



**STANDARDS FOR UNDERGRADUATE  
PHARMACY EDUCATION AND  
TRAINING IN SINGAPORE**

**2018**

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## **PREFACE**

The Standards for Undergraduate Pharmacy Education and Training in Singapore is the guidance document to ensure undergraduate pharmacy education and training will produce graduates that can practise competently and relevantly as pharmacists to serve the Singapore population.

The establishment of this guidance will ensure that high quality pharmacy undergraduate programmes offered in Singapore are maintained. It also provides guidance to programme providers for establishing and improving their programme. The standards will also be used as a benchmark to evaluate programmes offered outside of Singapore.

This inaugural publication is the work of the Pharmacy Practice Review Committee which was commissioned by the Singapore Pharmacy Council in 2015, tasked with the responsibility of promulgating the required standards for undergraduate pharmacy education and training. I want to acknowledge the Committee's significant contributions in making this document a reality and paving the way for maintaining and improving standards for undergraduate pharmacy education and training in Singapore, so that we will continue to have high calibre pharmacists in our healthcare system.

Mr Wu Tuck Seng  
President  
Singapore Pharmacy Council

16 August 2018

## EXECUTIVE SUMMARY

Pharmacists play an important role in the healthcare system by safeguarding the quality of health products and ensuring rational use of medicines to achieve optimal therapeutic outcomes for patients. Therefore, graduates from a professional pharmacy educational programme must meet the competency standards for entry into the profession to join the workforce following successful completion of their pre-registration training. The Singapore Pharmacy Council (SPC), which executes the functions described in the Pharmacists Registration Act 2007, has initiated the establishment of standards for pharmacy education and training in Singapore. The International Pharmaceutical Federation (FIP) has advocated that only quality education will produce a competent pharmacy workforce; therefore, FIP has developed a global framework for quality assurance of pharmacy education. The Pharmacy Programme Review Committee (PPRC) was tasked by SPC to develop the standards. PPRC has consulted the FIP framework, together with pharmacy programme accreditation standards from United States, United Kingdom and Australia, and used them as bases for the development of a set of Singapore standards for pharmacy education and training.

The established Singapore pharmacy education and training programme standards are set up with the following objectives:

- (a) To provide quality assurance and quality improvement for the pharmacy programmes offered in Singapore.
- (b) To assist in ensuring graduates from the programmes meet the minimum level of competence to enter the profession.
- (c) To ensure services provided by pharmacists are safe and effective and contribute to the improvement of public health.
- (d) To provide guidance to programme providers for establishing or assessing quality of their programmes.
- (e) To use the standards as a benchmark to evaluate programmes offered outside of Singapore.

In this document, the academic unit, within a university, which is directly responsible for offering the professional pharmacy degree programme is referred to as “pharmacy school”. The academic unit could be established as a college of pharmacy, school of pharmacy, faculty of pharmacy, or department of pharmacy.

The standards are classified into five broad categories that cover requirements for the pharmacy school’s infrastructure, management and leadership, risk and quality management systems, academic staff quality, non-academic staff capabilities, educational and training philosophy, professional curriculum, and student quality. Achievement of the standards is the minimum requirement for educational providers and regular reviews are additionally expected. The advances in science and technology, together with the expansion of pharmacists’ roles, will underpin changes in the pharmacy landscape of the future. Therefore, regular reviews should be conducted with the consultation of all stakeholders including pharmacists, academics, regulators, and policy makers. While a pharmacy school is guided by the indicative curriculum to develop its programme, outcome-based requirements for the curriculum are necessary in order to achieve these standards. In addition, the pharmacy school is required to demonstrate that its graduates can, following pre-registration training, meet the minimum national competency standards for entry to practise.

A brief outline of the standards is provided below:

- (i) The governance, structure and administration of the pharmacy school must be defined. There should be a well-defined reporting system between the pharmacy school and the university. The educational philosophies of the pharmacy school and university should be clearly defined and evidence of alignment must be stated. The pharmacy school must demonstrate that its operations are carried out under a clear organisational structure and management system. Strategic plans and all activities between the school and its stakeholders must be clearly indicated.
- (ii) It is important that resources allocation and management of the pharmacy school must be clearly stated. The pharmacy school must have a financial management system which is fit-for-purpose and which permits sound financial decision-making processes for the delivery and ongoing development of the programme. The pharmacy school must have appropriate, well-maintained and safe facilities and resources to support the teaching and learning activities of the programme and which meet the university norms in Singapore. There must be appropriate qualified full-time academic, technical and administrative staff to effectively deliver the professional degree programme.
- (iii) The pharmacy school must offer a professional, forward-looking pharmacy curriculum that is relevant to the practice of pharmacy and the future needs of health services users. The programme must be designed and delivered based on national healthcare priorities and professional requirements, as well as being aligned with the global perspectives and evolving trends in the pharmacy profession and pharmaceutical industry. The curriculum must provide a thorough foundation and knowledge based in the biomedical, pharmaceutical, social, behavioural, administrative, and clinical sciences, and encompass traditional, contemporary and innovative pharmacy practice. The curriculum must include experiential education and activities that allow students to interact with patients, caregivers and other healthcare professionals. Inter-professional education must be incorporated in the curriculum to facilitate the acquisition of competency for inter-professional collaboration. The competencies to be achieved on graduation from the pharmacy programme must be clearly stated. The principles, methods and practices used for assessment of students must be clearly defined and documented.
- (iv) The students admitted to the pharmacy school should declare their fitness to practise, in terms of health, aptitude and attitude. Students in the pharmacy programme should be given appropriate support to achieve their maximum potential before graduation. The pharmacy school must have established criteria for the selection of students that are applied in a transparent, fair and consistent manner. Comprehensive student services that encompass individual attention, guidance and support, must be available to all students. The pharmacy school must consider student perspectives and may include student representation on appropriate committees, including curriculum, assessment and evaluation activities. The pharmacy school's physical facilities must be safe, well-maintained and appropriately equipped for teaching, learning and research. Safety training and briefing must be conducted prior to the start of any potentially hazardous activities to reduce risk. A pharmacy school must have effective measures and processes in place to ensure the safety and well-being of students, staff, patients and the public in all its educational activities.

- (v) Quality assurance and risk management of the operations in the pharmacy school are essential for the maintenance of standards and to ensure the continuity and uninterrupted provision of the programme respectively. Therefore, the school must have clear quality assurance system and improvement processes in place for regular review of all activities in the programme. The pharmacy school must have a clear risk management strategy in place to ensure continuity of all its operations.

The Singapore Pharmacy Council aims to work closely with pharmacy schools that confer degrees recognised in Singapore for pharmacist registration and practice. To ensure quality in education and training provided by schools, these pharmacy education and training standards will form the minimum requirements for programme design, delivery and development. Pharmacy schools are expected to monitor their adherence to the standards and the outcomes of their curriculum as a means of self-regulation to demonstrate their educational and social responsibility and commitment to educating and training future generations of pharmacists for Singapore.

## 1. INTRODUCTION

### 1.1. The Singapore Pharmacy Council

The Singapore Pharmacy Council (SPC) is a statutory board that is structured as one of the six health professional boards within the Ministry of Health in Singapore. It is constituted by a President, two *Ex Officio* members and eight other pharmacists; all of whom are appointed by the Minister for Health [1]. The Chief Pharmacist also holds the position of the Registrar of the SPC who, together with the other members, keeps and maintains the register of pharmacists. The SPC executes the functions as described within the Pharmacists Registration Act 2007, one of which is to ensure that pharmacists who are registered with the SPC have successfully completed good quality pharmacy education and training and are considered competent to enter practice. Therefore, this set of standards for undergraduate pharmacy education and training is established to provide guidance to education providers so that their graduates meet the minimum standards for knowledge, skills, attitude and values at the point of registration with the SPC.

### 1.2. Good Pharmacy Education Practice

- 1.2.1. The International Pharmaceutical Federation (FIP) defines pharmacy education as the educational design and capacity to develop the pharmacist workforce for a diversity of settings (e.g. community practice, hospital pharmacy, research and development, industrial pharmacy as well as the academia). In addition, pharmacy education caters across varying levels of service provision and learners of different competence (e.g. technical support, human resources, pharmacist practitioners, pharmaceutical scientists, pre-service students).
- 1.2.2. Pharmacy education contributes to various professional development stages (including undergraduate, post-registration, continuing professional development, practitioner development, life-long learning).
- 1.2.3. There is no single, best model for the education and training of pharmacists world-wide but there are common concepts, principles and practices that should be employed by pharmacy education policy-makers and education providers to meet the needs of society locally, regionally and internationally.
- 1.2.4. The recommendations stipulated in the FIP Good Pharmacy Education Practice statement [2] provide a conceptual framework for the design, implementation and assessment of contemporary educational programmes for pharmacists throughout the world.
- 1.2.5. It is anticipated that pharmaceutical education policy-makers, working together with pharmacists and academics, should jointly explore strategies and methods to ensure the successful implementation of good pharmacy education practice.

- 1.2.6. FIP has developed a Global Framework on Quality Assurance of Pharmacy Education. The framework provides member countries guidelines for programme development and evaluation. It forms an excellent resource for the development of the local standards for pharmacy education. [3]

### **1.3. Pharmacy Profession in Singapore**

- 1.3.1. As of June 2018, there are 3,201 pharmacists registered with the SPC. Among those who are actively employed in Singapore, 55.7% work in the direct patient care sector while 33.9% are employed in the pharmaceutical industry, regulatory bodies and academia.
- 1.3.2. In the patient care sector, pharmacists are involved in acute, ambulatory, intermediate and long term as well as primary care. The roles of the pharmacists in these patient-facing sectors include dispensing of medication, identifying and intervening drug-related problems, optimising drug therapy through medication therapy management, managing minor ailments and providing drug information etc.
- 1.3.3. Pharmacists in the pharmaceutical industry are involved in drug development, clinical trials, regulatory affairs, manufacturing and distribution, sales and marketing of pharmaceuticals, pharmacovigilance etc. The primary objective is to assure quality use of medicines through ensuring the quality, safety and efficacy of health products and the development of medicines for the benefit of the public.

### **1.4. Preparing Future Generations of Pharmacists for Singapore**

- 1.4.1 Pharmacy graduates should be cognizant of the needs of the Singapore healthcare system and ensure quality, accessibility and affordability of health products for all people in Singapore. In addition, future generations of pharmacy graduates will need to be flexible and adaptable to the changes in the healthcare landscape so that the profession can evolve and develop to address the future needs.
- 1.4.2 Pharmacy undergraduates should appreciate the roles played by pharmacists and aim to:
- (a) provide excellent pharmaceutical care for optimal therapeutic and health outcomes;
  - (b) achieve the required competency to join the pharmacy workforce;
  - (c) safeguard the supply chain to ensure that quality, safe and efficacious health products will be delivered to the patients;
  - (d) provide reliable, accurate and up-to-date evidence and information for good practices;
  - (e) embrace the use of technology to provide timely services; and
  - (f) participate in health promotion and health education to better empower the public to take charge of their health and be responsible medication users.

With this undertaking, every student shall work towards enhancing pharmaceutical services and providing the best quality of care for the public in general.

- 1.4.3 Every future graduate from a pharmacy educational programme shall embrace the professional responsibility and be personally accountable to meet the pharmacy practice requirements stipulated in the Pharmacists Registration Act 2007, The Schedule; Sections 2 and 73.

The acts or activities constituting “the practice of pharmacy” as being able to apply the knowledge and science of pharmacy in:

- (a) interpreting, evaluating and implementing prescriptions of persons authorised by law to prescribe medication;
- (b) compounding, labelling, dispensing, distributing and administering medication;
- (c) initiating and modifying medication therapy in accordance with the collaborative practice agreements established and approved by healthcare facilities or voluntary agreements with persons authorised by law to prescribe medication;
- (d) patient assessment and counselling for the purpose of recommending and dispensing medication;
- (e) managing medication therapy;
- (f) evaluating medication use;
- (g) manufacturing and distributing medicinal products; and
- (h) quality assurance of medicinal products.

## 1.5. Objectives of The Pharmacy Education and Training Standards

These standards are established with the objective of providing guidance to:

- 1.5.1 ensure high quality education and training are being delivered by the education providers such that the pharmacy graduates are sufficiently equipped with knowledge, skills, attitude and values to function competently and be future ready for the healthcare workforce;
- 1.5.2 enable education providers to be empowered to deliver an indicative syllabus, develop and apply innovative educational technology and pedagogies to transform students into pharmacists who will meet entry-to-practice competency, possess an attitude for self-directed learning and continuous professional development;
- 1.5.3 protect the health interests and safety of the public by ensuring that the registered pharmacists are appropriately educated, trained and qualified to practise in a competent and ethical manner;

- 1.5.4 serve as essential requirements for setting up and developing pharmacy education and training programmes that share similar mission to produce the best pharmacists for the society; and
- 1.5.5 serve as the basis for recognising foreign pharmacy educational programmes for the purpose of registering pharmacists who have been educated and trained outside of Singapore.

## 2. THE STANDARDS FOR PHARMACY EDUCATION AND TRAINING

In this document, the academic unit, within a university, which is directly responsible for offering the professional pharmacy degree programme is referred to as “pharmacy school”. The academic unit could be established as a college of pharmacy, school of pharmacy, faculty of pharmacy, or department of pharmacy.

### 2.1. The Governance, Structure and Administration of the Pharmacy School

2.1.1. In establishing a pharmacy school, a university governance structure that facilitates appropriate representation of the school is essential.

- The pharmacy school is a clearly defined operational entity within the organisational, corporate and academic governance structures, and has systems of academic and administrative responsibility and accountability within the university.
- The university and pharmacy school works in collaboration to achieve the national standards for pharmacy education and training.
- The school has decision-making management committees for pursuing resources and facilities for programme delivery.

2.1.2. The strategic operational plans of the pharmacy school must be aligned with both the university’s and the school’s mission.

- With a clear mission to prepare graduates for professional practice that will meet local needs, the school must work on a strategic operational plan to demonstrate how the mission can be achieved.
- The strategic plan must embrace both the educational philosophy of the university (Appendix 1) and the progressive needs of the profession.
- The pharmacy school’s operations must encompass objectives that demonstrate commitment to excellence in teaching and learning methods, the care of patients, social responsibility, community involvement, research and scholarly activities.

2.1.3. There must be appropriate academic and professional stewardship within the pharmacy programme to support the autonomy of the school.

- The leadership of the school must serve as a role model and mentor for both its academic and non-academic, professional staff so that the vision and mission of the school are enacted.
- The leadership of the school must promote, facilitate and support relevant academic and professional partnerships to pursue mutual interests in research, clinical patient care and professional practice.

2.1.4. The pharmacy school must establish good relationships and regular engagement with internal and external stakeholders.

- Internal and external stakeholders who have interest in the pharmacy programme are consulted regularly. Examples of stakeholders shall include academic staff, members of the health profession, healthcare and

- professional organisations, the community, pharmacy students, pharmaceutical industry, regulatory bodies as well as the government.
- Active engagements with hospitals, community pharmacies, industry and regulatory bodies are essential to ensure sufficient access to quality placements for experiential education.
  - Active engagement of the school with their alumni to keep them updated about the development and progress of the school are necessary to cultivate rapport with the alumni who will be stakeholders in the school's initiatives.

## 2.2. Resources Allocation and Management of the Pharmacy School

2.2.1. Sufficient financial resources for effective operation of the pharmacy school and to deliver good quality education are essential.

- The pharmacy school must have current and anticipated financial resources to support the stability of the pharmacy programme to accomplish its mission, goals and strategic plans.
- The leadership must have defined autonomy in financial decision-making, clear mechanisms to secure financial resources and the authority to manage and direct financial resources for the pharmacy programme.
- The school must have, for thorough and effective planning, an established process for reviewing financial resource requirements.

2.2.2. Appropriate general and specialised teaching facilities are essential for the students to acquire and develop the required useful skill sets.

- Facilities for learning activities will be of sufficient size and configuration to accommodate the students for lectures, tutorials, experiential activities in real or simulated practice environments and practical laboratory sessions.
- The use of shared facilities must not adversely impact programme quality or student learning opportunities.
- There must be appropriate and adequate information and communication technologies to support teaching, learning and research objectives of the pharmacy programme.
- The infrastructure and technology to deliver the curriculum must be adequate to support all students and faculty. Access to learning resources and facilities must be available to support the professional and academic endeavours of students and staff.
- The pharmacy programme must have forward planning and regular review of facilities, resources and support infrastructure in alignment with programme changes for needs consistent with evolving pharmacy practice.

2.2.3. There must be an appropriate number of academic staff, of relevant expertise, and with appropriate qualification(s) in, but not limited to, the following areas: pharmaceutical sciences, pharmacotherapeutics and pharmacy practice. There must also be sufficient type and number of non-academic (technical and administrative) staff to support the operations of the pharmacy programme.

- Academic staff must be appropriately qualified (as stipulated by the faculty appointment scheme of the university) and experienced, and collectively have the necessary training and background to effectively manage and deliver the didactic and experiential components of the curriculum and support the achievement of all aspects of the school's mission, including research and service.
- Academic staff must effectively develop, deliver and evaluate the pharmacy programme to achieve its desired educational objectives and learning outcomes.
- Academic staff must be accessible for interaction and consultation with students for academic-related matters.
- Academic staff must achieve a balance between teaching, administrative/leadership, research/scholarship and clinical/professional practice which is within the university norms (where applicable).
- Academic staff must be adequately supported to develop their teaching, research and professional roles. This includes but not limited to effective mentorship, appropriate workload, effective personal support, opportunities for career growth and development, and continuing professional development opportunities.
- The responsibilities of all academic (including part-time and/or adjunct faculty/staff) and non-academic staff must be clearly defined and regularly reviewed.
- All academic and non-academic professional staff must undergo regular performance appraisal through established processes and be provided with opportunities for developing teaching and assessment skills, consistent with the identified needs of the pharmacy programme and their responsibilities in the programme.
- The pharmacy programme must have sufficient resources to provide a comprehensive range of support services that promote and facilitate student access, success and well-being.

### **2.3. The Professional Curriculum**

2.3.1. The school has the responsibility, authority and autonomy for developing a curriculum that is relevant and needs-based for Singapore; and at the same time is kept abreast with global developments in pharmacy practice.

- The school must have sufficient authority to design and oversee the curriculum and administer the pharmacy programme to achieve its objectives (Appendix 1).
- The academic staff must develop the curriculum with inputs from stakeholders (including pharmacists, alumni and students) to ensure that the curriculum has the breadth and depth to support the development of graduates in the relevant knowledge, skills, attitudes and values.
- Listening and communication skills, patient care, empathy, an appreciation of the determinants of health, team-working skills, moral issues are important components in the curriculum in addition to the pharmaceutical knowledge.

- The curriculum must include modules and topics that impart knowledge on good practices, code of ethics, pharmacy laws and professional conduct to the students.
- The curriculum must also provide knowledge on research-related topics such as principles of scientific methods and evidence-based practice, and provide students with the opportunity for research experience through research projects.
- Curriculum development must take into account local healthcare initiatives and priorities, as well as evolving roles and global perspectives of the pharmacy profession and pharmaceutical industry.
- Curriculum design and delivery must be regularly reviewed (making full use of data from assessment activities) and revised, when appropriate, to ensure optimal achievement of educational outcomes.

2.3.2. The curriculum must demonstrate congruency with contemporary pharmaceutical sciences, pharmacotherapeutics and pharmacy practice which must be integrated in ways that students are grounded in strong scientific principles and be able to apply the theories in practice to optimise the desired outcomes.

- The content of the curriculum must cover topics related to “health and disease”, “medicinal substance”, “health products”, “regulatory framework” and “health system”; and should be taught in a manner with a central focus on the patient/ consumer (Appendix 2). Students must be able to synthesise, integrate and apply the diverse information to enable them to achieve the required competence to provide care from simple to complex scenarios.
- Strategy for integration of curricular content must be clearly demonstrated. The school is given the flexibility to plan an integrated course content, deliver the course in an integrated manner or offer integrated assessment to achieve the desired educational outcome.
- Teaching and learning activities must include but are not limited to the following methods: lectures, practical classes, tutorials or small-group discussions, computer-assisted learning, self-directed learning, interactive small group teaching, collaborative case-based teaching, problem-based learning, use of contemporary tools such as virtual/simulated models, and experiential placements.
- The educational strategy of the school must demonstrate that the teaching, learning and assessment processes are linked to the progressive milestones of the programme.
- To prepare students for inter-professional practice, team-based collaboration and holistic quality patient care, the curriculum must include opportunities for students to learn about, from, and with students of other healthcare programmes (e.g. medicine, dentistry, nursing, social work and other allied health disciplines) and professionals in the healthcare team.

2.3.3. Experiential learning must be embedded in the curriculum, with elements of inter-professional education that allows students to interact and participate actively with healthcare providers, patients, caregivers and healthcare consumers.

- The pharmacy school must coordinate, monitor and regularly review the quality and performance of the experiential learning elements of the pharmacy programme.
- The experiential education programme leading to pharmacist registration must comply with requirements stipulated by the national regulatory body.
- The arrangement, objectives and learning outcomes for experiential training must be clearly documented.
- The experiential education experiences must be participative; interactive; varied; involve behavioural, affective and cognitive learning; provide exposure to inter-professional team practice; balance structure and autonomy; involve feedback to and from each student during and post-placement; have a process in place to identify and address concerns of students and preceptors; and have appropriate tools and methods for assessing learning outcomes.
- Regular feedback must be sought from both students and preceptors to monitor the quality of the experiential placements, as well as their teaching and learning effectiveness.
- The pharmacy school must ensure the safety of patients, caregivers and healthcare consumers with whom students interact.
- Students must be indemnified against professional liability at the sites of experiential learning.
- Simulated experiences may support and complement, but not replace, the actual experiential learning experiences.

2.3.4. The pharmacy school must ensure that the outcomes of the pharmacy curriculum are aligned with the national competency framework titled “Singapore Pharmacy Council; Competency Standards for Pharmacists in Singapore (Entry to Practice)”.

2.3.5 The principles, methods and practices used for the assessment of students must be clearly defined and documented and also made available to students.

- Formative and summative assessments must be used regularly and consistently in the curriculum.
- A range of assessment methods, including but not limited to: written examinations, written assignments, oral examinations, objective structured clinical examinations, continuing assessments, and project works should be directed at assessing knowledge, skills and professional attributes.
- Measures to ensure the reliability and validity of assessment tools must be in place together with mechanisms for ensuring academic integrity.
- Systems and procedures for student appeals of assessment results and/or management decisions must be in place.

## 2.4. Standards of the Quality of the Students

- 2.4.1. The admission criteria, policies and procedures are clearly stated and fairly applied.
- Admission criteria to the pharmacy programme must be clearly specified and readily available to prospective students.
  - Admission policies must be applied equitably and without bias to all prospective students.
  - There must be regular review of the admission criteria and policies to facilitate student success in the programme.
  - Prospective students must be made aware of any eligibility criteria that are mandatory to the pharmacy programme before application and enrolment.
  - Prospective students must declare their fitness to practise, and this will include their health, aptitude and attitude (Appendix 3).
- 2.4.2. The pharmacy school must have resources for students in need of support and counselling.
- There must be an active approach in identifying and supporting students in need of assistance and counselling.
  - Remedial support and counselling must be accessible to all students with academic and/or general welfare needs.
- 2.4.3. Students may be consulted in the school's curriculum management processes.
- Students may be given opportunities to provide input and feedback on the curriculum content and delivery for the early identification of problems or opportunities which might otherwise go unnoticed.
- 2.4.4. Students are protected from potential hazards in laboratories and sites of internship.
- Active and passive safety controls must be in place to ensure the safety and well-being of students and staff in all general and specialised teaching facilities including the use of personal protection equipment (e.g. gloves, laboratory coats, safety shield or glasses) and appropriate clothing. These controls should be managed through appropriate committees and guidelines.
  - Safety briefing and/or laboratory inductions are to be conducted to prevent accidents from occurring and to mitigate the seriousness of any accidents that may occur.
  - All safety procedures and requirements must be in accordance to those set by regulatory bodies in Singapore.
  - Students must undergo health screening before embarking on experiential training.

2.4.5. Clear procedures and systems must be in place to ensure patient and public safety arising from pharmacy education and training.

- Students must be supervised, monitored and assessed to ensure that they practise safely and professionally in all experiential activities involving patients and the general public.
- Any evidence of unsafe practice by the students must be addressed immediately and managed effectively through appropriate mitigation.

## **2.5. Quality and Risk Management**

2.5.1. Programme quality assurance is built into a process where feedback and review are regularly conducted.

- Quality assurance and improvement processes must be integrated into all activities of the pharmacy programme and all aspects of the school and must involve students, academic and non-academic staff, as well as external stakeholders.
- Quality assurance and improvement activities such as benchmarking with local/ international partner institutions or invitation of external reviewers must be developed and reviewed regularly to maintain the high quality of the pharmacy programme.
- The quality assurance system and monitoring processes must be robust, rigorous and transparent.

2.5.2. The pharmacy school, together with support from the university, is to have a documented risk management strategy for assuring continuity of the pharmacy programme.

- Efforts directed at mitigating or avoiding adverse outcomes must be in place to ensure the successful continuity of the pharmacy programme.

## APPENDIX 1

### Educational Philosophy and Strategies in Pharmacy Education

Being a healthcare professional, the pharmacist is responsible for ensuring good health among the public is maintained and health improvement is achieved by helping those who require the use of medicines. In this regard, in the education of a pharmacist, the curriculum will cover topics that will enable the student to learn and understand the functions of the human body; the properties of the medicinal substance; the science in the design and manufacture of the health product; and how the regulatory framework and health system oversee good and lawful practices.

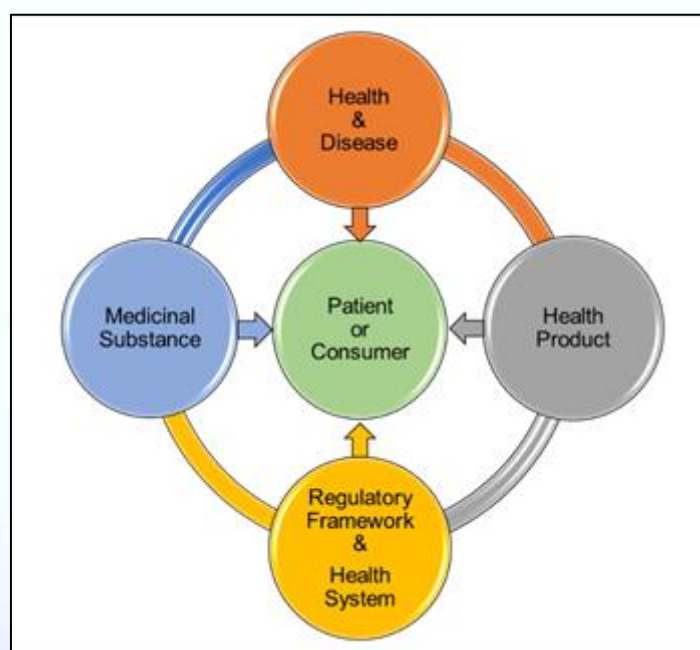


Figure 1: Illustrates what the pharmacist needs to learn and understand in order to practise competently in helping consumer or patient to achieve their target health outcomes.

The curriculum shall be multidisciplinary comprising biomedical sciences, pharmaceutical sciences, clinical sciences, pharmacotherapeutics, law and ethics, regulatory affairs and pharmacy practice. The disciplines are expected to be delivered in an integrated manner with progressive level of difficulty and complexity. Evidence of integrated planning of the course, integrated delivery or integrated assessment must be available in the educational strategy. Instructors are expected to use a variety of teaching and learning pedagogies to optimise the learning outcomes of the students. Instructors may use various forms of educational technology to deliver the course content. Instructors should inculcate the behaviour of self-directed learning and instil problem-solving and critical thinking skills through appropriate teaching methodologies.

The successful delivery of such pharmacy educational strategies should adequately prepare students with the necessary competency for entry to professional practice and future proof the graduates for the dynamism of the work places (refer to the document “Singapore Pharmacy Council; Competency Standards for Pharmacists in Singapore (Entry to Practice)”).

## APPENDIX 2

### Indicative Syllabus and Learning Outcomes

These are indicative topics which are essential in a pharmacy programme. The school must adopt a strategy that will deliver the content in an integrated manner, which may involve integration of content, delivery and/or assessment. In the following sections, descriptions of the topics and learning outcomes are provided for the education provider to design suitable courses for pharmacy undergraduate students.

#### Patient or Consumer

Related topics: Anatomy, Biochemistry, Physiology, Sociology, Communication

##### Goals/ Objectives

The student must understand the:

- (a) anatomy of the human body in relation to route of drug administration and drug disposition
- (b) normal physiological functions of the human body and potential dysfunctions
- (c) biochemical composition and pathways in the human body
- (d) genetic makeup of a person in relation to disease etiology and response to medicine
- (e) behaviour and beliefs of the person to encourage adherence to health or medicinal regimen
- (f) needs of special patient populations (e.g. paediatrics, elderly, pregnant/ lactating women)
- (g) basics in effective oral and written communication in both lay and scientific formats

##### Competency requirements

The student must be able to:

- (a) describe the normal human form and functions
- (b) communicate effectively with a person so as to elicit relevant information
- (c) provide instructions clearly on the safe use of medication
- (d) demonstrate professional interpersonal skills
- (e) articulate ideas effectively in oral and written presentations

#### Health and Disease

Related topics: Pathology, Epidemiology, Health Promotion, Microbiology, Pharmacotherapy, Pharmacology, Pharmacokinetics, Pharmacodynamics, Toxicology

##### Goals/ Objectives

The student must understand the:

- (a) elements of good health, health promotion and disease prevention
- (b) etiology of diseases or the pathophysiology of medical conditions
- (c) relationship between pathogens and the diseases
- (d) rationale behind the safe and effective use of medications
- (e) principles of evidence-based medicine and practice
- (f) disposition of drugs in the human body

### Competency requirements

The student must be able to:

- (a) describe the fate of drug in the human body
- (b) provide advice/counselling on health promotion
- (c) recognise common minor ailments
- (d) identify drug-related problems
- (e) assess severity of diseases
- (f) develop evidence-based care plans for treatment or management of disease

### **Medicinal Substance**

Related topics: Pharmaceutical Chemistry, Medicinal Chemistry, Natural Products, Computer-aided Drug Design, Biotechnology, Pharmaceutical Analysis

### Goals/ Objectives

The student must understand the:

- (a) chemistry of functional groups and heterocycles in relation to their interactions with chemicals (drug synthesis) and biological systems (drug-receptor interaction)
- (b) thermodynamics and chemical kinetics in relation to ligand-target interaction and rate of reaction
- (c) physicochemical properties of chemical drugs and biologics in relation to the impact on their pharmacodynamic and pharmacokinetic profiles
- (d) principles, instrumentation and application of essential analytical techniques used in quality control of medicinal substance
- (e) principles of medicinal chemistry in drug discovery integrated with synthetic approaches
- (f) principles of computer-aided drug design

### Competency requirements

The student must be able to:

- (a) describe chemical properties from chemical names or structures and relate to action of the medicinal substance
- (b) interpret analytical data with relation to identity and purity of the medicinal substance

### **Health Product**

Related topics: Pharmaceutics, Pharmaceutical Technology, Biopharmaceutics

### Goals/ Objectives

The student must understand the:

- (a) range of dosage forms and its variety of uses
- (b) principles of pharmaceutical calculation
- (c) science and principles of formulation of various dosage forms
- (d) quality assurance processes, including the actives, excipients and the final product
- (e) potential of degradation of products in relation to shelf life
- (f) principles and process of sterilization and asepsis in sterile product manufacturing and preparation
- (g) potential of microbial contamination and control in therapeutic products

- (h) principles of current good manufacturing practice in relation to quality assurance of products
- (i) essence of environmental control in manufacturing processes and facilities
- (j) principles of biotechnological processes in the manufacture of biologics
- (k) functions and regulation of medical devices
- (l) concepts in bio-pharmaceutics, developmental pharmaceutics, pre-formulation studies

#### Competency requirements

The student must be able to:

- (a) recognise the condition of health products that may not be suitable for consumption or use
- (b) explain the principles behind expiry date of health products
- (c) select appropriate dosage form for administration
- (d) prepare extemporaneous preparations from a formula or prescription
- (e) perform pharmaceutical calculations accurately

#### **Regulatory Framework & Health System**

Related topics: Pharmacy Law, Pharmacoeconomics and Outcomes, Good Practices

#### Goals/ Objectives

The student must understand the:

- (a) laws and regulations that govern professional practice and health products
- (b) mechanisms of the health system in Singapore (e.g. health policy, health reimbursement, healthcare management)
- (c) principles of good practices (e.g. GMP, GLP, GCP)
- (d) principles of medication management (e.g. medication safety, pharmacoeconomics and outcomes, pharmacovigilance)

#### Competency requirements

The student must be able to:

- (a) explain the health policies applicable in the Singapore context
- (b) apply the laws, regulations and good practices in the discharge of their duties
- (c) recommend care plans that are cost-effective

## APPENDIX 3

### Fitness to Practise Advisory for Pharmacy School

Pharmacy education and training should accommodate individuals with varied backgrounds, including those with health conditions and disabilities which are deemed not to adversely interfere with the progression through the programme. Pharmacy students have privileges and responsibilities that are different from students in other programmes in the university. As such, a separate set of standards in professional conduct are expected of them and they must be fit to practise as students.

The pharmacy school is responsible for ensuring that students have opportunities to learn and practise according to the standards expected of them. This section thus describes the minimum requirements for students' fitness to practise in relation to their health and behaviour. It aims to help the pharmacy school make consistent decisions on cases where student's fitness to practise has raised concern.

#### Scope and threshold of student fitness to practise

1. The pharmacy school must consider the students' fitness to practise as the public has placed its trust and confidence in the profession. This is because students exhibiting inappropriate behaviour or having health issues may adversely impact the safety of the patients, public, other students and staff.
2. The admissions process must include appropriate health screenings and checks that certify students to be fit to partake in both didactic and experiential learning pedagogies.
3. As part of the admissions process, applicants must be informed that poor behaviour or impairment in health may affect their fitness to practise before or during their period of study as a student. This in turn may impair their eligibility to graduate from the programme of study; and seek registration to practise as a pharmacist.
4. Students' fitness to practise must be considered on a case-by-case basis through the pharmacy school's own fitness to practise procedures.
5. Students must have opportunities to seek help for any matter before it becomes a fitness to practise concern.
6. When fitness to practise concerns are identified, the pharmacy school must offer support and remediation (where appropriate) to the student, based on an assessment of the risk to the student himself/herself, patients, public, other students and staff.
7. When assessing the fitness to practise of a student, the following must be considered:
  - (a) seriousness of the behaviour in question
  - (b) patterns of behaviour
  - (c) likelihood of repeat behaviour
  - (d) severity of health condition
  - (e) likelihood of health condition compromising the safety of patients, themselves or others
  - (f) failure to abide by the university's code of student conduct
  - (g) the student's maturity and year of study
  - (h) the student's response to support and remediation.

8. Areas of concern related to a student's fitness to practise include (but are not limited to):
  - (a) criminal conviction
  - (b) drug, alcohol or other substance misuse
  - (c) aggressive, violent or threatening behaviour
  - (d) cheating or plagiarizing
  - (e) dishonesty or fraud
  - (f) unprofessional behaviour or attitudes
  - (g) health conditions and lack of management of them (failure to follow medical advice/plans and recognise limits/abilities, or lack of insight into health conditions, that might impair student's fitness to practise).

## ACKNOWLEDGEMENTS

This document on the Standards of Undergraduate Pharmacy Education and Training in Singapore is developed by the Pharmacy Programme Review Committee (PPRC) whose members are appointed by the Singapore Pharmacy Council (SPC). The task of the PPRC is to review the global pharmacy education standards and formulate a set of standards that are relevant and pertinent to the practice of pharmacy in Singapore. The establishment of this document is a milestone in standardizing the education and training of pharmacists in Singapore. This document will form the basis for self-assessment by the pharmacy school to ensure quality and consistency in the delivery of pharmacy programmes in education and training that will meet the competency standards for entry into practice.

The members of the PPRC are hereby acknowledged with thanks for their efforts and time in promulgating this inaugural set of standards for pharmacy education and training in Singapore. The members of the PPRC, which is appointed between the period of 1 January 2015 and 31 December 2016, are listed below. Mr Sia Chong Hock was appointed as a new member of the PPRC with effect from 01 September 2017 and his contributions to the document is also acknowledged.

Assoc Prof Chui Wai Keung (Chairman)  
Assoc Prof Priscilla How  
Dr Camilla Wong Ming Lee  
Dr Ellick Wong

The PPRC would like to take this opportunity to thank the registrar of SPC and the chief pharmacist, Assoc Prof Lita Chew, who guided the committee in the process of developing the document. Assoc Prof Chew provided the exciting changing landscape of the pharmacy profession in Singapore and this set the guidance for the standards to prepare future-ready pharmacists to meet the needs of the country. The PPRC would also like to acknowledge with thanks colleagues from the MOH Professional Training and Assessment Standards Division for reviewing the draft copy of the document and providing critical comments for improvement.

The PPRC likes to thank the president of SPC, Mr Wu Tuck Seng, and the SPC for their support and time in reviewing the draft copies of the document. The PPRC would also like to thank Ms Felicia Ling and Ms Jasmine Ng for their secretarial support at the meetings. Last but not the least, the PPRC would like to acknowledge the following organizations for providing the relevant reference materials to enable this document to be written:

- (a) The International Pharmaceutical Federation (FIP)
- (b) The General Pharmaceutical Council (GPhC, UK)
- (c) The Australian Pharmacy Council (APC, Australia)
- (d) The Accreditation Council for Pharmacy Education (ACPE, USA)

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## GLOSSARY

SPC	Singapore Pharmacy Council
FIP	International Pharmaceutical Federation
PPRC	Pharmacy Programme Review Committee
GMP	Good Manufacturing Practice
GLP	Good Laboratory Practice
GCP	Good Clinical Practice

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