify, evaluate, correct, and prevent errors in the medication distribution system
- The development, implementation, and evaluation of practices that assure safe, accurate and time-sensitive medication

1.3 Medication Dispensing and Distribution Systems

1.3.3 Distribution Systems (cont.)

How the medication distribution system supports the safe and effective use of medication (cont.)

- Comparison of several quality assurance strategies and choice of the most appropriate ones to evaluate the system
- Distribution of pharmaceuticals to inpatients
  - Compare and contrast centralized and decentralized drug distribution systems in a hospital setting
- How pharmacy information systems and automation is used to support safe and efficient drug distribution in a community or hospital setting

Global and cultural awareness in medication supply

- Distribution of pharmaceuticals in developing countries
  - Drug shortages, rationing and emergency preparedness
  - Debate regarding drug shortages due to supply chain fluctuations and disasters, especially in relation to ethical dilemmas in the practice of pharmacy
  - The various stakeholders involved in the debates on drug shortages and how these viewpoints are important to pharmacists

Storage and disposal of medications

- Stability, storage, toxicological and social issues relating to drugs
- Principles and procedures for drugs storage
- Ensure the integrity of drug products
- Storage and handling of drugs

  (e.g. storage of parenteral or enteral products employing aseptic techniques)
- Management of drug recalls, disposal of drugs, expired drugs

Repackaging and labelling of pharmaceuticals

- Prepackaging requirements of drugs
- Labeling and packaging requirements
- Label pharmaceutical dosage forms to comply with legislation and best practice

1.3 Medication Dispensing and Distribution Systems

1.3.4 Drug Administration

Introduction to medication administration

- Pharmaceutical products and the common dosage forms, routes of administration and related devices
- Knowledge and competencies necessary to safely and effectively administer medications
  (e.g. safety measures involved in administering medications by injection; emergency protocol: adverse reaction planning)
- Drug administration techniques
  (e.g. appropriate intramuscular, subcutaneous and IV injection techniques)
- Administration of medication to children
  (e.g. “teaspoon”)
- Self-administration techniques
- Clinical nutrition support
- Supervised administration in the pharmacy
  (e.g. methadone)

Drug delivery systems

- Basic principles of drug delivery
- The appropriate use of drug delivery systems to ensure appropriate response to therapy of medications used in a variety of disease states
- Current dosage delivery systems and their components
- The interplay between medication delivery systems and medication safety
- Quality assurance and management of drug delivery systems in different practice settings
- Supervision of medication delivery systems in the institutional and community settings

1. Clinical Sciences Aspects

1.4 Patient Assessment

1.4.1 Obtaining a Patient History

The clinical interview

- Patient interviewing techniques
  (e.g. introducing self, explaining purpose of the interview, beginning new areas of inquiry with open-ended questions, asking more personal questions later in the interview, clarifying patient responses, summarizing key information, organizing interview in logical and consistent manner)
- How to conduct patient interviews with diverse patients/caregivers
  (e.g. patients with cognitive impairment)
  - Ability to conduct a patient interview
    (e.g. with gathers information about the patient's chief complaint/needs and medications)
  - Identify appropriate information in a patient interview that will affect drug use
    (e.g. drug dose, schedule and medication adherence)
- Use identified information from a patient interview
  (e.g. to select the appropriate resources to provide patient information on how to prevent disease exposure or transmission; to communicate a tailored therapeutic strategy as well as therapeutic alternatives to the prescriber or patient for the correction or prevention of drug-related problems)

Acquisition of a comprehensive health history

- The basic principles and techniques of history taking and their different components of information
- Obtain necessary information from a patient
  (e.g. to determine if guidelines regarding their care are being met)
- Obtain a complete medication history for a patient along with patient understanding of purpose and prescribed or recommended regimen for each medication
  - Assesses how each medication is actually being used
    (e.g. frequency of use; number of doses missed in a typical week and reasons for missed doses; if appropriate, observes techniques of administration such as with a metered dose inhaler)
  - Assesses perceived problems with each medication
    (e.g. difficulty administering medication, cost of medication, and inconvenience of dosing regimen)
  - Assesses any side effects the patient may be experiencing with all medications being taken
  - Assesses medication effectiveness
    (e.g. patient perceptions of effectiveness of each medication or treatment regimen; how patient determines medication is working; how physician determines medication is working; results of lab tests or specific information on key indicators of treatment success, including patient-reported outcomes such as pain scores)

Collect, assess and interpret patient information

- Collect pertinent information from the medical chart (health and medication history forms) or database
  (e.g. information about prescription and nonprescription medications, herbal products and other dietary supplements, health and wellness information, patient lifestyle habits, preferences and beliefs, health and functional goals, socio-economic factors that affect access to medicine, allergies/adverse reactions, and disease)
  - How to read and interpret patient charts
- Assess a patient's health status
  - The collection and assessment of subjective and objective data
  - Discriminate between reliable and unreliable patient information when you know their source
  - Identify the benefits of, and barriers to access to patient data during the patient care process

1. Clinical Sciences Aspects

1.4 Patient Assessment

1.4.1 Obtaining a Patient History (cont.)

Collect, assess and interpret patient information (cont.)

- Interpret relevant patient information/data to determine medication related needs (MRNs) for general and patient-specific scenarios
  (e.g. demographics, social conditions, medical history/status, co-morbid conditions, physical assessment, laboratory/other diagnostic tests, medications, allergies)
  - Compare and contrast (differentiate) therapeutic alternatives to meet a patient's MRNs by considering, for example, clinical efficacy, adverse effects, drug interactions, availability, affordability and adherence
  - Select and justify the most appropriate therapeutic alternative to meet a patient's MRNs

Organize and document patient information

- Organization and documentation of pertinent information from a patient interview, laboratory or diagnostic report, or from another provider's note
- The structure, development, and use of various documentation styles
  - Commonly used formats (e.g. SOAP note) and structures (e.g. charts)

Patient records and systems

- Use of a patient documentation system to obtain and document patient information
- Creating, maintaining, management and utilizing individual patient records
- Create a patient database following completion of a medication history interview
  - Types of information gathering and formats for the database
- Understand need for interoperability of health records and data exchange and its impact on collaborative patient-centred care

1.4 Patient Assessment

1.4.2 Patient Screenings

The role of diagnostics in the clinical continuum of patient care

- The importance of differential diagnosis in the clinical evaluation of a patient
- The fundamentals of laboratory medicine and its importance to screening, diagnosis, and evaluation of patients
- Patient assessment focused on clinical laboratory interpretation and monitoring

Diagnostic tests

- The use of several common diagnostic tests, utilized to screen disease and monitor patient response to selected drug therapy
- Different types of testing (lab, imaging, etc.) and how to critically judge information provided by various tests
- The appropriate lab test(s) to assess a particular organ system and selected diseases
- Determine the reliability of diagnostic testing in terms of sensitivity, accuracy, positive predictive value and negative predictive value
- The scientific rationale behind different methods of diagnostic testing
- Drugs and physiologic factors that can interfere with specific lab tests

Clinical laboratory testing

- Knowledge and technical ability to order lab tests
- Understanding of how the test is performed and the appropriate techniques for measurement of: cholesterol, blood glucose, bone density, PSA, body fat analysis and other parameters, etc.
- The assorted techniques to obtain samples for testing
  (e.g. perform a fingerstick blood glucose using a blood glucose monitor)
- Laboratory testing in resource-limited settings
- Construct a differential diagnosis for a patient based on a variety of clinical scenarios

Interpretation of laboratory test results

- Introduction to laboratory values and the fundamentals of interpreting clinical laboratory test results to assist with the diagnosis or management of disease
- Identify normal and abnormal laboratory ranges and values for common tests
- The clinical implications of abnormal levels
- Important signs and symptoms associated with abnormalities of common laboratory values
- False positive and false negative results

Wellness and health screenings

- Development and implementation of health-screening programs in a variety of pharmacy practice settings
  (e.g. cardiovascular risk screening: 10-year risk for coronary heart disease (CHD) and the risk factors for CHD)
- The importance/role of well-care screenings in specific population
- Screening methods
- Screening and referral services (disease detection and advising patients/patient groups on the need for further medical evaluation)
- Screening for drug induced diseases

1. Clinical Sciences Aspects

1.4 Patient Assessment

1.4.2 Patient Screenings (cont.)

Monitoring patient parameters

- Monitoring parameters take into account drug, patient and disease specific data
- Establish intervals and frequencies for monitoring
  (e.g. check temperature twice daily, measure intake and output every 8 hours)
- Determine an appropriate monitoring programme to allow assessment of management goals
- Patient monitoring in inpatient, community and clinic settings

Therapeutic Drug Monitoring (TDM)

- Concepts of therapeutic drug monitoring
- Techniques used for therapeutic drug monitoring by pharmacists
- Monitoring and evaluating the patient's response to therapy (therapeutic efficacy and safety)
- Medication alterations specific for special population patients
  - Dosage calculations, dosage adjustments and drug monitoring for positive/negative outcomes in special population patients
    (e.g. geriatric, neonates, infants, children and pregnant, patients with renal and hepatic disorders, sickle cell, cystic fibrosis, genetic disorders)

OTC point-of-care testing devices

- The various diagnostic tests available on the market
- The use and the strengths and weaknesses of performing rapid diagnostic tests in the ambulatory setting
- The role of home diagnostic and monitoring devices in the diagnosis, staging, and monitoring of various disease states
- Properly use and interpret select point-of-care screening technology
  (e.g. glucometers, bone densitometer, INR point-of-care device, at-home cancer tests)

1.4 Patient Assessment

1.4.3 Physical Assessment

Introduction to physical assessment

- Patient physical assessment for diagnosis and monitoring, and the use of patient medical status inventories in pharmaceutical care
- Basic theory, terminology and techniques used in performing the major components of a physical exam
- Systematic approach to performing a physical assessment of a patient using four modes of assessment: inspection, palpation, percussion and auscultation
- Interpretation and evaluation of the patient physical state
- How physical assessment can be used to assess medication efficacy, toxicity, or side effects; and potential drug interactions
- Recognize physical findings that may be attributed to common disease states and pharmacotherapy

Vital signs and general observation

- Height and weight (body mass index and waist circumference)
- Vital signs: respiratory rate, heart rate, blood pressure, temperature
- Identify when and why vital signs should be taken
- Variations in technique used to assess vital signs
  (e.g. various methods and sites used to measure blood pressure; how to measure the radial and the apical pulse; compare tympanic, oral, and axillary methods of measuring body temperature; the technique for assessing respirations)
- Ranges of acceptable vital signs for an infant, a child and an adult

Assessment of body systems

- Symptom assessment (physical and psychosocial)
- Components of a physical examination
  (e.g. Integumentary; HEENT (head, eyes, ears, nose, throat); Neck; Back; Breasts/axillae, epitrochlear nodes; Thorax and lungs; Cardiovascular and Peripheral vascular; Gastrointestinal/Hepatic/Renal; Abdomen; Endocrine Assessment; Lower extremities; Musculoskeletal; Neurologic Assessment and Mental Status Exam; Optional exams; Rectal examination in men; Genital and rectal examinations in women, and the changes that occur in the presence of disease or drug therapy)
- Pain assessment (determine a patient's pain level utilizing a pain scale)
- Physical assessment techniques using the appropriate devices and equipment for different organs and systems
  (e.g. use of a peak flow meter in pulmonary assessment)

Principles of ECG and common abnormalities

- Principles of cardiac function and electrophysiology with a focus on systematic interpretation of cardiac rate and rhythm parameters for electrocardiogram

Emergency medical technician service

- Topics in pharmacy emergency preparedness
  (e.g. anaphylaxis)
- Triage patients to the appropriate component of the emergency response system

Basic life support and first aid

- First aid training
- The basic principles of cardiopulmonary resuscitation
- Principles of advanced cardiac life support and management of patients with acute cardiovascular emergencies

1. Clinical Sciences Aspects

1.5 Medication and Patient Safety

1.5.1 Medication Errors

The concepts of healthcare quality and medication safety

- Introduction to the problem of medication errors in healthcare
- The evolution of concern about medication errors, adverse drug events, medical error, and patient safety

Epidemiology of patient safety and medication errors

- Epidemiology of patient safety and medication errors, ascertainment and analysis of medication error data

The basic safety principles employed in the medication use process

- The types and causes of medication errors
- Strategies for improving the medication use process
  (e.g. medication use safety systems and medication error reduction programs)
- The role of medication safety resources and reporting systems

Causes of medication errors, including human and systems factors

- Psychosocial aspects that contribute to medication errors
- Inter- and intra-personal aspects that contribute to medication errors
- Factors that may contribute to medication-related errors in a community practice setting
  (e.g. dispensing under time pressure, stress)
- Role of drug names, drug packaging, labeling in medication errors
- Drug categories and abbreviations associated with error risks

Medication errors and their consequences on patients and healthcare in general

- The impact of medication errors on the individual patient and their family

Mechanisms to promote medication safety

- The importance of medication error detection, reporting, evaluation and prevention
- The principles and procedures of medication safety initiatives
- The development of strategies to reduce the likelihood of medication incidents
- Role of the patient in preventing medication errors
  - Counsel patients to supply the necessary medical information to the healthcare team

Medication error detecting methods

- The process for conducting an incident analysis (root cause analysis)
- The process for conducting a failure mode and effects analysis (FMEA)
- Identify medication errors based on their corresponding ISMP key element
- Resources to monitor and evaluate errors

Medication error reporting systems and techniques to identify and categorize medication errors

- ISMP, Medwatch, MUE, guideline development
- Determine when to report an error and what information to include
- Compare and contrast mandatory vs voluntary reporting programs
- Integrate professional responsibility to report and analyse medication errors

1.5 Medication and Patient Safety

1.5.1 Medication Errors (cont.)

Medication safety practices

- Pharmacy leadership in medication safety
- Risk management and medication errors
- Plan for system improvement to enhance medication safety
- The design of error-free medication systems
- The role of tall-man lettering in prevention of errors related to look-alike, sound-alike medications
- Medication prescribing, dispensing, and administration errors
  - Integrate communication skills to identify, reconcile, and prevent prescribing errors: methods to correct prescription errors through appropriate physician communications
  - Modify the pharmacy dispensing process to prevent dispensing errors
  - Effectively communicate drug information to those involved in medication administration
  - The importance of follow-up and monitoring in preventing errors

Supporting technology and automation

- Compare/contrast computer systems and computerized physician order entry (CPOE) systems with regard to errors
- The role of automation in reducing errors
- How point-of-care technology can prevent medication errors

Significant medication error research

1.5 Medication and Patient Safety

1.5.2 Patient Safety

Patient safety concepts and principles

- Difference between patient safety and quality of care
- Topics of the patient safety such as human factors, systems thinking, effective teamwork, safety culture and managing errors
- The importance of patient safety in the clinical setting

Organizations and services related to patient safety

- Organizations devoted to assurance and advancement of quality healthcare
- The importance of organizational leadership and teamwork in improving safety
- Strategies for creating a safe working environment in the hospital and community pharmacy setting

Methods of improving patient safety

- Communication strategies that enhance patient safety
  - Provide the basic information needed for a patient to safely achieve medication success
  - The importance of health literacy's impact on patient safety
- Management of medication use safety systems
  - The use of informatics tools to promote patient safety
  - Technologies and systems used to automate the medication delivery process and impact on patient safety
  - The different types of computer system features that can contribute to drug dispensing safety
  - Patient safety (triple check, use of computer dosing checks, REM's). Patient safety community (work flow, clutter, job assignments)
  - The requirements for a compliant Risk Evaluation and Mitigation Strategy (REMS) program

E-prescribing and patient safety

- The types of errors that can occur with e-prescribing software
- The types of errors prevented with e-prescribing software
- The role of clinical decision support as it relates to e-prescribing

Role of professional pharmacy societies, boards of pharmacy, governmental agencies, and legislation in promoting and improving patient safety

1.6 Drug Information and Literature Evaluation

1.6.1 Drug Information Concept and Applications to Clinical Practice

Philosophy and fundamentals of drug information practice

- Principles and procedures in the provision of drug information
- Drug information in the 21st century
- Information literacy
- How information can be used to change practice
- Information resources
- Drug information services

Drug information retrieval processes, and analysis

- Systematic searching and hierarchy of information to support clinical judgement and patient care
- Use of drug information and medical references and resources to identify and retrieve pertinent scientific information
- Application of drug information and literature evaluation skills in the delivery of patient-focused care
- The application of drug information in various practice settings

Manage medication information

- Fundamental skills needed for the provision of drug information in pharmacy practice
- Legal and ethical responsibilities of the pharmacist regarding the provision of drug information
- The differing drug information needs of healthcare professionals and patients
- Providing reliable drug information to health professionals and consumers
- The drug information provider role of the community pharmacist
- Scientific literature presentations

1.6 Drug Information and Literature Evaluation

1.6.2 Drug Information Resources

Basic principles of access and utilization of drug information resources in pharmacy practice

- Drug information resources as a tool for providing pharmaceutical care

Types of drug information and literature available and its role

- Multiple forms of drug literature including primary, secondary, tertiary, computerized databases and internet resources
  - Primary literature: the source (original clinical research articles)
  - Secondary literature
    (e.g. extensive bibliographies, meta-analysis articles, review articles, clinical guidelines)
  - Secondary health science databases
    (e.g. PubMed/Medline, Embase, OVID, International Pharmaceutical Abstracts (IPA), EBSCO and other library databases)
  - Tertiary literature
    (e.g. common references and texts books that pharmacists use in practice, internet information resources, mobile resources)
- The features and limitations of primary, secondary, and tertiary literature for use in clinical practice
  - The fundamental tools necessary to identify the quality of healthcare information available in primary, secondary, and tertiary resources
  - The strengths and weaknesses of the various databases
  - The role of the internet in providing accurate and timely drug information
- Identify valid and credible sources of drug information
- Ability to judge the reliability of various sources of drug information

Library resources

- Drug information library resources and access to these resources
- Using libraries: classification systems, electronic searching

Literature search methodology and techniques

- How to locate, search and access databases, texts, e-books, government resources, websites and various drug compendia
- Effective and efficient search strategies to find needed drug information from primary medical literature, drug references, and other evidence sources
- Efficient internet searching for drug information
  - Literature search engines for lay, professional, and scientific literature
  - Standard indexing-abstracting systems used in searching pharmaceutical/medical literature
  - Search techniques for on-line databases

Utilization of technology for drug information

- Introduction to using pharmacy related information technology resources
- Use information technology systems to assist in the provision of drug information

1.6.2 Drug Information Resources (cont.)

Drug industry and literature

- Relationship of pharmaceutical industry to drug literature
- Specific situations in which the drug manufacturer can serve as a source of information
- The pros and cons of drug industry sources

1.6 Drug Information and Literature Evaluation

1.6.3 Asking and Answering Drug Information Questions

The role and functions of a drug information pharmacist

- Problem-solving skills in the area of drug information retrieval and provision

Drug information questions

- Drug information question formulation
  - Formulate answerable clinical questions given patient-specific information
  - Steps of asking a PICO question (Problem, Intervention, Comparison, Outcome)
- Skills required to handle different types of drug information questions

Information request

- Classification and evaluation of information requests
  - Categorize questions (e.g., adverse effects, identification, drug therapy) to aid in gathering of background information and information retrieval
- Collect all pertinent data necessary to investigate a particular drug information request
- Determine whether the response requires rapid attention or may be delayed
- Assess the availability of colleagues, government agencies, support groups, etc. which may be beneficial in resolving specific requests

Concepts involved in responding to drug information requests

- Analysis of the question
  - Define the question that needs to be answer
  - Ability to clarify questions before answering
- Conducting a systematic search
  - Apply knowledge of research methods and information sources to retrieval of appropriate information for answering drug information questions
  - Primary literature evaluation and critical thinking skills necessary to formulate prudent drug information responses and patient care recommendations
  - Synthesize the results from publications to support the answer to a clinical question
  - List all information sources used to answer clinical questions
- Formulating and communicating a response
  - Use the information gathered to formulate evidence-based answers
  - Provide complete, clear and concise written and oral responses to drug information questions at a level appropriate to the requester (e.g. professional or patient), including required references
  - The importance of using a systematic approach to answering drug information questions
- Document responses to information requests in a professional manner

Drug information centers

- History of drug information centers
- The functions, structure and services of a drug information center
- Role of the drug information specialist

1.6 Drug Information and Literature Evaluation

1.6.4 Drug Literature Evaluation

Introduction to clinical literature evaluation

- Concepts of drug literature evaluation and application to pharmacy practice and patient care
  (e.g. drug therapy decision-making, to make patient/population recommendations, to solve drug-related problems)
- Assessing the quality of information from a variety of sources
- Overview of the principles of bibliometric and medical/pharmaceutical literature evaluation

Critical appraisal of pharmaceutical and medical literature

- Critical evaluation of primary literature/clinical guidelines focused on the provision of drug information for individual patients
- Systematic approach to critical appraise medical literature utilizing a structured framework

Analysis and interpretation of pharmaceutical and medical literature

- Contemporary issues in the interpretation of biomedical research
- Drug literature analysis techniques
- Applied data analysis and biostatistics in the interpretation and critical analysis of biomedical literature needed to develop and utilize evidence-based recommendations for patients and healthcare practitioners

The various types of research articles and critically evaluate these resources

- The basic structure of scientific/medical articles: abstract, introduction, methods, results, discussion, and conclusion
- Assessing appropriateness of study
  (e.g. study design, quality of the data, statistical test selection and application, study limitations, bias/confounding, objective-methods cohesion, statistical analyses, and implications of the study results)
- Critical evaluation of internal validity, external validity, and impact on clinical care
- Evaluation of the strengths and weaknesses of the article, and recognize errors in study design or statistical methodology

Evaluating studies

- Distinguish between various study designs (observational, randomized controlled trials, qualitative, etc.) and interpret their relative value and application to practice
- Evaluating a study: the ABCS (Applicability, Bias, Confounding, Significance)
  - How to evaluate studies of Therapy (Randomized Controlled Trials)
  - How to evaluate studies of Prognosis/Cohort Studies
  - How to evaluate studies of Harm/Case-control studies
  - How to evaluate studies of Harm (Observational Studies)

1.6 Drug Information and Literature Evaluation

1.6.5 Evidence-Based Clinical Practice

Introduction to Evidence-Based Medicine (EBM)

- Concepts and rationale for evidence-based practice
- The difference between the traditional medical paradigm and the EBM paradigm
- Principles and methods of EBM
- Interpreting the results of statistical tests that are relevant to evidence-based practice

The notion of levels of evidence/herarchy of evidence

- The hierarchy of study designs as it relates to level of evidence
- Strategies to understand, question and evaluate evidence
- How to grade the level of evidence, based on the quality of the study

Evidence-based clinical decision-making

- The roles of clinical evidence and evidence-based practice in clinical decision-making for patient care
- Evidence-based decision-making process
- Patient characteristics and medical evidence for clinical decision-making
- Make medication management and medication-related policy decisions for individuals or populations based on the best available evidence
- Make decisions based on available health sector data
- EBM resources

Application of clinical trial results to patient care

- The usefulness of clinical trial data for making evidence-based practice decisions
- Interpreting clinical trial data and applying the data to patient cases to support therapeutic recommendations
- Landmark clinical trials that have influenced the way medications are used in clinical practice

Practice of evidence-based pharmacy

- Identification, evaluation, and application of evidence relevant to improving clinical pharmacy practice and patient-centred pharmaceutical care
  (e.g. assessing patients' drug-related needs; identifying, resolving, and preventing drug therapy problems; developing a care plan and plan for follow-up; communicating with a patient and the healthcare team)
- The role of the pharmacist in EBM

1.6 Drug Information and Literature Evaluation

1.6.6 Professional Writing

Professional writing for clinical practice

- Basic principles of scientific writing
- Use professional writing style and tone

Practice and reflect on writing in professional, public, and academic genres

- The types of professional writing
  (e.g. the résumé, the business letter, professional emails, the memo, articles, and journal writing)
- Common forms of medical writing
  (e.g. patient reports, clinical notes, case studies, protocols, care instructions, writing for a medical audience)
- Academic writing
  (e.g. writing abstracts, research reports, academic papers, literature reviews)

How to write and prepare a manuscript/article for publication

- The process of writing and publishing an article
  (e.g. analysing published literature, soliciting journals for interest, referencing, journal requirements/deadlines, peer review, and author rights/responsibilities)
- How journals are published and papers accepted for publication
- The publication and peer review processes of scientific journals
- Identify which journals are considered highly reputable
- The purpose of editorials that accompany major article publications

Integrity in medical writing

- Copyright, appropriate use of sources and misuse of sources
- Strategies to avoid plagiarism

1.6 Drug Information and Literature Evaluation

1.6.7 Pharmacy and Therapeutics Committee

The role and functions of a pharmacy and therapeutics committee

- The role of the joint commission and its specific requirements for pharmacy practice in the hospital
- The tools needed to conduct new drug evaluations and formulary reviews

The development, implementation and use of drug formularies in community and institutional settings and across the healthcare system

- How drugs are listed in hospital formularies
- The fundamentals of formulary management
- Propose and justify a medication addition or deletion to a health-system formulary

The rationale for clinical practice guidelines, the process by which they are developed, and potential limitations to their use

1.6 Drug Information and Literature Evaluation

1.6.8 Health Information

Contemporary health topics

- Distinguish among lay, professional, and scientific literature
- Systematic approach to retrieving health information
- The potential impact and implication of published information on current practices

Facilitate appropriate consumer use of health information

- Literacy in the access and use of health information

Health information technology

- Developing, evaluating, using, and maintaining healthcare information systems
- The availability, selection and use of electronic and printed sources of medical and pharmacy information

Manage bibliographic data

- Principles of information management
- Formulate strategies for keeping current with the medical and pharmacy literature
- Correctly citing and referencing literature sources

Factors affecting health information exchange

2. Social and Behavioural Pharmacy Sciences Aspects

2.1 Sociological Aspects of Pharmacy Practice

2.1.1 Sociological, psychological, and behavioural aspects of pharmacy practice

Introduction to sociological theories and concepts that impact health and healthcare

- Definition of health, wellness and wellbeing
- The differences between health and healthcare
- The differences between illness, sickness, and disease
- The social, emotional/psychological aspects of health and illness that patients often experience
- The social model of health. Variety of wellness models (including Rath and Harter)

The foundations of social and behavioural pharmacy

- The social and behavioural issues that impact health including their influence on the pharmacist-patient relationship and the ability of the pharmacist to provide patient care
- The application of behavioural science principles to help understand the influence of humans on the appropriate delivery of pharmacy care services and drug use in society

Introduction to psychology

- The ways in which individual psychology shapes and affects health and healthcare
- The major psychological theories (behaviouralism, cognitivism, developmentalism and psychoanalytic theories) and application of each of these theories to pharmacy practice and patient care
- Elements of behavioural psychology that are relevant to the practice of pharmacy
- Theoretical basis for human behaviour: development, conditioning, learning, motivation, perception, ability, personality, stress

Health behaviours

- Overview of theoretical health behaviour models
- How theories of health behaviour can be applied to maintaining and improving health and wellbeing
- Behavioural aspects of patient-pharmacist interactions and doctor-pharmacist interactions

Factors that influence health behaviour

- The environmental, geo-political, socioeconomic, cultural, psychological and biological factors that influence the health and wellbeing of individuals, families, communities and populations
- How certain patient characteristics such as gender, race, sexual orientation, culture, religion, disparities, literacy, and health beliefs affect a patient's interactions in the healthcare system and enhance or compromise the effectiveness of treatment regimens

Patient and professional behaviours

- Patient and health professional behavioural science principles
- Psychosocial processes that underpin patient health behaviours
- Understand, influence and modify patient behaviours
- Professional behaviours that help improve patient quality of life and patient safety

2. Social and Behavioural Pharmacy Sciences Aspects

2.1 Sociological Aspects of Pharmacy Practice

2.1.1 Sociological, psychological, and behavioural aspects of pharmacy practice (cont.)

Health Behaviour Change

- Health belief model
- Models and theories of behaviour change (Transtheoretical Model of Change) and stages of change model
- Principles and strategies of behaviour modification
- The process of behaviour change
  - The 5 A's Behavioural Intervention Protocol

2. Social and Behavioural Pharmacy Sciences Aspects

2.2 Patient-Reported Outcomes

2.2.1 Patient Humanistic Outcomes

Economic, clinical, and humanistic outcomes (the ECHO model)

- The ECHO model as a framework of measuring program, procedure, or product effectiveness

Introduction to patient-reported outcomes

- Definition and examples of patient-reported outcomes
  (e.g. quality of life, patient satisfaction, adherence, as well as a reduction in drug-related morbidity and mortality)
- Similarities and differences between patient-reported outcomes and professional reported outcomes
- How patient-reported outcomes are used by healthcare providers, researchers, policy makers
- The participation of patients in achieving positive clinical outcomes and maximizing their health-related quality of life

Design an evaluation tool to evaluate an outcome

- Classical test theory and item response theory use in patient-reported outcomes instruments
- Psychometrics and questionnaire development
- Concepts of validity, internal reliability, sensitivity, test-retest reliability, generalizability, readability, respondent burden
- Methods by which survey questions and responses are chosen
- Cross-cultural applications

Health-related quality of life/health status measures

- The World Health Organization definition for health-related quality of life (HRQL)
- The domains and subdomains that are commonly assessed in HRQL instruments
- Wilson and Cleary model: relationship between physiologic, biologic, symptom, and functioning
- Preference weighting and utility analysis
- The concept of clinically meaningful difference in health-related quality of life (HRQL) research
- Generic or a disease specific HRQL instrument
- The term response shift and its implication to health-related quality of life (HRQL) studies
- Sources of existing health-related quality of life (HRQL) data
  (e.g. large datasets, registries, and proprietary datasets (MEDSTAT))

Satisfaction

- The theoretical foundation from which satisfaction is derived and used in healthcare assessment
- The various types of satisfaction measured in healthcare; specifically, satisfaction with medication; satisfaction with healthcare; satisfaction with health state
- The uses of satisfaction data, including use by accreditation agencies, payers (insurance companies, purchasers of healthcare), and research

2. Social and Behavioural Pharmacy Sciences Aspects

2.2 Patient-Reported Outcomes

2.2.1 Patient Humanistic Outcomes (cont.)

Work-related outcomes: presenteeism, productivity, disability

- The concept of work and work outcomes
- The common domains constructing health and work-related outcomes
- The methods used to determine health and work related outcomes
- The findings of studies that evaluate health and work related outcomes
- Secondary data sets that contain patient-reported work-related outcomes

2. Social and Behavioural Pharmacy Sciences Aspects

2.3 Professional Communication

2.3.1 Communication Concepts

Introduction to communication

- What is communication?
- Basic principles, skills and techniques of good communication
  (e.g. listening skills, asking questions, providing empathy, understanding/managing confusion, understanding/managing conflict, and understanding/analysing nonverbal behaviour)
- Communication models and styles
- Design, preparation, delivery, and critique of educational, informative, and persuasive communication methods
- Barriers to effective communication and strategies to overcome those barriers
  (e.g. environmental barriers to communication with patients)

The components of effective interpersonal communication

- Introduction to factors and processes involved in interpersonal communication: source and receiver variables, and strategic interaction with different types of people
- Forms of communication: verbal (oral, written, visual) and nonverbal communication skills and strategies
  - Factors that may influence the effects and effectiveness of different forms of communication with different stakeholder groups
  - Written communication as an effective tool for interpersonal communication and documentation of recommendations and consultations
- Improving personal communication

Professional communication

- Professionalism in communication
  - Communicate pertinent information in concise and professional manner
  - Professional dress and appearance
- Ethical considerations in professional communication
- Communicating with impact

Health communication

- Influencing health through communication
  - Use of health information/communication as a health promotion strategy
- The essential elements and skills in the area of healthcare communications
- Communicate in lay and professional language, choosing strategies appropriate for the context and diverse audiences (strategies for patient-centred and colleague centred communication)
- Persuasion theory and the application of theory to health communication
  - How persuasion principles operate in all facets of healthcare
    (e.g. audience analysis and evaluation for health campaigns, pharmaceutical advertisements, and interpersonal influences on health behaviours)
- The most effective means to communicate opinions and concerns
  (e.g. express one's knowledge and opinions to team members involved in patient care with confidence, clarity, and respect, working to ensure common understanding of information and treatment and care decisions)

2. Social and Behavioural Pharmacy Sciences Aspects

2.3 Professional Communication

2.3.1 Communication Concepts (cont.)

Aspects of communication associated with pharmacy practice

- The importance of communication in contemporary pharmacy practice
  (e.g. in the delivery of optimal pharmaceutical services)
- Application of communication principles and skills that enable development and maintenance of constructive interpersonal relationships in a variety of pharmacy practice settings

Introduction to interviewing

- Principles of interviewing
- Interview patients and healthcare providers

2.3 Professional Communication

2.3.2 Patient Communication

Patient-centred communications

- Theoretical principles for communicating effectively with diverse patients, their families and communities in a variety of context
- The ability to communicate in a clear and coherent manner
  - Information with patients, families, and healthcare team members in a form that is understandable, avoiding discipline-specific terminology
  - Evaluating patient comprehension

The pharmacist-patient relationship and professional interaction

- The importance of the patient/pharmacist relationship and understand how to optimize interactions between them
- Principles required to develop positive relationships and promote positive therapeutic outcomes: engage, empathize, educate and enlist
- Different types of pharmacist-patient relationships
- Techniques, strategies and resources pharmacists use to enhance health-related interactions and interpersonal relationships with patients and care givers

Communicating health and pharmaceutical information to patients

- Effectively and professionally communicate information related to healthcare, pharmaceutical care plans, population health, and other related information to patients
  (e.g. inform patients of choices about their therapy)
- Negotiate decisions with patients about their therapy
  - Written and oral communication skills to facilitate a climate of empathy, shared decision-making, mutual support and trust with families and other caretakers
  - Effective methods for creating positive, therapeutic relationships with patients through the application of communication skills (empathy, assertiveness training, effective listening, clarification to ensure understanding, etc.) and other behavioural interventions
- Communication to improve patient outcomes in the healthcare environment
  - Foundations of clinical communication, including direct and indirect clinical communication techniques to increase the participation of patients in achieving positive clinical outcomes and maximizing their health-related quality of life
  - The pharmacist's role in using communication skills to enhance patient understanding of therapeutic regimens, improve medication adherence and empower patients to become more involved in their own healthcare
- The flaws in many of our traditional communications and assumptions when caring for patients

Social Cognitive Theory (SCT) and behavioural theories applicable to health-related communication

- Definition of SCT and how it is associated with provider-patient communication
- Other behavioural theories' applicability to provider-patient communication

2.3 Professional Communication

2.3.3 Interprofessional Communication

Introduction to interprofessional communication

- The importance of professional communication in the interdisciplinary team
- Communication principles and skills necessary for successful interactions with peers, other health professionals and professional contacts
  - The inter- and intra-professional relationships of healthcare providers
  - How to effectively communicate with other healthcare professionals and document the interactions
- Models for in-depth interprofessional communication and behaviour within healthcare teams
- Recognize and understand how the uniqueness of other team members, including power and hierarchy within the interprofessional team, may contribute to effective communication and interprofessional tension

Organizational communication in pharmacies

- Communicate effectively with peer pharmacists, technicians and other pharmacy staff to develop and maintain a positive and productive work environment

Communication with healthcare providers

- Strategies and resources that can be used by pharmacists to enhance communication with prescribers and other healthcare professionals
  - Identification, extraction and interpretation of data to be communicated to other healthcare practitioners
  - Provide constructive feedback to peers
- Communicate with healthcare providers to demonstrate opportunities around collaborative patient care
  (e.g. new drug therapy, hot topics, new patient-centred services)
  - Communicate and collaborate with physicians, nurses, other healthcare providers, community members, policy makers and administrators in a considered and systematic way, focusing on patient best clinical outcomes
  - Share information, ideas and solutions with other pharmacists and health professionals
  - Effective communication and team collaboration to clinical decision-making
- Communicating with health professionals in a variety of settings
  - Apply approaches to communication with other healthcare professionals in special settings and with specific groups of people
- Special communication challenges that relate to pharmacists and other healthcare providers
- Obstacles to effective interprofessional communication and communication strategies to overcome obstacles
- Communicating with healthcare professionals to resolve issues
  - Effective professional communication techniques to solve prescription problems and provide drug therapy management in ambulatory pharmacy environments

2.3.3 Interprofessional Communication (cont.)

Communication modalities with other members of the healthcare team

- Verbal, written, graphic, and electronic communication with healthcare providers
  - Appropriate non-verbal, verbal, questioning and listening skills when communicating with other healthcare professionals
- Interprofessional communication formats
  (e.g. SBAR, SOAP notes, chart review, pharmacist documentation)
  - The importance of standardized interprofessional communication formats
  - Compare and contrast different standardized interprofessional communication formats
  - The various components of a SOAP note and where each should be placed
- Interprofessional communication calls
  - Communicate via telephone about a patient to resolve a medicated-related problem
  - Transcribe an oral order over the phone

2. Social and Behavioural Pharmacy Sciences Aspects

2.3 Professional Communication

2.3.4 Active Listening and Empathic Responding

Active listening

- The process of active listening
- Strategies for active listening and body language interpretation that enhance communication with patients
- Active listening skills and techniques
  - The importance of and apply effective listening skills to interview a patient regarding the patient's drug therapy needs
- Barriers to active listening

Empathic responding

- Concepts of "caring" attitude, empathy and compassion
- Social support and emotion in healthcare
- Identify and describe empathic responding and responses used in communication
- Professional attitude with appropriate empathy during interactions with patients and other healthcare providers
  - Communicate in a non-judgmental, non-discriminatory and respectful manner
  - Appropriate verbal and non-verbal expression and display empathy and tact in work-related communication
  - Identify and respond empathically to patient concerns

2.3 Professional Communication

2.3.5 Assertiveness and Resolving Conflicts

Assertiveness in communicating

- Assertiveness and problem-solving techniques
- Identify and demonstrate assertiveness in communication with patients and healthcare providers, co-workers, managers, and employees
- Compare and contrast passive, aggressive and assertive behaviours
- Constructive criticism and providing feedback

Resolving conflicts with patients and others

- The causes and mechanism of conflicts
- Conflict resolution
  - Conflict management techniques, and negotiation in multiple situations
  - Techniques to establish a harmonious working relationship or to defuse/prevent conflicts at the workplace
- The importance of effective communication to providing effective patient care and minimizing stress and conflict
  - Strategies to facilitate communication with difficulty patients and sensitive health situations
    (e.g. angry patients)
- Apply critical thinking, problem-solving and scientific reasoning skills to prevent or resolve problems within the practice of pharmacy
  - Plan appropriate intervention strategies to address problems
  - Plan follow-up to verify problems are resolved and no new problems exist

2.3.6 Special Communication Situations

Communication with specific populations

- Special communication challenges that relate to patients and strategies to overcome these
  (e.g. based on gender, age, cultural, racial, socio-economic differences, heightened sensitivity)
- Communicating with people of different ages
  (e.g. child, adolescent, adult, older adult)
  - Generational differences in communication
  - Communication strategies to overcome potential sensory, language, and cognitive limitations in older adults
- Effective communication at the end of life
  - The communication needs of dying patients and grieving family or significant others
- Communication with patients with disabilities
  - Assess patients for physical/mental impairment impacting verbal and written communication processes
- Recognize fatalistic statements and appropriately communicate with a potentially suicidal person

Health literacy

- The importance of health literacy in patient communication
  - Implications of health literacy for public health and for various patient populations
  - Critically analyse certain disease states and assess how literacy impacts health and wellness with this disease
  - The connection between cultural literacy and health literacy and the ways in which campaigns can be designed to promote health in the context of culture
  - The connection between civic literacy and health literacy and the ways in which campaigns can be designed to promote wellness in the context of civic engagement
- Forces that affect health literacy including culture, health system demands, etc.
- Assess the patient's level of literacy and health literacy
  - The advantages and drawbacks of assessment tools (REALM, STOFHLA) used to measure health literacy
- Communication with patients of varying health literacy levels
  - Health literacy of indigent populations
  - Ability to effectively interact with patients with low literacy
  - Strategies for creating useful internet and print materials for use with patients of varying levels of health literacy
- Issues relevant to low health literacy
  - Limited health literacy as a barrier to patient education and appropriate strategies to overcome barrier

2.3.6 Special Communication Situations (cont.)

Deal with people from culturally and linguistically diverse backgrounds

- Introduction to cultural competence
  - Cultural diversity: Culturally diverse patients
    (e.g. Indigenous health)
  - The professional importance of recognizing cultural differences
  - Foundation for development of knowledge, attitudes, and skills required of culturally competent healthcare providers
  - Definitions and models of cultural competence, characteristics of culturally effective practitioners and workplaces
  - Cultural factors that facilitate/hinder communication
  - Cultural communication gaps in healthcare
  - Issues relevant to multicultural communication and the challenges of cross-cultural and bilingual communication
  - Working with interpreters, legal and professional imperatives for cultural competence
- How to care for patients who are part of a different culture
  - Cultural sensitivity when interacting with patients
  - Communicate and dealing with people with different cultural beliefs, values, behaviours, practices, religions and languages
  - Ways that culture can affect healthcare beliefs and practices
    (e.g. interactions with patients with health-related and medication beliefs)
  - Strategies to appropriately adjust behaviour or communication style based on cultural and communication considerations in order to optimize patient care
    (e.g. implement a culturally proficient care plan)

Importance of integrating health literacy and cultural competence to provide quality patient care

2.3 Professional Communication

2.3.7 Presentation Skills

Group presentation skills

- Skills in public speaking
- Present and defend ideas in a logical and effective order
- How to produce a team presentation
- Explain sometimes complex concepts to members of the team who might be from different science backgrounds

How to communicate effectively with various audiences

- Ability to present ideas, plans, and data in appropriate written and oral formats to succinctly and effectively communicate with various audiences
- Ability to prepare and deliver effective presentations to groups in a variety of healthcare education and professional settings
- Formal presentation to a professional audience
- Techniques to capture the attention of an audience

Communication and dissemination of scientific information in written and oral formats

- Communication skills that scientists need to speak directly, concisely and informatively about their work to colleagues and supervisors, conference audiences or specialist panels
- Methods for research dissemination that are used by many health professionals
  (e.g. papers and review articles, poster, podium presentations, seminars, round table presentations)
- Development of scientific materials to present findings of research studies
  (e.g. appealing posters and presentations, persuasive slides and other audiovisual materials)
- Develop the scientific content of the presentation and handle questions following the presentations

2.4 Ethics

2.4.1 Ethical Concepts

Introduction to ethical theories and principles

- Concept of ethical practice
- Distinguish ethics, morals and law
- Personal values and ethical principles in professional and social contexts
  (e.g. autonomy, accountability and dignity, beneficence, veracity, equality and justice, and confidentiality, trust, honesty and integrity, non-malfeasance, respect)
- The primary ethical theories and the impact of social culture in their interpretation and application
  - Differences and similarities between a variety of ethical theories
    (e.g. consequentialism and non-consequentialism)
- What makes a situation unethical?
- Ethical analysis

Introduction to the field of bioethics

- Bioethical principles relevant to the healthcare environment
- The role and autonomy of the patient
- Rights and responsibilities of patients/consumers

Ethics and values of a health professional

- The concept of the duty to care
- Ethical issues in teamwork
- Values of the pharmacist as a provider of care
  (e.g. ethical, benevolent, empathetic, competent, open-minded, prudent in making judgments, and devoted to serving others)

Ethics in pharmacy practice

- Ethical issues facing pharmacists in today's healthcare environment
- Application of ethical principles, values and theories to pharmacy practice situations
  (e.g. in the provision of pharmaceutical products and services to patients)
- Ethical codes that guide the profession of pharmacy and application in a practice setting
- The interrelationship of pharmacy law and ethics, including legal/ethical workplace issues
  (e.g. professional negligence/malpractice, patient privacy, and conscientious objection)
- The elements of a tort claim in the context of pharmacist malpractice

Ethical decision-making in the context of professional health practice

- The background, history, theories, models and components of ethical decision-making in the professional medical environment
- The process of ethical decision-making
- Ethical decision-making principles to the provision of pharmaceutical care

Overview of healthcare business ethics

- Professional behaviour and ethical issues related to the development, promotion, sales, prescriptions, and use of drugs
- Ethical considerations: profit vs patients' best interests

2. Social and Behavioural Pharmacy Sciences Aspects

2.4 Ethics

2.4.1 Ethical Concepts (cont.)

Ethics and the pharmaceutical industry

- The history of ethical, legal and regulatory forces that have shaped the pharmaceutical industry
- Common criticisms of the pharmaceutical industry and recent legislative efforts to mitigate specific unethical practices

Classic cases that have shaped medical ethics

2.4 Ethics

2.4.2 Personal and Professional Conduct

Personal conduct

- Personal responsibility
- Organizational and personal ethical norms

Professional ethics

- Introduction to the concepts and elements of professionalism and professional conduct
- Values and principles of professionalism

  (e.g. empathy, compassion, honesty, integrity, accountability, altruism, service-orientation, trustworthiness, competency, desire for learning, confidence, tolerance, cooperation, leadership, autonomy, justice, punctuality)
- Domains of professionalism and self-assess level of professionalism in each domain
- The importance of self-assessing professionalism on an ongoing basis

Professionalism in pharmacy practice

- The association between professionalism and pharmacists standards of conduct in pharmacy practice
- The civil liability, professional ethics, behaviours and attitudes of a pharmacist
- The pharmacist's professional responsibility to care for patients and to respect patients as autonomous individuals
- Understanding of right and wrong in terms of professional behaviour and patient care
- Difference between what is ethically required of professional pharmacists and what is legally required
- Respect for differences related to cultures, values, ethnicity, gender, sexual orientation, religion, language and socio-economic status and how these may impact health, health practices, and physical assessment
- Respect roles/responsibilities, and expertise of other health professions

Etiquette

- Professional meeting protocol and multicultural etiquette
- Telephone and electronic etiquette

The similarities and differences between personal and professional behaviour

2.4 Ethics

2.4.3 Ethical Problems and Dilemmas

Introduction to ethical problems and dilemmas

- The historical basis of ethical problems
- Ethical dilemma and the impact on the patient, pharmacist, physician, family
- The personal and professional resolution of ethical dilemmas in healthcare
- Process for evaluate, dealing and solving ethical dilemmas in pharmacy practice
- The moral options open to a pharmacist faced with a moral problem

Ethical dilemmas commonly seen in clinical practice

- Ethics surrounding reproductive healthcare decisions
  (e.g. abortion, assisted reproduction, stem cells, cloning)
  - Ethical issues regarding a pharmacist's responsibility to provide information and medication related to reproductive health
    (e.g. contraception, pregnancy testing, pregnancy termination)
- Ethical issues related to death and dying
  (e.g. comas, end-of-life care, requests to die, physician assisted dying or euthanasia)
  - Historical and contemporary theories and models of death, dying and the grief process from the perspective of the healthcare practitioner
  - The importance of people's beliefs and practices surrounding death and dying and to be able to respond with sensitivity and respect to people whose beliefs and practices may differ from their own
  - The ethical issues surrounding the pharmacist responsibility and ethical behaviour to provide information and dispense medication related to end-of-life care, including when provision/dispensing may be in conflict with personal moral beliefs or values
- Research and experimental treatments
  (e.g. human subjects)
- Individual rights and the public good
  (e.g. vaccination, genetic testing and screening, right to refuse medication, stopping the global threat of AIDS)
- Spiritual considerations in patient care and therapeutic dilemmas produced by spiritual beliefs
- The ethical dilemmas relevant to pharmacy practice posed by drug shortages and disasters

Conflicts of interest in pharmacy business and healthcare decision-making

- Questionable business practices in pharmacy
- The conflict of interest presented to pharmacists by community retailers supplying unhealthy, potentially addictive products
  (e.g. tobacco, alcohol, junk food, and lottery tickets)
- Potential ethical dilemmas in pharmacy practice arising from interactions with the pharmaceutical industry and how to address them
- Legal and ethical expectations for the professional behaviour of the pharmacist when actions may be in conflict with personal beliefs and values

2.4.3 Ethical Problems and Dilemmas (cont.)

Conscientious objection by healthcare professionals

- The necessary steps that a pharmacist must take when refusing to fill a prescription due to conscientious objection
- Legal principles governing a pharmacist's rights and responsibilities pertaining to refusal to fill a prescription due to religious or moral objection

2.4 Ethics

2.4.4 Privacy of Health Information

Privacy

- The principles of privacy applicable to pharmacy operations
- The right to privacy as they affect the legal rights and responsibilities of patients, healthcare providers, and policy makers
- Preparing and maintaining records that respect a patient's privacy interests and comply with the law
- Legal and regulatory requirements, ethical standards, and organizational policies and procedures for protection of health information and maintaining privacy, and ensuring security

(e.g. collection, use, disclosure, access to, protection, and destruction of health information)

Confidentiality

- Maintenance of patient confidentiality and professional boundaries
- Professional obligations with respect to confidentiality

Informed Consent

- Patient consent form
- The appropriate elements of an informed consent document
- The quality of a consent form

2.4 Ethics

2.4.5 Ethics in Research

Introduction to ethics in clinical research

- The historical progression of research ethics and oversight
  (e.g. Belmont Report)
- Overview of ethical and regulatory aspects of clinical research (ethics in human and animal research)
- The function of ethics committees

Research using human subjects

- The circumstances surrounding the formation of the Declaration of Helsinki, The Nuremburg Code, and the USA's IRB process
- The process and requirements used to ensure proper review of pharmacy research involving human subjects
- The criteria used by the Institutional Review Board (IRB) to assess the ethical acceptability of proposed human subjects research studies in pharmacy
- The ethical obligations and responsibilities of pharmacists conducting human subjects research (both pre-clinical and clinical)
- Examples of lapses in judgment in clinical research
  (e.g. Tuskegee study of untreated syphilis)

2.5 Public Health

2.5.1 Public Health Pharmacy

Introduction to public health

- The importance of public health as a science and its goal of maximum health for all
- Public health terminology and concepts
  (e.g. health and disease; acute illness; chronic disease/illness; community health; illness behaviour; morbidity and mortality)
- Historical development of public health
  (e.g. food and water safety, sanitation and disease monitoring)
- The basic principles of public health, public health practice and the public health delivery system
  - Population vs individual health
  - Population health management
- Public health priorities and interventions
- Aspects of public health including organizations, administration, environmental social health problems

The determinants of health

- The major determinants that influence the health of populations and individuals
  (e.g. the biological, social, environmental, and economic determinants of health)
  - The social determinants of health
    (e.g. poverty, ethnicity and culture, gender, age, income, education, employment, social status, state laws)
  - The relationship between access to clean water, sanitation, nutrition, environmental degradation and pollution and risk of communicable and chronic diseases

The impact of disease on society

- Health and disease indicators
- The burden of disease: prevention and management of health problems

Measures of health

- How health, illness and disability are measured, particularly the determinants of health
- Common measures of health
  (e.g. morbidity, mortality, birth/death rates, health status, health-related quality of life (QOL), Quality Adjusted Life years (QALYs))

Improving health outcomes from a public health perspective

- Principles of health improvement
  (e.g. surveillance, basic/clinical sciences, intervention/translational science, prevention/health promotion)

Public health practice from a pharmacy perspective

- How pharmacy practice interfaces with public health delivery in a variety of settings
- The challenges, tools, strategies and models of the intervention of the pharmacist in public health

Public health research

- The role of public health research in ongoing clinical practice

2.5 Public Health

2.5.1 Public Health Pharmacy (cont.)

Public health programs

- The public health programs and role of pharmacist in these programs
  (e.g. immunization programs, needle exchange program, prevention of sexually transmitted diseases)
- Planning, designing, implementing, and evaluation public health education and health promotion programs and health information campaigns

Global health pharmacy and international health

- Geographic specific or global distribution of diseases and potential health hazards
- The key barriers that developing countries face in the provision of healthcare and their impact on the health of population and individuals
  (e.g. healthcare system funding, healthcare worker migration, access to medicines)
- The disparities in healthcare and pharmaceuticals that are present in underserved, minority and rural populations on a global level
- The influence of the presence or absence of pharmacy-related services and initiatives on regional health
- Improve public health in places where health and healthcare delivery inequities exist and reduce health disparities
- Opportunities that exist for pharmacists in the area of global health service

Environment and pharmaceuticals and personal care products

- How pharmaceuticals and personal care products are introduced into the environment
- Mechanisms available to limit this type of pollution
- Actual and potential cause/effect relationships between specific products/byproducts and types of wildlife
- Actual and potential cause/effect relationships between specific products/byproducts and humans
  (e.g. reproductive effects)

Disaster planning and emergency preparedness

- The role of the pharmacist as a health professional and citizen in the context of disaster management
  (e.g. emergency response, disaster preparedness, humanitarian relief)

2.5 Public Health

2.5.2 Epidemiology and Pharmacoepidemiology

Introduction to epidemiology

- Basic concepts and terminology in epidemiology
  (e.g. epidemiology, pharmacoepidemiology, the host-agent-environment, medical surveillance, need for public health investigation, morbidity, mortality, outbreak and onset (epidemic), epidemic curve, incubation period)
- Principles of epidemiology as a diagnostic discipline of population health
- Methods of epidemiology in healthcare
- Epidemiologic measures
  (e.g. measures of disease occurrence, frequency and risk, measures of association and impact)
- Epidemiological and database considerations
  - Accessing and using population health and demographic data
- The challenges and applications of epidemiology in pharmacy practice
  - How epidemiology is being used to evaluate contemporary health issues, with special emphasis on the role of prescription drugs and pharmacy services in selected diseases
- Epidemiological evidence and its limitations

Clinical epidemiology

- Clinical epidemiology, including abnormality, diagnosis, disease frequency, risk, cause, prevention, prognosis, and treatment outcomes
- Principles of clinical epidemiology relevant to pharmacy practice
- Clinical epidemiology in evaluating the implications of the introduction of new healthcare interventions, including procedures, diagnostic tests, devices and drugs

Pharmacoepidemiology

- What is pharmacoepidemiology
- Application of principles of epidemiology to the study of drug use and outcomes in large populations and methods for continual monitoring for unwanted effects and other safety related issues
- Concepts and methods used to measure the source, diffusion, and use of drugs in populations
  - Modern methodological concepts commonly utilized within pharmacoepidemiology
    (e.g. propensity score methods)
  - The utility of pharmacoepidemiologic methods as they apply to risk assessment, drug therapy selection, disease prevention and, programme and policy formulation
- Pharmacoepidemiologic issues affecting healthcare and pharmacy practice

Epidemiological and pharmacoepidemiological studies and research

- Common epidemiological study designs and their strengths and weaknesses and common applications for each of these study designs
- The major analytical methods, calculations and research methods commonly used in epidemiology and pharmacoepidemiology research
- Sources of bias that may influence the validity of epidemiological research

2.5 Public Health

2.5.2 Epidemiology and Pharmacoepidemiology (cont.)

Epidemiological and pharmacoepidemiological studies and research (cont.)

- The application of epidemiological and pharmacoepidemiological research to areas of public health, health services research, outcomes research and related areas
  (e.g. studies of disease occurrence in populations, drug utilization studies, international measures of drug consumption, studies that provide an estimate of the probability of beneficial effects in populations, or the probability of adverse effects in populations, and other parameters relating to drug use benefit)
- Factors that may potentially impact the quality of pharmacoepidemiologic research
  (e.g. choice of study design, data quality and common sources of bias)
- The STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) Guidelines

The interaction between medication safety and pharmacoepidemiology/ /pharmacovigilance

- Professional and technical aspects of drug use control
- Poison control centers and clinical toxicology
- Regulation of controlled and dangerous substances
- Special problems involving the control of narcotics, poisons, and other controlled substances

2.5 Public Health

2.5.3 Pharmacovigilance

The field of pharmacovigilance

- Basic concepts of pharmacovigilance
- Methodological issues related to pharmacovigilance and post-marketing drug surveillance studies (Phase IV)
- Methods to enhance the role of pharmacists in pharmacovigilance activities

Principles of adverse drug reactions and drug interactions

- What constitutes an adverse drug reaction
- The mechanisms underlying adverse reactions to drugs
- The frequency, causality, types of reactions, and drug effects on selected organ systems
- The occurrence, impact, and clinical aspects of adverse drug effects
- Detection, evaluation, classification and documentation of adverse drug reactions in the clinical practice setting
- Potential adverse effects of medications and strategies to reduce or prevent and manage the occurrence of such effects
- Identification of drug/drug, drug/laboratory and drug/food interactions
- Adverse reactions and Naranjo practice

Report adverse drug reactions

- Where and how to report adverse drug events
- The reporting mechanism for drug misadventures
- The development, implementation, and evaluation of systems to identify and report medication errors and adverse drug events

Surveillance systems for drug misadventures

- Appropriate systems (institutional and government) to report adverse drug reaction and medication errors
- Maintenance of vigilance for medicines use specific to certain population groups
- Methods for continual monitoring for unwanted effects and other safety-related aspects of drugs
- Methods for risk minimization (RiskMAPS and REMS programmes)

2. Social and Behavioural Pharmacy Sciences Aspects

2.5 Public Health

2.5.4 Infection Prevention and Control

Healthcare-associated infections

- The relationship of the chain of infection to the transmission of infection
- Risk factors for infection and those individuals most at risk for acquiring an infection
- The incidence, transmission, and prevention of healthcare-associated infections

The maintenance of proper aseptic conditions

- General principle of primary and secondary engineering control and sterilization methods to the maintenance of proper aseptic conditions
- The role of healthcare equipment in the transmission of infection and the methods of disinfection of healthcare equipment
- The difference between medical and surgical asepsis

Infection control policies

- The rationale and components of routine practices
- The rationale and components of additional precautions
- Basic analytic techniques to investigate and prevent infectious disease outbreaks and hospital infections
- Importance of documentation, policies and procedures relevant to institution, home infusion and compounding practices

3. Administrative Pharmacy Sciences Aspects

3.1 Healthcare Systems

3.1.1 Healthcare Delivery Systems

Introduction to the healthcare delivery system

- Overview of the healthcare system
  (e.g. history, evolution, future direction, public health policies, stakeholders, and major challenges for providers, payers, and users of the system)
- The basic structure, organization, composition, regulation and functions of the healthcare delivery system
- Social, political, and economic factors of the healthcare delivery system
- The barriers and enablers for optimal healthcare delivery system
- Healthcare costs, access and quality indicators for healthcare systems
- Factors of increasing pressure in the healthcare system
  (e.g. the burden of chronic disease, the ageing of the population, new therapies, earlier diagnosis and increasing healthcare costs)
- Diversity/equity in healthcare
- Characteristics, causes, and effects of health disparities in the healthcare system
- Compare and contrast demand and need with respect to healthcare delivery
- Healthcare improvement mechanisms at the micro- and macro-system levels
- Assessment, planning, implementation, and evaluation of healthcare delivery

International healthcare systems

- Comparison of healthcare delivery systems and pharmacy systems around the world
  (e.g. structure, financing, cost, quality indicators, recent reforms and innovations, their advantages and disadvantages)
- The differences in health outcomes between the various healthcare models
- Provision of healthcare, pharmacy and medicines in developing countries

Models of delivery of healthcare services

- Healthcare systems and models currently in place through which patients receive directed care
- Models of healthcare systems
  (e.g. Bismarck, Beveridge, National Health Insurance, Pay as you go, and the Cafeteria Plan/Ecology Model)
- New models of care
  (e.g. integrated care systems, medical home models of care, and accountable care organizations)
- Methods to provide high-quality/low-cost healthcare to large patient populations

How each patient is moving through the health system

- The patient flow through different levels of care
  (e.g. primary care (first point of contact), secondary care (community health services), tertiary care (hospital))
- How transitions of care affect the healthcare system and how community pharmacy contribute to transitions of care

The financing of healthcare

- The various methods of financing healthcare delivery and the implications for risk sharing, cost containment, access, quality and potential for improvement
- The sources of funding of prescription drugs, hospital services, physicians services and other health services

3. Administrative Pharmacy Sciences Aspects

3.1 Healthcare Systems

3.1.1 Healthcare Delivery Systems (cont.)

The financing of healthcare (cont.)

- The difference between the sources of funding for health services and the private or public form of delivery/provision of health services
- Financing mechanisms and payment strategies to providers

Healthcare reform

- The basis for healthcare reform
- Reasons and goals for healthcare reform and potential opportunities for pharmacists
- Various perspectives on the future of healthcare delivery systems, their modification, change and reform including financial and other concerns
- The impact of changes in healthcare upon the principal actors including: patients, providers, insurers, financers, regulators, and corporate purchasers
- The elements influencing healthcare legislative reform and potential impact on the current and future pharmacy practice model

Health system pharmacy practice

- The current place of the pharmacy profession in the healthcare system and its possible future, including levels of competence and specialization
- How pharmacy services and pharmaceutical products are integrated within the healthcare system

Medication use system

- The medication use system in both community and hospital settings
  (e.g. procurement, storage, prescribing, transcription, dispensing, administration, monitoring, and documentation)
- Pharmaceutical care delivery within a framework of the medication use system
- Principles for managing the medication use system
- Comparisons between medication use systems around the world and look at other controversies related to access, choice, and quality of healthcare

Insurance and reimbursement in pharmacy

- Introduction to pharmacy payment systems
- Health systems reimbursement structures and the fundamentals of reimbursement models from the governmental and private perspective
- Methods to obtain payment for prescription drugs, health goods, and patient-oriented professional services from both individuals and third-party payers
  - Work through the drug reimbursement system including strategies that affect drug selection
- The risks and benefits of various public and private insurance programs from both the perspective of the pharmacy provider and the patient
- How various forms of reimbursement can create different incentives to control utilization of healthcare
- The role of public and private insurers, pharmaceutical industry, and managed care on healthcare delivery
- The role of pharmacy with the various healthcare insurers
- Health insurance operations and how to help customers with their insurance options at the pharmacy counter

3. Administrative Pharmacy Sciences Aspects

3.1 Healthcare Systems

3.1.1 Healthcare Delivery Systems (cont.)

The incidence and problems associated with overuse, underuse, and misuse in the healthcare system

- Concept of fraud, waste, and abuse and the major factors that contribute to drug-related fraud and abuse

Indigent care programs in healthcare delivery at a local, national and international level

- Challenges in delivering care in low-resource settings
- Barriers to health and healthcare access in low-resource settings and vulnerable populations
- Tools and strategies to address the needs of specific vulnerable populations

3. Administrative Pharmacy Sciences Aspects

3.2 Economics/Pharmacoeconomics

3.2.1 Economic Principles

Economic principles and concepts

- The basic economic concepts
  (e.g. utility, demand, supply, equilibrium price, the price system, price discrimination, elasticity of demand, scarcity, tradeoffs, goal seeking behaviour, markets, equilibrium, efficiency, equity)
- Principles of economics and their application in a variety of situations or settings
- Economics in operations

Microeconomics

- The forces of supply and demand
  (e.g. market forces, externalities, the environment, competition)
  - The factors that cause a change in the demand or supply of a product or service
  - The impact that a change in supply or demand will have on the equilibrium price and equilibrium quantity of a product or service
  - The various types of market structures
    (e.g. perfect competition, monopolistic competition, oligopoly, monopoly)
- Consumer behaviour
  - The role and behaviour of the consumer in the healthcare system
- The nature of production costs
- Price setting by firms in a range of market types

Macroeconomics

- The larger scale aspects of the economic systems in which businesses operate
- The determinants of gross domestic product, inflation, unemployment, and the forces that affect the general rate of interest
- Discussions on economic (e.g. inflation) and social (e.g. employment) goals to be pursued at national and global level
- Ethical rationale and impact of government policies on the macroeconomic environment and business conditions
- The fundamental forces affecting international trade

Economic analysis

- Types of economic analysis
- The use of conventional economic analytical tools
- Limitations of economic analysis

Economic outcomes assessment as tools in decision-making

- Principles in economic evaluation and decision analytic modeling, and critical appraisal of economic evaluation studies

3. Administrative Pharmacy Sciences Aspects

3.2 Economics/Pharmacoeconomics

3.2.2 Health Economics

Introduction to health economics

- Health economics
  (e.g. definition, types, burden on healthcare system)
- Fundamental concepts behind rationing and economic evaluation of healthcare
- The economic principles that influence healthcare policies and systems
- Economic models of risky health behaviour

The economics of health and healthcare

- Costs of health
- Costs of disease
  (e.g. financial, human, community, national, global)
- How the economics of healthcare is different from the economics of other industries
- The factors that can cause healthcare costs to increase
- The professional contributions that pharmacists make in reducing healthcare costs
  (e.g. economic and health consequences of preventable adverse drug events)

Economic issues for the health system

- Major economic dimensions of healthcare system and public health practices
- Sociologic and cultural diversity impact on the economics of the healthcare system
- Economic analysis applied to the management of health systems with special emphasis given to community and hospital pharmacies
- Applications of economic theories and health-related quality of life concepts to improve allocation of limited healthcare resources

Economic evaluation of healthcare services

- Methods used in economic evaluations of healthcare
- The techniques to evaluate healthcare economic data for application to the pharmaceutical care of patients and development of health policy
  - Measuring and assessing the economic and non-economic consequences of healthcare interventions, emphasizing drug therapy, and pharmaceutical services

How economic performance of the healthcare system could be improved

3. Administrative Pharmacy Sciences Aspects

3.2 Economics/Pharmacoeconomics

3.2.3 Concepts of Pharmacoeconomics

Introduction to pharmacoeconomics

- Basic concepts in pharmacoeconomics
  (e.g. cost and costing, outcomes assessment and health-related quality of life, cost-of-illness, cost-minimization, cost-benefit, cost-effectiveness, cost-utility analysis and decision analysis using pharmacoeconomic modeling techniques, net monetary benefit, and sensitivity analysis)
- Problems and strengths associated with pharmacoeconomics
- Pharmacoeconomics standards, modeling, data sources, and uncertainty

The role of economics as they relate to pharmacy practice

- How pharmacoeconomics impacts pharmacy, regardless of what type of healthcare setting the pharmacist practices
  (e.g. in drug utilization review and formulary development in hospital pharmacy)
- The principles and techniques of pharmacoeconomics to the evaluation of pharmaceuticals and pharmacy services, and its application to improve patient outcomes
- The key concepts of economics to issues in the pharmaceutical sector
  (e.g. drug insurance, drug research and development, procurement of generic drugs)
- Impact of economics on pharmaceutical use
  (e.g. drug product selections, medication non-compliance and other forms of risky health behaviours)
- Economic models of the pharmacist labor market
  - The methods of economic analysis to investigate how markets allocate resources, when they work well and the role for government when they do not work well

Pharmacoeconomic analyses

- The theory underlying pharmacoeconomic analysis
- Economic evaluation methods as applied to pharmaceutical products and services: cost-minimization analysis (CMA); cost-effectiveness analysis (CEA); cost-benefit analysis (CBA); cost-utility analysis (CUA); cost-of-illness analysis
- The role of pharmacoeconomic analysis in therapeutic, administrative and policy decision-making
  (e.g. drug therapy decisions, formulary management, set prices, pharmaceutical reimbursement policies and decisions)
- Strengths and weaknesses of standard pharmacoeconomic approaches available to assess the economic impact of pharmaceutical interventions

Measuring and estimating cost

- Measurement of cost and health benefits
- Principles of measuring and analysing costs and outcomes and techniques used to evaluate them across drug treatments
- Pharmacoeconomic analysis of the cost of drug therapy to healthcare systems and society
- The costs of healthcare interventions and the clinical and humanistic consequences of these interventions

3.2.3 Concepts of Pharmacoeconomics (cont.)

Pharmacoeconomic research and studies

- Pharmacoeconomic research in community pharmacy practice, medical centers and clinical trials
- Methodology employed in pharmacoeconomic research
  - The different pharmacoeconomic study designs and their strengths and weaknesses
- Critical evaluation of different types of published pharmacoeconomic studies in the medical literature
  - Critical appraisal of health economic evaluation studies (use of Drummond checklist)
- The main applications of evidence generated from pharmacoeconomics studies
  - How published evidence can be used to critically appraise the value of pharmaceuticals and pharmaceutical care in a variety of settings
  - How comparative effectiveness research can be integrated into clinical pharmacy practice and may help control costs of healthcare
  - Application of pharmacoeconomic research principles in the determination of alternatives producing the best health outcomes for invested resources
- Direct, indirect and intangible costs for pharmacoeconomic research projects

Health status measures

- Health-related quality of life and its role in patient outcomes research
- Based measures of health-related quality of life and quality adjusted life years
- Applications of economic theories and health-related quality of life concepts to improve allocation of limited healthcare resources
- Types of outcome evaluation and outcome measures
  - How to assess and interpret economic and health-related quality of life (HRQL) outcomes and sequelae of drug therapies within healthcare systems
  - Evaluation of the humanistic outcomes associated with drug therapy and the provision of pharmaceutical care on quality of life including the utilization of sensitivity analyses, decision analysis models, and discounting
  - Identify and interpret different health outcomes and measures of these outcomes
  - The methods to choose a cost-effective drug therapy for patient populations in order to achieve quality clinical, economic and humanistic outcomes

The common modeling approaches (decision-making tree and Markov model) used in pharmacoeconomics studies

- Basic steps and techniques in decision analysis
  - Basic management and decision analysis functions to evaluate the need for and document the effect of pharmaceutical care interventions in a variety of pharmacy practice settings
  - Apply decision-making strategies in a variety of healthcare settings
  - Design a decision tree
    (e.g. calculate an expected cost and expected outcome using a decision tree)

3. Administrative Pharmacy Sciences Aspects

3.2 Economics/Pharmacoeconomics

3.2.3 Concepts of Pharmacoeconomics (cont.)

The common modeling approaches (decision-making tree and Markov model) used in pharmacoeconomics studies (cont.)

- Economic evaluation of pharmaceuticals and their use in decision-making
  - Apply principles of pharmacoeconomics and evidence-based medicine in making decisions regarding formularies and individual patient care
  - Economic factors that influence medication therapy decisions in contemporary health systems and payment for medication-related services
  - Make decisions on the cost effectiveness of therapeutic alternatives

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.1 Pharmacy Management and Leadership Concepts

Introduction to management

- Definition and analysis of management theory and management styles
- Management process and their application to professional activities
- The five core managerial sciences: human resource management, operations management, marketing, accounting, and finance

Pharmacy practice management

- The role of management within pharmacy
- The role and responsibilities of the pharmacist as a manager
  (e.g. in disaster and crisis management)
- Management theories, models, and techniques used by pharmacists to ensure that patient care is delivered in an effective and efficient manner
- The basic principles of management (planning, organizing, directing and controlling resources) applicable to professional pharmacy practice and to the operation of a pharmacy
- The managerial aspects of pharmacy practice within the different settings of the healthcare system, with an emphasis on financial, material, operational, and human resource management
- Management tools, including informatics, needed to assess and address change, increase competitiveness, improve quality, and optimize patient services

Introduction to leadership

- Concepts, practices, principles and models of leadership as they apply to personal development, professional relationships, and pharmacy practice
  - Traditional and emergent paradigms of leadership
  - The relational leadership model
  - The five practices of leadership
- Leadership theories and their effects as it applies to healthcare
- What makes an individual a professional leader: the attributes and qualities of a good leader

Leadership development in pharmacy practice

- Importance of leadership within the pharmacy profession and ways to influence
- Evolution of pharmacy leadership
- Relationship between ethics and leadership
  - Integration of the characteristics of ethics on leadership behaviour and its effect on the motivation of followers
- The leadership role of the pharmacist
  - Core leadership skills required by pharmacists
    (e.g. strategic, focused, persuasive, open to feedback, decisive, visionary, empowering, emotional intelligence, building teams, problem-solving, evaluating others, value creation, managing finances, managing risk, marketing of healthcare, methods of negotiation, service-oriented)
  - Specific goals of leaders to improve the practice of pharmacy
  - Leaders in the pharmacy world
    (e.g. pharmacy practice leaders from community practice, institutional practice, Health Maintenance Organizations (HMO) and managed care, biotechnology and clinical research)

3.3 Practice Management and Leadership

3.3.1 Pharmacy Management and Leadership Concepts (cont.)

Leading and managing change

- Concepts of change management in the context of healthcare organizations and pharmacy practice
- The principles and components of change management: how to manage and implement change
- Organizational decision-making processes, methods of navigating change, and the leader's role in change
- Management of innovative changes in pharmacy practice

Leadership and control in organizations

- Organizational culture and leadership in health
- Theories of organizational healthcare leadership, including power, conflict management, complex systems and structure
- The basics of management theory as applied to healthcare organizations
  - Fundamentals of managing a pharmaceutical organization unit in terms of procurement, human resources and clients in a business and professional framework
- Manage a positive work environment
  - Positive reinforcement strategies
  - Creating learning environments in organizations
- The key influences on the development of an organization's strategy
  (e.g. analyse those influences, propose appropriate strategic behaviour for an organization and demonstrate an understanding of how strategic change can occur within an organization)

Managing risks in pharmacy practice

- Principles of risk assessment and risk management
- Identify and manage risks associated with the practice of pharmacy
- Risk management methodologies and risk reduction

Motivational theories

- The various motivational theories
- Apply motivational theories to pharmacy practice

How to manage a project: project management issues

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.2 Pharmacy Business

Introduction to business

- The role of business in society and the role of profits
- Business management concepts, techniques, methods and models
- The various forms of legal business organizations
- Basic principles about business structures
  - Differences between business organizational structures
    (e.g. LLC, sole proprietor)
- Business development, financial planning, and capital generation
- Business assessment tools
  (e.g. SWOT, PEST, Porters 5 Forces)
- Business ethics
  (e.g. business ethics as they apply to the pharmaceutical industry)
  - Professionalism and the duties of professionals in the business context
- Factors that contribute to overall business success
- External and internal environmental context of business and organizational practices

Business strategy

- Strategic business decision-making
- Business planning
  - General process of planning
  - Essentials and techniques of strategic business planning and sustainable business
- Strategic business plan
  - The purpose of a business plan
  - The components of a business plan
    (e.g. executive summary, purpose, background, programme description, financial projections and conclusion/summary)
  - How to create, develop and implement a business plan
- Strategic planning and prioritization in the different pharmacy and healthcare settings
  (e.g. strategic business plan for implementation of MTM services into a community pharmacy)
  - The roles and processes of strategic and business planning in pharmacy
  - Pharmacy business plan (contracts, proposals)

Aspects of pharmacy business management

- Business and personnel management in pharmacy practice
- Business operations pertaining to pharmacy practice
- Healthcare policy in relation to the management of a pharmacy business

The dichotomy: business manager vs health professional

- Evolution of the role of the pharmacist in the pharmacy business management

Types of business for pharmacy

- The types of business unit formats that comprise the various pharmaceutical practices and their implications for business practice
- The most successful and non-successful pharmacy type businesses in the past 20 years
- Sustainable business models for the pharmacy and services offered

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.2 Pharmacy Business (cont.)

Starting a business or new service

- Identifying and evaluating new services, new businesses, and a different way to do business
- What is involved in starting, owning and running an independent pharmacy business
- The design, development and completion of some of the steps necessary to open an independent pharmacy business
- Appropriate management procedures, estimates of capital requirements, and the mechanics involved with the initial operation of a business

Small business ownership

- Business ownership concepts
  (e.g. ownership/franchise issues, forms of ownership, transitioning ownership)
- The requirements for small business ownership
- The management and administration of a community pharmacy as a small business
- Variables of ownership and management which may impact business success

Buying and selling a pharmacy

- Concepts related to purchasing and operating a pharmacy practice
- Business plan for the purchase of an existing pharmacy or developing a new pharmacy
- Complex partnerships agreements during the purchase of a pharmacy
- Being a business manager in an independent pharmacy
- Basic pharmacy management skills in the areas of legal forms of business ownership
- Policies and procedures required to own and manage a community retail pharmacy

Organizational planning

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.3 Pharmacy Practical Operations

Pharmacy work environment

- Pharmacy layout/design
  (e.g. design workspaces and workflow that promote safe medication dispensing and confidential patient counseling and education)
- Safety in the workplace
  - The development of a culture of safety in the pharmacy workplace
  - Workplace health
    (e.g. the importance of occupational health for maintaining a safe workplace)
  - Safety procedures in the workplace
    (e.g. safe handling of hazardous drugs and solid and hazardous wastes)
  - Occupational safety and health administration regulations for the prevention of threats or injury
    (e.g. needle stick injuries, guidelines for prevention and steps to take in the event of a blood-borne pathogen exposure)
- Pharmacy security
  - The requirements and strategies for pharmacy security and the basics of personal safety
    (e.g. in the event of robbery)

Pharmacy operations management

- Operations management and its essential tasks
- Application of management principles to pharmacy operations in a variety of settings
  (e.g. community, health system, managed care)
- Economic, administrative, and human aspects of pharmacy operations
- Basics of pharmacy operations
  (e.g. pharmacy workflow, practice activities, medication safety, topics of technology selection and automation in pharmacy, quality management, income statements, cash flow, inventory management, principles of effective customer service delivery)
- The roles of pharmacy managers in assuring the efficient operations and safety of a pharmacy practice
- Operations management in remote locations experiencing constraints on resources

Purchasing and managing inventory

- Concepts of purchasing/procurement and inventory management: group purchasing organization (GPO), use of GPO and wholesaler, inventory control, pharmacy industry relations, shortages, value based purchasing
- The importance, both financially and operationally, of purchasing and inventory management to a pharmacy
- Drug acquisition, inventory management and storage
  - The drug acquisition process and inventory control methods
  - Inventory management (inventory costs, inventory levels, turnover, ordering stock)
  - Calculate inventory turnover rates and use this information to make purchasing, inventory control, and budgeting decisions

Managing the supply chain system

- Clinical and operational implications related to drug distribution/supply chain issues including drug shortages, counterfeit drugs, and drug diversion

3.3.3 Pharmacy Practical Operations (cont.)

Drug shortages

- Management of drug shortages
- The drug shortage problem and the impact on patients, pharmacies, physicians, and drug plans
- Contributors to the drug shortage problem
- The role of pharmacists in resolving drug shortages and tools to use at the patient level

Customer service

- Principles for ensuring good customer service
- Customer behaviour and customer relationship building and maintenance
  - Effectively deal with angry customers/customer complaints
  - Steps for dealing with “difficult” patients and customers
- Human Sigma as a model for customer service operations

Quality management

- Definitions and elements of quality and examples of quality deficits in healthcare
- Quality and safety management
- Methods for ensuring quality in pharmacy practice
- Methods to explore and explain variation in quality, benchmarking
  (e.g. Root Cause Analysis, Healthcare Failure Mode and Effect Analysis)

Continuous quality improvement

- How to design, implement, and evaluate continuous quality improvement programs
- The quality improvement process and strategies
- Healthcare improvement mechanisms at the micro- and macro-system levels
- Adoption of quality improvement through comprehensive use of information technology and systems that reward rather than impede quality
- The use of data in continuous quality improvement initiatives

Measurement of quality

- Means to measure quality
  (e.g. process, outcome, balancing)
- Differences between measurement for improvement, measurement of accountability, and measurement for research

Quality assurance and quality control

- The nature and importance of quality assurance in healthcare and its implications for pharmacy practice
  (e.g. in promote safe medication use and systems management)
- Quality assurance strategies and components of an effective quality assurance program

3.3.3 Pharmacy Practical Operations (cont.)

Quality assurance and quality control (cont.)

- The implementation of quality control and assurance programs in a practice based environment
- Quality assurance agencies
  (e.g. JCAHO, NCQA)

Outcomes evaluation of pharmacy operations/services

- Operations analysis
- Apply different outcomes measures to assess success/failure of service
- The types of outcomes a pharmacist would need to measure in a pharmacy-related service: the economic, clinical and humanistic outcomes of a clinical pharmacy service

3.3.4 Accounting and Financial Management

Accounting concepts and principles

- The role of accounting
- Fundamental accounting principles
- Basic management tools in the areas of accounting
  (e.g. preparation of budgets and business plans, payroll and GST legislation, marketing, partnerships law, decision-making and the use of financial software to effectively understand the information provided by support staff to make effective business decisions)
- Common terms used in accounting records and financial reports
- Application of accounting concepts and techniques used to gain intelligence about all aspects of business operations
  - The use accounting information for decision support, analysing historical operations and planning and control future business activity

Fundamentals of financial management

- Basic finance terms
  (e.g. financial statements, financial ratios, benchmarking, budgeting, productivity, workload, interventions, cash flow, GST, business transactions, and business reports required for the accountant like Business Activity Statements)
  - Budgeting and financial planning process: common types of budgets and budgeting techniques
  - Financial ratios and application
    (e.g. liquidity ratios, profitability ratios, turnover ratios)
  - Identify cash flow problems and apply solutions to address
- Financial aspects of business
  - Goals of financial management
  - Financial planning, investment analysis, tax analysis, budgeting, and other aspects of personal and business finances
  - Financial assessment
- Financial systems for small business and health services management
- The financial expectations of a successful practice

Financial management in organizations

- The financial challenges of healthcare organizations
  (e.g. enhancing revenues, managing costs, accessing capital at reasonable rates, and ensuring the integrity of financial reporting)
- Typical pharmacy organization's process of budget administration and associated implications

Pharmacy financial accounting basics

- Financial management principles applicable to pharmacy practice day-to-day operations in various practice settings
  - Utility of financial ratios and basic financial ratios used in community and institutional pharmacy practices
  - Describe and integrate information from a pharmacy business unit into a balance sheet and income statement

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.4 Accounting and Financial Management (cont.)

Pharmacy financial accounting basics (cont.)

- Analysis of the financial viability of a pharmacy business
  - Financial accounting and valuation when buying or selling a pharmacy
  - Loans and financing costs to establish and run a pharmacy operation
  - Financial aspects of pharmacy management
    (e.g. personnel and insurance costs, fixed and recurring expenses, third party payments, receipt of payment, and revenue generation)
  - The financial aspects of the development and implementation of innovative clinical services in the community setting
- Cost control strategies for pharmacy
- Develop a financial plan to establish or maintain a pharmacy's operations

Clinical services reimbursement

- Comparative funding models for hospital and community pharmacy services
- Billing for pharmacy services
  - How do community pharmacies generate revenue in order to sustain the delivery of care?
  - Processes for billing for services in the community pharmacy setting
  - Reimbursement for pharmacists' services
    (e.g. type of reimbursement for pharmacists' MTM services)
- The various payers for pharmacy services
- The evidence that intervention-based reimbursement models change practice behaviour and contribute significantly to a pharmacy's revenue stream, and impact health system costs or patient outcomes (have value for payers)

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.5 Human Resources

Introduction to human resources management

- Principles of human resource management
  (e.g. principles for interviewing, recruiting, hiring and terminating, training, developing, supervising, motivating, retaining, developing and rewarding of employees, and evaluating professional and non-professional staff)
- Designing, implementing and maintaining human resource management
- Recruitment strategies
  - Critical steps in recruitment and selection of employees
- Human resource practices that promote effectiveness, efficiency, cost-effectiveness and workplace satisfaction for professional and technical staff
- Contracts of employment
  - Employee responsibilities and rights in the workplace
  - Employee performance evaluations (performance management and performance appraisals)
  - The major categories associated with human resource disciplinary actions
- Legal issues in human resource management
  (e.g. discrimination, harassment, human rights, diversity)

Human resources management applicable to pharmacy practice

- The supply of and demand for health professionals
- What are the key things you would look for in hiring a pharmacist?
  - Interview a candidate for a pharmacy position
    (e.g. appropriate job interview etiquette, questions, and answers)
- The pharmacy workforce
  - The organization, roles, and responsibilities of the health-system pharmacy staff
  - Management of staff within the practice setting, including pharmacists, technicians, and other supportive personnel
  - The role of teams in organizations (team work in the pharmacy)
  - Ability to coach and discipline pharmacy staff
  - Develop staffing plans and organizational chart
  - Workload management

Organizational behaviour

- Principles of professional behaviour
- The role of emotions in organizational behaviour
- How job satisfaction, organizational commitment, job stress, and job turnover affect organizational behaviour and performance
- Organizational behaviour and human resource management that are relevant to professional and technical staff
- Organizational theory and behaviour for the management of people and processes in a healthcare organization

Unions and unionization in pharmacy practice

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.6 Personal and Professional Management

Personal resource management

- Principles of personal management
- Methods of personal continuous quality improvement

Personal and professional development

- Personal and professional challenges

Professional development plan

- Career as a process requiring planning, development, and management
- Development of professional portfolios, resume and a curriculum vitae
  - Tips on writing curriculum vitae

Continuous professional development

- The importance of continuing education/lifelong learning
  - Lifelong self-learning skills to maintain professional competence
- The importance of continuous improvement as a professional
- The stages of the continuing professional development (CPD) cycle and the learning skills required to effectively engage in CPD

Self-Assessment and reflection

- Basic concepts and theories of self-assessment and reflection
  (e.g. critical reflection of assumptions, double-loop-learning and self-assessment strategies using multiple modes of application)
- Connections between self-assessment and reflection
- Career self-assessment
- Effectively self-assess and improve personal and professional abilities on an ongoing basis (continuous professional and personal development)

Professional networking

- The importance of professional networking as a method of self-marketing
- Methods of networking

3. Administrative Pharmacy Sciences Aspects

3.3 Practice Management and Leadership

3.3.7 Marketing and Promotion

The theory and practice of marketing

- Marketing concepts and principles
  (e.g. merchandising, policies for promotion)
- The various methods and strategies used by manufacturers to market their products
- Marketing of services and development of an implementation plan
- Marketing materials based on a target audience(s)

Healthcare marketing

- Marketing process and communication strategies for healthcare products and services

Marketing and its purpose in pharmacy business strategy

- Marketing principles relevant to pharmacy practice
- How to formulate marketing plans and strategies as they apply to the profession of pharmacy and the pharmaceutical industry
- Marketing techniques and promotional strategies for pharmacy goods and services
- The role that consumer behaviour plays in the development, positioning and pricing of pharmaceutical goods and services

Marketing of drugs

- The role and influence of the pharmaceutical industry and the controversies surrounding drug advertising
- Evaluation of drug advertising

Market analysis and market strategies

- Evaluating the market and competitors
- Key trends in consumer markets
  (e.g. principles of customer segmentation and analysis, retails share of the consumer, the changing role of retailing in consumer spending priorities, the influence of key demographic and social trends on consumer markets)
- The impact of consumer market trends on the pharmacy sector: opportunities and threats

3.3.8 Professional Effectiveness

Innovation and entrepreneurship

- The elements of entrepreneurship and entrepreneurial processes
- The importance of entrepreneurship and the roles that entrepreneurs have in pharmacy practice
- What is needed to be an entrepreneur in pharmacy today
- The needs and opportunities for pharmacists to develop innovative or entrepreneurial strategies to achieve professional goals and solve problems

Time and stress management

- Theories and approaches to time management
  - Utilize organizational skills in planning and managing work time
  - Time management organization
  - Personal time management
- Develop and be able to troubleshoot schedules so that issues are solved with attention to the business requirements
- The role of stress in illness and how stress management is a key component in maintaining a personal well being
- Ways to handle individual stressors and to decrease stress
  (e.g. through relaxation techniques, time management, personal health and effective coping techniques)

Management of performance

- Key performance indicators in areas of productivity, quality, on-going quality control, resource management
- Performance improvement and quality assurance
  - The various performance improvement strategies used in the healthcare industry
    (e.g. PDCA, Flow charting and PI methods, Root Cause Analysis (RCA), Failure Mode and Effects Analysis (FMEA), Lean thinking, six sigma)
  - The strengths and weakness of the respective models
- Tools to monitor, manage, and improve performance

Managing productivity and work systems

- Concepts of productivity, effectiveness and efficiency
  - Personal and team effectiveness
- Analyse systems, to work in groups to identify how the system may fail, and to design improved systems
- Performance metrics/productivity
  - Workload measurement systems

3. Administrative Pharmacy Sciences Aspects

3.4 Pharmacy Law and Regulatory Affairs

3.4.1 Health and Drug Policy

Health policy

- Health policy concepts and regulation affecting health
  - The policy and political environment in which health services operate
  - Contemporary health policies and related issues that directly affect the organization of healthcare delivery, coverage, provision and provider reimbursement
- The process for formulating health policy and the impact of various health policies on health systems (e.g. healthcare access, healthcare quality, and healthcare cost), providers, and patients
  - The balance of power between different stakeholders in the development of health services policies and decisions
  - What facilitates or impedes the policy implementation and the influence of the stakeholders and the media in the management of health services issues
  - Policy challenges relevant to pharmacists, healthcare managers, policy makers, providers and consumers
- Global health policy and the interrelationship between global and domestic policy issues
- Public health policy
  (e.g. why the national drug shortages problem is a public policy issue?)
- The role of the pharmacist in healthcare legislation

Regulatory agencies in healthcare and pharmacy practice

- The role of various government agencies in the regulation of healthcare and pharmacy practice
- Conceptual understanding of regulatory agencies and how pharmacy practically and ethically interacts with them
- Administrative agencies that regulate pharmacy
  (e.g. Drug Enforcement Administration (DEA), Food and Drug Administration (FDA))

Introduction to regulation and drug policy

- Pharmacy's role in drug-policy decision-making
- The policy making process and current prescription drug policies so as to modify and influence policies that do not promote safe, effective and accessible drug therapy and provision of pharmaceutical care
- The legislation and regulation of medications and pharmaceutical products
  (e.g. the drug development process, production, testing, monitoring, marketing, procurement, storage, supply, sale and use of drugs, cosmetics and medical devices)
  - The laws regulating the pharmaceutical industry
  - Regulation of the quality, purity, strength, and labeling of medications

The drug approval process

- Role of regulatory authorities during the process of drug approval
  (e.g. evaluation of the efficacy, safety and quality of new drugs)
- The general process and steps involved in the development of a new drug
- The four phases of clinical testing of a new drug

3. Administrative Pharmacy Sciences Aspects

3.4 Pharmacy Law and Regulatory Affairs

3.4.1 Health and Drug Policy (cont.)

The drug approval process (cont.)

- The process by which a new chemical entity or device is approved for marketing
- The establishment and control of prices for new drugs, and the decision to list drugs for reimbursement

Medicines regulation and scheduling

- Medication legal categories and classification systems
  (e.g. controlled, orphan, OTC, BTC)
- The process of the change of status from a prescription medication to a nonprescription medication

Investigational drug approval process

- The statutory and constitutional arguments that underpin legal disputes over access to “investigational” drugs, as well as compare and contrast the various ethical and policy positions that inform these arguments

3. Administrative Pharmacy Sciences Aspects

3.4 Pharmacy Law and Regulatory Affairs

3.4.2 Pharmacy Law

Introduction to law and the legal process

- Jurisprudence and legal terminology
- The legal system, court systems and processes
- The nature of law and its sources both nationally and internationally
- The basic steps in the legislative process
- The role that administrative agencies play in promulgating law
- Elements of business and contract law
  (e.g. contracts, torts, trade practices regulation, contract and consumer protection, property and intellectual property)

Pharmacy practice legislation

- Brief history of pharmacy law: the interplay between pharmacy and the law
- The laws, rules and regulations that affect pharmacy practice and operations
  (e.g. regulation of pharmacy personnel, the functioning of pharmacy, provision of patient care and clinical pharmacy services, professional conduct, business conduct, hospital practice, prospective drug review and counseling)
- Regulations pertaining pharmacy registrations and licensure
  - Standards for pharmacy permits
- The laws and regulations that govern the prescribing and dispensing process
  (e.g. legal requirements and regulation for written and verbal prescriptions, elements required on the prescription and pharmacy label, electronic prescribing, mail order, “internet” pharmacy, patient counseling requirements)
  - The legislation relating to prescription medicines, OTC, complementary medicines, controlled substance, medical devices, drugs compounding, etc.

Regulations governing pharmacist practice

- The laws, policies, standards, codes and guidelines that govern the roles of professionals in industry and pharmacy
- The pharmacist’s rights, responsibilities and limits under the law
- The pharmacist’s role in reducing liability by reducing drug-related misadventure
- The legal basis of pharmacy practice, including the administrative, civil and criminal laws that impact practice
- Pharmacist negligence and other liability concerns facing pharmacists
- Regulation of pharmacy professionals including, licensing, legal liabilities, continuing education, pharmacy operations, and operations in institutions
- Unlawful acts and consequences
  - Violations, penalties and disciplinary actions
- Professional liability insurance

Professional pharmacy organizations and associations

- Overview of pharmacist professional organizations
- The role and importance of professional pharmacy organizations in shaping the profession
  (e.g. in developing standards)

3. Administrative Pharmacy Sciences Aspects

3.4 Pharmacy Law and Regulatory Affairs

3.4.2 Pharmacy Law (cont.)

Professional pharmacy organizations and associations (cont.)

- The importance of involvement in pharmacy organizational, regulatory, and state issues

  (e.g. identify issues, pending legislation and regulations at local and national levels and how to make a positive impact)

- The efforts of pharmacy organizations to interact with legislative process
- Legislature and the detailed regulations issued by the board of pharmacy that govern the profession of pharmacy

Pharmacist licensure issues

- Pharmacist and supportive personnel registrations and licensure

  (e.g. licensure by examination; licensure by endorsement, requirements, fee; renewal of license; reactivation of license; continuing professional pharmaceutical education; continuing education credits)

Laws and regulations of other healthcare providers

3. Administrative Pharmacy Sciences Aspects

3.5 Informatics and Health Technology

3.5.1 Pharmacy and Health Informatics

Introduction to pharmacy and health informatics

- The use of informatics in pharmacy practice
- Basic informatics terminology and definitions in relation to healthcare information systems
  (e.g. data, information, hardware, software, networks, storage devices, operating systems, information retrieval, data warehousing, application, firewalls)
- Understanding of a microcomputer, computer software packages, graphical user interface, word processing, spreadsheets, graphical applications, e-mail, and the internet in preparation for use in pharmacy practice settings
- Pharmacy informatics principles and their application to safety and efficiency improvement of the medication use process
- The role of informatics in assisting clinicians in assuring, through decision support technologies, optimal medication use and quality
- The role of pharmacy informatics in healthcare delivery, including security, privacy, and confidentiality issues

The use of computer software and pharmaceutical databases

- Computerized physician order entry systems (e-prescribing)
- Professional software programs used in patient care
  (e.g. dispensing software that allows the proper labelling of medications and the archiving of the drug history of patients)
- Database applications and records management (systematic creation, storage, reproduction, distribution, and retention of records)
- Electronic records used across the continuum of care (e.g. EHR, EMR, PHR) and their clinical, administrative and research uses
- The effectiveness and cost-effectiveness evidence for EHR integrated e-prescribing systems

The consumer/patient role within healthcare informatics

- The development of consumers as ePatients and health information seekers, using tools such as patient-controlled electronic health records
- e-Health literacy and the impact of the internet on access to information by patients

Future informatics needs in healthcare

3.5.2 Health Technology

Use of technologies in healthcare

- Evolution of healthcare technology and delivery
- Reasons for systematic processing of data, information, and knowledge in healthcare for patients and populations
- The benefits and current constraints in using information and communication technology in healthcare
  - The use of technology to improve patient care as well as increasing patient safety and error reduction
- The context and methods of health technology assessment
- Factors affecting the adoption of e-technology in pharmacy and medical practice
- The perspectives and roles of patients and providers when using technology in care

Current and emerging technologies for pharmacy practice

- Overview of health technologies currently being used in healthcare practice, with a focus on their use and impact on care delivery
- Role and use of automation in health-system pharmacy
  (e.g. automation in medication dispensing)
- The availability of various technologies applicable to the delivery of pharmacy care, their impact on pharmacy practice, and their applications to patient care
  (e.g. point-of-care technologies)
- Pharmacy information technologies and their impact on the practice of pharmacy
- The development, deployment, and use of hardware and software technologies to enhance patient care including improvements in efficiency and safety
  (e.g. robotic dispensing/picking, bar code medication administration, automated dispensing cabinets)

Telecommunications technologies

- Differences between telehealth, telemedicine and telepharmacy, benefits and issues inherent in these health delivery models
- Providing services to communities without pharmacies using tele-pharmacy and tele-medicine
- Mobile technologies available to healthcare providers and patients: mobile health (m-Health)

4. Miscellaneous

4.1 Research Design

4.1.1 Introduction to medical research

Introduction to theory and practice of scientific research

- Philosophy of scientific research

Basic concepts in clinical research

- The clinical question being addressed in a research study: matching study design to the research question
- The differences between a population and sample. Sampling methods
- Reliability, internal and external validity of a study
  - Threats to internal validity (confounding, bias, random error), hypothesis testing and scientific reasoning
- The common sources of bias in specific types of research studies
  - Common methods to control for confounding/reduce bias and interpret results

Research protocol and methodology

- Development and design of research protocol and methodology
  (e.g. planning a research question; critically appraising the literature; developing a testable hypothesis; designing a study and selecting a research method; obtaining ethics approval (if required); managing a research project; draw appropriate conclusions from research results; presenting research results)

How to present a study

- How to write academically
  (e.g. introduction (title/source, authors, funding, study objective, background); methods (design, setting, sample population, inclusion criteria, exclusion criteria, intervention, major study endpoints, statistical analysis); results (patients, endpoints); discussion; evaluation (study strengths, study limitations, usefulness))
  - The use of citation managers to organize articles
- How to Conduct a Peer Review
- Reporting guidelines
  (e.g. CONSORT, STROBE)

Assessment of the quality of research

- How to assess the quality of research

Ethics in research

- The historical and philosophical underpinnings of research ethics
- Regulatory and ethical principles involved in human subjects research

4. Miscellaneous

4.1 Research Design

4.1.2 Biomedical studies

Observational studies

- Cohort studies
- Case-control studies
- Other observational studies: Cross-sectional studies, case reports
- Survey Studies
  - Survey instruments: design and interpretation
  - Measuring instrument accuracy

Experimental studies

- Main aspects of clinical trials in industry, academia and government settings
- The fundamentals of experimental design, implementation, and data analysis pertinent to pharmaceutical clinical investigations
- The responsibilities and the role of principal investigator of a clinical trial
- Randomized controlled trials (RCTs)
  - Design and planning of randomized controlled trials
    (e.g. Types of randomization; Blinding (single-blind study, double-blind study, triple-blind, double-dummy, open-label))
  - Sample size and power
  - Specific trial designs: active comparator trials; the crossover trial; the cluster randomized trial; the uncontrolled trial; the pragmatic trial; the pharmacokinetic trial
- Quasi-Experimental studies

Qualitative research studies

- Discuss when a qualitative approach may be advantageous to answer a research question
- Different methods of data collection in qualitative research
  - The attributes of the main methodologies (ethnography, phenomenology, grounded theory, case study) in qualitative research
  - The research interviews (including focus groups)
- The validity and reliability of a publication that uses qualitative research methods

Systematic review and meta-analysis

- Narrative reviews, systematic reviews, meta-analyses, indirect treatment comparisons (network meta-analysis)
- The steps of the review process

4. Miscellaneous

4.1 Research Design

4.1.3 Statistical principles and data analysis

The basic biostatistical concepts used in the medical literature

- Basic statistical concepts
  (e.g. p values, confidence intervals, statistical vs clinical significance, type I and II errors, estimation, inference, hypothesis testing, analysis of variance, contingency tables, descriptive statistics, inferential statistics, sample size and statistical power, absolute and relative risk, intention-to-treat analyses, sensitivity and specificity)
  - The basic principles of probability theory, population distributions and random sampling
  - Types of variables (categorical = nominal = dichotomous; ordinal; continuous)

The common statistical tests used in clinical research

- The appropriate statistical test(s) to analyse a given set of data that employ common research designs, and interpret results
  - Assumptions and concepts behind the choice of a statistical test
  - Statistical distributions: normal or non-normal (skewed, bimodal, exponential)
  - Compare and contrast nonparametric and parametric data, measures of central tendency, and measures of variability
- Statistical tests commonly employed in biomedical sciences and their basis for use
  (e.g. Chi-square test, t-tests, ANOVA, Correlation, survival analysis, Simple and Multivariate regression methods)

Statistical data analysis

- Describe, compute and interpret basic medical statistics (ARR, RRR, OR, NNT, NNH, 95%CI, etc.)
- Appropriate use of statistical software package for entering, manage and analysing research data
  (e.g. SPSS® and Microsoft Excel)
- Development of simple databases and spreadsheets for the analysis of data

4. Miscellaneous

4.2 History of Pharmacy

4.2.1 History of pharmacy profession

Evolution of pharmacy as a profession from ancient times to the present

- The contributions of the ancient Mesopotamian, Egyptian, Chinese, Greek and Roman cultures to the development of pharmacy
- The evolution and implications of the profession from its historical roots to pharmaceutical care

  (e.g. the historical evolution of the pharmacist's role from one focused on drug compounding and distribution to a patient-centred practice model and interprofessional collaboration)
- Evolution of pharmacy associations, education, pharmaceutical research, and manufacturing

Historical events that have shaped today's professional pharmacy practice

- The emergence of pharmacy and pharmacists as a distinct profession and professionals
- Major milestones and contributors in the evolution of pharmacy
- Political, social, and economical considerations past, current, and future as they pertain to professional enculturation and pharmacy's progress as a healthcare discipline

The history of medicines in different times and cultures

- Origins and development of drugs
- Minerals, selected drugs, and plants of historical value
- Significant drug discoveries
- The development of critical therapeutic agents that revolutionized the treatment of disease and how these discoveries affected the pharmacy profession
- The drug development process from laboratory to patient

The history of pharmacy, its role in the healthcare system, and interactions with other healthcare professionals

- The social, scientific, and economic development of medicine and pharmacy
  - The ways in which medicine and pharmacy pursued professionalizing in the late 19th and 20th centuries and how these professions define themselves in the 21st century
- History of hospital pharmacy
- Pharmacy retailing in the late 1990s: industry structure, ownership trends, store format trends, operational developments

Individuals who contributed to the evolution of pharmacy

- Individuals who can be considered heroes in the profession who have been instrumental in the adaptation of our healthcare system to provide access to quality healthcare