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2.3 Digital health in pharmacy education: Faculty perspective

Author

Lilian Azzopardi, FIP Digital Health in Pharmacy Education Core Team Member, FIP AIM Advisory Committee Member, Professor and Head, Department of Pharmacy, University of Malta, President, European Association of Faculties of Pharmacy, Malta

Pharmacy academic institutions have a mission of sustaining professional pharmaceutical workforce development through a robust education. Promoting transformation of the profession through research, using advanced technologies, is essential for tomorrow's pharmacy practice. This noble mission is achieved by addressing the inter-connected complex facets of education and research in pharmacy while maintaining a social accountability focus. The integration of social accountability goals in a college's mission, strategy, curriculum, learning experiences, research activities and partnerships sustains the relevance of education and research to meet the needs of society.

2.3.1 Why digital health in pharmacy education matters?

Within the social accountability framework, pharmacy educators have a responsibility to reflect on developments in the healthcare ecosystem. Digitalisation is a significant evolvement which is contributing to opportunities and challenges in the healthcare ecosystem. Digital health, which has picked up momentum very rapidly, is revolutionising the way patient care is delivered. Society is empowered and is in a position to seek on-demand healthcare as a result of accessibility to technologies that generate health data and provide access to health services.

A confident, capable, agile and digitally enabled pharmaceutical workforce is required to make use of the full potential of digital health. Only with education and training can the pharmaceutical workforce keep up with the pace of digital health transformation.

In this context, questions that need to be addressed by academia are:

1. What facilitates preparedness of graduates for the evolving health systems in the light of digital health?
2. Which learning experiences provide skills necessary in this digital age?
3. How can effective learning experiences be organised?

2.3.2 Preparing graduates that are relevant to the evolving health systems

Pharmacy graduates have the opportunity to take up career options in a number of settings including in direct-patient care practice in hospital and community pharmacies providing clinical pharmacy and pharmaceutical care, in patient safety settings such as pharmaceutical regulatory sciences and pharmacovigilance, and in industrial settings such as quality assurance and manufacturing. Key to this state-of-affairs is the contribution by pharmacy graduates in these settings as patient safety advocates. Pharmacists are acting as co-ordinators of care and as an anchoring profession through collaboration with other disciplines. To this effect the patient-

centred focus in pharmacy curricula is crucial to prepare graduates as valid players in health systems. All these functions benefit from a sound education in aspects of digital healthcare.

The FIP Nanjing Statements on Pharmacy and Pharmaceutical Sciences Education provide a global vision of the future needs of pharmaceutical education standards.[1] Clusters include a professional skills mix, foundation training and leadership, and experiential education. In Europe, the European Association of Faculties of Pharmacy (EAFP), established a position paper to highlight the four pillars for relevant pharmacy education, namely, a science-practice balance, teaching methods, team players and preparedness.[2]

The Nanjing Statements and the EAFP position paper provide a framework for pharmacy educators to update curricula so that they ensure that graduates are prepared for today's healthcare ecosystems using the context of digital health as a basis (Figure 8). Case examples of challenges and opportunities of digital health, for which graduates need to be prepared, include:

- **Personalised care:** Digital technologies are enabling society to observe biological markers through medical applications and wearable devices. The big data generated is an opportunity for understanding the totality of the patient's background. A sound science-practice balance is a fundamental requirement for students to acquire the skill to support patients in the interpretation and personalisation of the inferences of such data in the context of the individual's health status.

- **Service provision:** With the advent of digitalisation, the provision of patient care through telehealth gives the opportunity for patients to access healthcare via telecommunications. Telemedicine and telepharmacy revolutionise the patient-pharmacist-healthcare team interaction. Teaching methods, including experiential education, go beyond communication skills and ought to embrace remote communication as this is applied to provide patient counselling, patient monitoring and to actively interact within the healthcare team.

- **Safety and risk:** Ensuring patient well-being by regulating the safety, quality and efficacy of delivery systems that feature digital platforms is of essence. Encompassing digitalisation prepares students for the current and future evolvements.

- **Leadership:** Student competence to reflect on strengths, weaknesses and opportunities takes up a leading role in adopting digital health to transform health systems. Teaching methodologies including exposure to real-life practices strengthen the impact of the exposure.
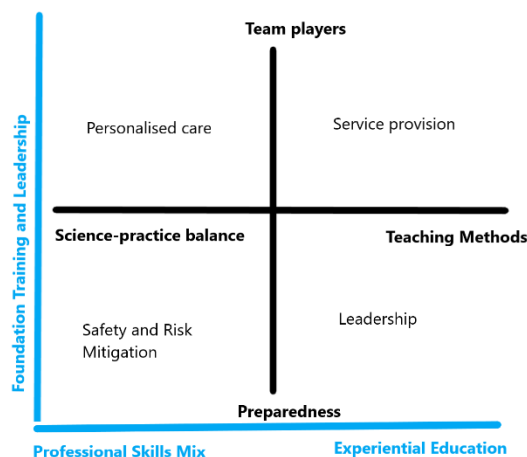
Figure 8: Domains in pharmacy education in the digital age

Figure 8 illustrates how the clusters of experiential education, professional skills mix and foundation training and leadership from the FIP Nanjing Statements[1] and the four pillars of relevant pharmacy education of science-practice balance, teaching methods, team players and preparedness as identified by the EAFP position paper[2] intertwine. Both propositions support domains that promote education which prepares pharmacy graduates for the digital age.

Pharmacy and pharmaceutical sciences education must be needs-based to meet existing and emerging requirements in digital health. These requirements must reflect the needs in all sectors of pharmacy and pharmaceutical sciences, from clinical pharmacy to drug research, of all members of the pharmaceutical workforce as well as patients and the community.

2.3.3 Learning experiences that provide required skills

Learning experiences require an unfragmented education that has a foundation of science as applied to practice. The basis for the didactic experience is guided by a balance between biomedical sciences and clinical sciences. In addition to the knowledge base, the value of students being exposed to longitudinal experiences throughout the curriculum cannot be overstated. The longitudinal practical and placement experiences support the mobilisation of knowledge and application to administrative, social, therapeutic and regulatory interventions. The learning experience reinforces student transition from the "learning how to think" to the "thinking how to learn" mentality. The outcome of this learning experience is to develop active, self-directed lifelong learners who are able to evaluate and update with the dynamic developments in the healthcare ecosystem, including digital health.

The relevance of experiential education becomes accentuated when aiming to provide learning experiences in the perspective of our contemporary digital age. Students are exposed to the realities of communicating with patients through telemedicine: understanding barriers that patients may have to access healthcare through digital health and overcome anxiety. Work ethics that improve on communication techniques need to be addressed in a remote communication environment.

Laboratory sessions require adjustment to secure the facet of digital health. Efforts should be directed to provide a learning experience on embracing digital technologies in healthcare rather than towards exposing students to the technologies available at the time. Laboratory sessions need to boost skills involved in handling and managing digitalisation in healthcare systems and may require a transversal approach in evaluation and use. A transversal approach adopts a comprehensive learning experience of applications of digital health in addition to theoretical areas of study such as formulation, dispensing and analysis. The laboratory mindset within colleges of pharmacy should evolve from classic aspects to include exposing students to technology-driven learning facilities.

Capstone projects which give a comprehensive overview of digital health as it impacts on service development, personalised medicine approach and regulation, expose students to an intellectual experience which nurtures leadership skills in leading innovative applications of digital health. Such capstone projects may be incorporated during undergraduate and post-graduate level programmes.

2.3.4 Organising effective learning experiences

Academic pharmacy has transitioned its science-focused curriculum delivered within a higher education institution, to include a competence-based learning model which includes experiences within relevant health systems.[3] A way how pharmacy education could respond to the needs of society, in the environment of digitalisation, is through a ''Fourth Generation'' paradigm of digitalised pharmacy education (Figure 9).

A people-centric Fourth Generation encapsulates a proactive approach in preventing communicable and non-communicable disease and respond to the needs of society. Embedded within the people-centric curriculum, domains may be identified that sustain development of competences which ensure: efficacy, safety and quality medicinal products (including medical devices) and digitalised drug delivery systems; access to medicines and pharmaceutical services; and patient monitoring and application of information to specific individual needs.

A technology-driven delivery of the learning experience provides for a large proportion of the students, who are now from the Z generation, therefore open and amenable to digital technology. Their avid use of social media, digital communication, cloud computing and mobile apps should not jeopardise the emphasis on personal professional and social interactions. This environment highlights the importance of technology-driven quality education which emphasises the collaborative, people-centric focus. Digitalisation results in bringing down boundaries and expanding networks. Collaborative networks among health professionals that exploit the benefits of interprofessional education are easier to conceptualise within a digitalised education. Benefits of interprofessional education, namely, the development of mutual respect, sharing patient care, connecting with patients and experiencing equitable and effective teamwork, are transferable skills that prepare students for a collaborative practice approach.[4]

Figure 9 illustrates the Fourth Generation of digitalised pharmacy education — a people-centric education within a collaborative instructional approach that is technology-driven and with the objective of covering the domains essential for safe, effective and quality pharmaceutical contributions.
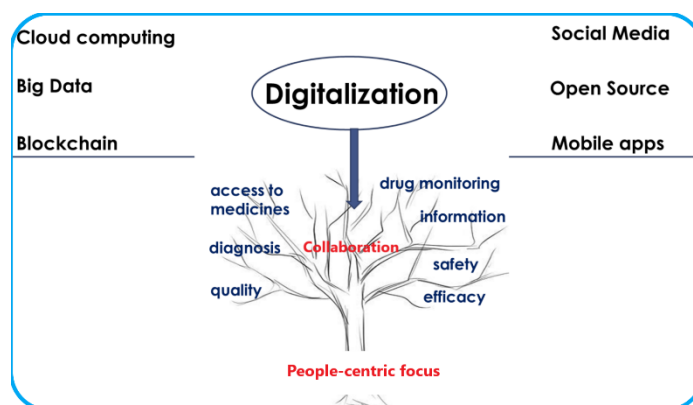

Figure 9: Fourth Generation of digitalised pharmacy education

2.3.5 How to assess competences in providing care and ensuring patient safety in the digital age

Pharmacy education prepares pharmacists who in turn are life-long learners and educators entrusted with promoting good practice in pharmaceutical processes and advising on rational and safe use of medicinal products. In a learner-centred model, assessment is not only a measure of evaluating learner success but is also an indicator of success of the educator model. Having set the faculty perspective of embracing curriculum developments and teaching modalities that support student competences in performing in the digital health age, identifying appropriate assessment processes that measure the outcome is commensurate. Electronic examination platforms allowing different written examination structures, including short-answer and

multiple-choice questions, are an option. Carefully designed digital formats for assessment serve as a technique of assessing digital skills within a specific environment such as that created during an exam session. A trend in adopting digital assessments in medical education has been witnessed.[5]

The application of Objective Structured Clinical Examination (OSCE) gained momentum in pharmacy entry-to-practice licensing examinations and final examinations over the past 15 years.[6] OSCEs are useful learner-centred assessment model adopted in some regions of the world in pharmacy education to evaluate students' ability to counsel and educate patients, to optimise drug therapy and to evaluate and provide drug information.[7, 8] The implementation of OSCEs in pharmacy education serves as a student performance-based summative assessment for clinical and patient skills.[9] OSCEs may be adjusted to reflect realities in health systems that incorporate digital health for example ability of the student to counsel patients remotely.

Considering that digital health requires the development of discreet competencies which provide a comprehensive proficiency, the application of the more recent concept of "entrustable professional activities" (EPAs) may be also pertinent. EPAs sustain continuous assessment modalities that provide feedback to the learner and the faculty.[10] EPAs for pharmacy practice capture domains that are relevant to pharmacy education in the digital age. Updating EPAs to reflect tasks specific to digitalised healthcare systems puts forward an assessment process which may be triangulated along other conventional assessment procedures. Research in the application of EPAs to pharmacy student assessment would inform better on the advantages and disadvantages of adapting these structures in the context of digitalisation.

2.3.6 Conclusion

Pharmacy educators are key players in preparedness for digital healthcare.[11] A Fourth Generation of digitalised pharmacy education is proposed to achieve effective teaching and student learning models that meet this evolvement.

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