

Deepening Understanding of Pharmacy Practice through Experiencing Virtual Reality and Mobile Patient-Health Application

Vivian Lee¹, Paula Hodgson²

The Chinese University of Hong Kong, Hong Kong^{1,2}

Abstract

Technologies such as notebook computers, virtual reality devices and mobile applications can be useful tools to prepare pharmacy students in the 21st century [1]. Pharmacy educators start getting their students to use mobile applications and technology to enrich the learning experience, and students can find useful and reliable medical references and drug information with medical mobile applications [2]. More importantly, students need to build a comprehensive understanding that pharmacy is not only about drug dispensing or prescription checking; they should have an opportunity to experience how they connect with patients and perform medication reviews with changes in patients' health conditions over time, modelling the practice of professional pharmacists [3]. Generation Z pharmacy students in Hong Kong have a lot of exposure to the use of mobile applications for communication with peers. This case study reports how a pharmacy educator redesigned the curriculum so that students could gain a balance between cognitive knowledge and the human side of pharmacy practice by experiencing ways of communication with doctors and patients using virtual reality devices connected to mobile phones or notebook computers in preparation for clinical internships. In addition, a mobile application for e-health support for patients is under development; it will gather health records of individual patients, information on drugs being prescribed and the pharmacist, and medical appointment data. A pilot has been conducted to fine-tune the user interface of the application before it is launched in the autumn, 2019. The pharmacy educator may then be able to demonstrate to students how the application will allow pharmacists to build a sustainable approach to providing services to patients who have had acute or chronic diseases in the community from admission to a hospital to follow-up medication requirements and review of medication prescriptions in the growing aging population in Hong Kong.

Keywords: *Virtual reality, mobile application, professional preparation, community.*

1. Introduction

Universities in Hong Kong have strongly encouraged educators to adopt innovative pedagogies to prepare future graduates with professional knowledge and skills since the 1990s, and campus environments have been upgraded with the latest learning management systems and wifi access for all users. Although the physical facilities have changed, the mode of learning remains predominantly through lectures. Students may be given paper cases to examine and discuss, so that they can develop critical thinking and communication skills [4]. However, students studying medical programs need to acquire not only clinical reasoning skills but the ability to elicit patient information and build relationships with patients when preparing them for patient-centred care [5]. The majority of students say that they are ill-prepared for their internship and seek more simulation practice with more supervision and feedback [6]. This paper discusses how a pharmacy educator embeds an immersive learning environment to provide opportunities for students to experience how to interact with patients and doctors through virtual reality while enabling them to develop professional clinical skills in the course 'Pharmacology and Therapeutics' before their internships in a university in Hong Kong. The second part of the paper reports the development of a mobile application for e-health support for patients as preparation for the pharmacy students to anticipate the possibility of adopting a sustainable approach to providing patient-centred care that continues to connect patients in the community.

2. Learning through immersive and non-immersive virtual reality

To prepare Year three pharmacy students before they attend clinical settings the following year, they are asked to view clinical cases using their smartphones connected to virtual reality headsets in class. Two scenarios were developed on the topic of acute coronary syndrome and heart failure with patient backgrounds extracted from authentic patient cases from a local hospital. They are totally immersed in the simulated cases as if they are personally interacting with patient and doctor in the hospital when using the headsets. Alternatively, students can view the scenarios with tablets or notebooks. However,

this non-immersive mode of virtual experience loses the sensation of close encounters with a doctor or patient, with whom the majority of students have never held a personal conversation. Therefore, the pharmacy teacher introduced a totally new method in her teaching in 2018 by adopting the VR technology in class, where one student put on the head-mounted display and sensors to go through the immersive virtual reality case, with 360-degree video displayed on the front screen for the rest of the class. The teacher explained the medical concepts and paused between questions raised by the doctor and the patient in the scenario for students to think about and reply. Students seemed daunted because they needed to focus not only on the patient history, which they normally did in paper cases, but also questions directly asked by the doctor and the patient in the clinical environment. Having gained feedback from students after the first lesson, the teacher then provided materials and case questions on the second topic before class so that they could be better prepared to respond to questions by the doctor in the second virtual reality case. They were also split into smaller groups for in-class discussion. There is an affective dimension, in which emotions are induced when learners interact through the immersive virtual reality [7], and patient-centred treatment can start in class. As they start to realize the complexity of a hospital ward that they will experience during their internships, the virtual reality experience can extend beyond reading medical history as in paper-based cases and enable them to pay attention to observing a patient's physical condition and how to communicate with doctors with greater confidence.

2. Development of mobile patient-health application

Students can build empathy when they experience 360-degree VR clinical scenarios with their smartphones [8]. Moreover, a mobile application for e-health support for patients can connect pharmacists and real patients in the community. Mobile applications have varied functions, including drug and medical information, medical calculations and medical news that are regularly made use of by pharmacists; some applications allow communication with other professionals and patients [2]. With smartphone applications, Dutch pharmacists can provide pharmaceutical services that include direct contact with patients, performing medical reviews and updating patient conditions in the community [10]. However, the majority of patients in Hong Kong may need to work on mobile applications in Chinese, especially for senior citizens in the territory's aging population. Thus, a Chinese mobile application is under development to allow future pharmacy graduates to have connections with patients to provide a sustainable approach to operating a patient-centred service. The application's functions include: (1) regular drug-taking notifications and alerts; (2) personal health information; (3) asking question of a pharmacist; (4) drug information; (5) advice on drug taking; (6) drug precautions; (7) new and next appointments and reminders; (8) new drug notifications; and (9) drug-taking records. The database will collect all registered patients or users whether they use public or private medical services. Pharmacy students are often shown cases with one type of pathology at a time, and now they can see more authentic cases before their internships while the pharmacy educator shows them more cases. She can illustrate drug intake and changes of medication for users and patients, while the database may serve to indicate growing trends in drug prescription, patterns of drug consumption across age groups and, possibly, emerging demands in drug use in order to provide proactive arrangement of patient-centred care for the whole community.

3. Discussion and conclusion

In preparing future pharmacists, whether they will be serving in hospitals or communities, educators need to provide a holistic experience for their students on pharmacy practice, including clinical analysis of patient conditions with drug prescription, communication with patients and doctors, counselling on the use of drug therapy, and having a sustainable approach to patient-centred care [10]. The experience of immersive and non-immersive virtual reality brings a new horizon of learning experience in the classroom [11]. Although pharmacy students tend to focus on drug dispensing, it is essential for them to be competent in medication therapy management and cognitive pharmaceutical services as healthcare professionals [12]. The most effective sustainable approach for medication adherence is to have mobile devices to remind patients and educate them on appropriate drug use. Patients value the opportunity to contact and make enquiries with pharmacists when needed, and this type of on-demand consultation is new in Hong Kong. Pharmacy students of the 21st century are ready to use their mobile devices to learn and prepare for their future careers [13]. Therefore, educators can take innovative pedagogy to better engage them and broaden their horizons through the use of immersive and non-immersive virtual reality so that they can develop clinical reasoning and communication skills in class. They will be better equipped if they have more opportunities to address authentic cases and pose questions to practising pharmacists as they are prepared to become

healthcare professionals to serve the aging population in Hong Kong. Further research can be conducted on pharmacy education with the use of patient-health applications on how this may improve pharmacy students' readiness in both their internships and as junior pharmacists after graduation.

References

- [1] Aungst, T.D., Miranda, A.C., and Serag-Bolos, E.S. "How mobile devices are changing pharmacy practice", *American Journal of Health-System Pharmacy*, 2015, 72(6): 494–500.
- [2] Aungst, T.D., "Medical applications for pharmacists using mobile devices", *Annals of Pharmacotherapy*, 2013, 47(7–8): 1088–95.
- [3] van de Pol, J.M., Geljon, J.G., Belitser, S.V., Frederix, G.W., Hövels, A.M., and Bouvy, M.L. "Pharmacy in transition: a work sampling study of community pharmacists using smartphone technology", *Research in Social and Administrative Pharmacy*, 2019, 15(1): 70–76.
- [4] Popil I. "Promotion of critical thinking by using case studies as teaching method", *Nurse Education Today*, 2011, 31(2): 204–07.
- [5] Konopasek, L., Kelly, K.V., Bylund, C.L., Wenderoth, S., and Storey-Johnson, C. "The group objective structured clinical experience: building communication skills in the clinical reasoning context", *Patient Education and Counseling*, 2014, 96(1): 79–85.
- [6] Hayes, C.W., Rhee, A., Detsky, M.E., Leblanc, V.R. and Wax, R.S. "Residents feel unprepared and unsupervised as leaders of cardiac arrest teams in teaching hospitals: a survey of internal medicine residents", *Critical Care Medicine*, 2007, 35(7): 1668–72.
- [7] Riva, G., Mantovani, F., Capideville, C.S., Preziosa, A., Morganti, F., Villani, D., Gaggioli, A. Botella, C., and Alcañiz, M. "Affective interactions using virtual reality: the link between presence and emotions", *CyberPsychology & Behavior*, 2007, 10(1): 45–56.
- [8] Beggan, A., Morton, S., and Simpson, T. "How did it make you feel? Using immersive 360 VR video to build empathy within clinical settings", Association for Learning Technology, 2017. <https://altc.alt.ac.uk/2017/sessions/how-did-it-make-you-feel-using-immersive-360-vr-video-to-build-empathy-within-clinical-settings-1739/>
- [9] van de Pol, J.M., Geljon, J.G., Belitser, S.V., Frederix, G.W., Hövels, A.M. and Bouvy, M.L., 2019. Pharmacy in transition: a work sampling study of community pharmacists using smartphone technology. *Research in Social and Administrative Pharmacy*, 15(1), 70–76.
- [10] Clifford, S., Garfield, S., Eliasson, L. and Barber, N. "Medication adherence and community pharmacy: a review of education, policy and research in England", *Pharmacy Practice*, 2010, 8(2): 77–88.
- [11] Hodgson, P., Lee, V.W.Y., Chan C.S., Fong, A., Tang, C.S.Y., and Cheung S.W.L. "A SWOT analysis of blending immersive virtual reality in the classroom" in Li, K.C. and Tsang, E. (eds) *Proceedings of the 2018 International Conference on Open and Innovative Education (ICOIE 2018)*, The Open University of Hong Kong, Hong Kong, 4–6 July, 11–22.
- [12] Toklu, H.Z., and Hussain, A. "The changing face of pharmacy practice and the need for a new model of pharmacy education", *Journal of Young Pharmacists*, 2013, 5(2), 38–40.
- [13] Bryant, J.E., and Richard, C.A. "Pharmacy students' use and perceptions of Apple mobile devices incorporated into a basic health science laboratory", *Currents in Pharmacy Teaching and Learning*, 2017, 9(1), 78–83.