

SHORT REPORT

# Use of a real-time virtual patient simulation for interprofessional distance education: A pilot study

Paul Burmeister<sup>1</sup>, Gabrielle Isaacs<sup>1</sup>, Bronwen Griffiths<sup>1</sup>, Lanxinning Mo<sup>1</sup>, Jordan Chin<sup>1</sup>, Cate McCall<sup>2</sup>, Stephen Duffull<sup>1</sup> 

<sup>1</sup> School of Pharmacy, University of Otago, Dunedin, New Zealand

<sup>2</sup> Centre for Postgraduate Nursing Studies, University of Otago, Christchurch, New Zealand

## Keywords

Interprofessional education  
Nursing student  
Pharmacy student  
Real-time simulation  
Virtual patient

## Correspondence

Stephen Duffull  
School of Pharmacy  
University of Otago  
Dunedin  
New Zealand  
stephen.duffull@otago.ac.nz

## Abstract

**Objective:** To evaluate the use of cloud-based virtual patients as a tool for engagement in interprofessional distance education (IPDE). **Methods:** Five pairs of final-year pharmacy and final-year nursing students interacted with an autonomous, real-time, cloud-based virtual patient (VP). They were debriefed after completion of their case and completed a questionnaire on the relevance of the VP to core IPE competencies. **Results:** The virtual patient approach was considered to be able to cover 25 of the 39 core IPE competencies. From a thematic analysis, there was evidence of students learning from, with, and about each other. **Conclusions:** The use of cloud-based autonomous VPs could be a successful tool for IPE.

## Introduction

The logistic challenges of interprofessional education (IPE) are significant, with most IPE occurring in synchronous settings, *i.e.* at a time when the different team members are in the same place at the same time (Bridges *et al.*, 2011). The authors have recently piloted the use of a real-time, cloud-based, virtual patient (VP) simulation using SimPHARM (Duffull & Peterson, 2020) for asynchronous IPE with positive findings (Duffull *et al.*, 2020). In this report, they will describe the expansion of this approach to pilot virtual patients for interprofessional distance education (IPDE), in which all participants were at different geographical locations.

## Methods

### Participants

Participants were final year Bachelor of Pharmacy (BPharm) and Master of Nursing Science (MNSc)

students. Five participants from each professional programme were recruited. The pharmacy student participants had previously used SimPHARM in years 2, 3, 4 of their professional programme as part of their training. Nursing student participants had not used SimPHARM previously. The pharmacy and nursing students did not know each other prior to the study and were not co-located during the study. The study occurred during the COVID-19 lockdown, and all interactions between and within researchers and participants took place through the online video platform Zoom.

### Study design

The study was performed in three parts. In Part 1, nursing students attended an initial SimPHARM training session and, later, the pharmacy and nursing students were provided time to socialise on a zoom meeting and then completed a multiplayer practice case together synchronously. The same VP (Theo Anderson; summary

in Appendix A) was used for both situations. Part 2 involved teams of pharmacy and nursing students caring for a VP (Amelia Thompson; summary in Appendix B). In Part 3, participants were invited to attend a synchronous debrief session by Zoom and complete a questionnaire (full results are shown in Appendix C). The questionnaire consisted of 25 questions based on a 5-point Likert scale. Students were asked to rate their ability to achieve core IPE competencies (Anon., 2016) via interaction with their VP. Of the 39 core competencies, 14 were excluded as they were deemed impossible to meet by interacting with a VP (e.g., respecting the dignity and privacy of patients). In addition, SimPHARM log files for each team were reviewed. This study was approved by the University of Otago Human Ethics Committee (23 April 2020, D20/103).

Qualitative data were collected during the debriefing. All quotes were transcribed, collated, and formatted in Excel. A thematic analysis was performed for evidence of IPE qualities. All participants were assigned an ID number (pharmacy students: P1, P2, ...; nursing students: N1, N2, ...).

## Results

Of the 39 core competencies, 25 were rated by the students as being moderately or highly amenable to IPDE using a VP. Of note, RR7, CC1, CC5, and TT2 were rated as being moderately amenable by pharmacy students and highly amenable by nursing students (who rated all elements highly amenable). See Appendix C for details.

The log files from SimPHARM showed that each IPE team enacted between a median of 4 treatment decisions (range: 2–7), resulting in the prescription of new medicines, de-prescribing, and changing the dose of existing medicines. These decisions were predicated on a median of 33 lab tests (2–84) and communicated with 19 (9–54) clinical notes, of which 7 (5–14) were considered to be interactive (asynchronous discussion).

The qualitative data were reviewed for evidence of an IPE theme that might reflect the use of the distance VP approach. Three IPE themes were identified.

### (1) Students learning **with** each other:

*"We decided things together. We would bounce ideas back and forth, then come to a decision, and then prescribe"* (P5) and *"In working cases together, it [SimPHARM] was a good tool"* (P1).

### (2) Students learning **from** each other

Comments from students included *"Active conversation with my partner was good as we learnt from each other"* (N2) and *"I learnt stuff [from my pharmacy partner] in a different way that's helpful – [concepts] made much more sense when [my] partner explained it"* (N5).

### (3) Students learning **about** each other

One nursing student reflected upon differences between their pharmacy partner and themselves: *"I noticed a difference in the types of questions asked between my partner and I"* (N5), and a pharmacy student: *"[SimPHARM] helped me to understand the role of the nursing students and how their knowledge differed from mine, and how we could work together to improve patient care"* (P5).

## Discussion

The results of this study illustrate the practicality of IPDE using a cloud-based VP approach. Students rated their IPE experience well and indicated that they felt the VP approach could potentially cover 25 of the 39 core competencies in part or entirely, including eight communication competencies. While all activities were conducted at a distance, the initial socialisation and debriefs were both synchronously run by a virtual meeting platform. Given that the VP generated by SimPHARM is autonomous, the student's interaction with the VP did not require the presence of a tutor, and students could complete the case in their own time and location. An additional benefit of an autonomous VP approach is that students can 'experiment' safely without negative educational consequences from their decisions (de Visser *et al.*, 2011).

The thematic analysis revealed evidence of the three principles of IPE (WHO, 2013), with both pharmacy and nursing students indicating that they learnt from, with, and about each other through this experience.

## Conclusions

Based on user experiences, SimPHARM could fill a gap in IPE education. The VP simulation may provide a platform for many of the IPE core competencies required for IPE programmes.

## Acknowledgements

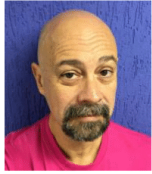
The authors thank the Pharmacy and Nursing students for taking part in this study.

## References

- Anon. Interprofessional Education Collaborative (2016). Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel. Washington, DC. Retrieved from: <https://ipecollaborative.org/uploads/IPEC-Core-Competencies.pdf>
- Bridges, D.R., Davidson, R.A., Odegard, P.S., Maki, I.V., & Tomkowiak, J. (2011). Interprofessional collaboration: three best practice models of interprofessional education. *Medical Education Online*, **16**; <https://doi.org/10.3402/meo.v16i0.6035>
- de Visser, H., Watson, M.O., Salvado, O., & Passenger, J.D. (2011). Progress in virtual reality simulators for surgical training and certification. *The Medical Journal of Australia*, **194**(S4):S38-S40. <https://doi.org/10.5694/j.1326-5377.2011.tb02942.x>
- Duffull, S.B., & Peterson, A.K. (2020). Students' perceptions of playing a serious game intended to enhance therapeutic decision-making in a pharmacy curriculum. *Currents in Pharmacy Teaching and Learning*, **12**(11):1348-1353. <https://doi.org/10.1016/j.cptl.2020.05.011>
- Duffull, S., Peterson, A., Chai, B., Cho, F., Opoku, J., Sissing, T., Smith, D., Tongskul, T., & Wilby K. (2020). Exploring a scalable real-time simulation for interprofessional education in pharmacy and medicine. *MedEdPublish*. <https://doi.org/10.15694/mep.2020.000240.1>
- WHO (World Health Organization). (2013). Framework for Action on Interprofessional Education & Collaborative Practice. [March 4, 2013]. [https://www.who.int/hrh/resources/framework\\_action/en/](https://www.who.int/hrh/resources/framework_action/en/)

## Appendices

### Appendix A: Case summary – Theo Anderson



## SimPHARM Case Description

**Case Level:** Early Learning

**Case Run:** Single visit, 1 hour

**Patient:** Theo Anderson

### Patient Description:

#### Introduction to Theo:

Mr Anderson is admitted under your care with a simple fracture of the tibia with evidence of deformity in the local area. The medical team wish you to chart some analgesia.

**Gender:** Male

**Weight:** 176 lbs. / 80 kg

**Height:** 5'11" / 180 cm

**Age:** 60

#### Case Details:

Theo has no pre-existing conditions. He arrives with the paramedical team currently feeling little if any pain. Theo had received a sedative prior to your arrival as he was extremely agitated. He is just waking up from this and his pain is returning. The pain will return over the next half-an-hour.

#### Pathologies:

Condition	Severity	Occurrence	Duration	Probability
Simple fracture of the tibia	Severe pain	Acute – maximum pain occurs if untreated at 40 minutes into case.	Duration of case	100%

#### Pre-existing Medication:

Nil

#### Availability of drugs and laboratory investigations:

Only three drugs are available in this case (paracetamol / acetaminophen, naproxen and morphine). All investigations are available for students.

#### Debrief notes

This is a 1 hour case. Almost no lab tests can be ordered and returned within an hour which means the student is faced with the prospect of making a decision in the absence of all information that could (in theory) be known. They have only 3 choices.

A choice of paracetamol alone would need to be justified by the student and when the student reflects to identify that this did not provide adequate or fast enough pain relief.

A choice of naproxen while perhaps logical for this type of pain is far too slow in onset to have any significant effects.

The only choice therefore that can work is morphine. Note students will see side effects emerge which will vary between students so this is an important debrief point for the class.

**Appendix B: Case summary – Amelia Thompson**



**SimPHARM Case Summary**

**Case Level:** Mid  
**Case Run:** Single visit, 48 hours  
**Patient:** Amelia Thompson

**Patient Description:**

**Introduction to Amelia:**

Amelia has been referred to the student for management of her hypertension.

**Gender:** Female  
**Weight:** 173 lbs. / 78 kg  
**Height:** 5' 5" / 165 cm  
**Age:** 52

**Case Details:**

Amelia has mild-moderate essential hypertension. She has been initiated on a starting dose of cilazapril. This does not have been titrated and her hypertension is currently not under control. She has a history of asthma and osteoarthritis. This case mixes silent disease with symptomatic diseases and tests the student's ability to prioritise. The relatively short time frame for the case will limit what the student can achieve so target setting for BP will need to be focused on what they would anticipate seeing at 48 hours treatment.

Amelia is quite resistant to paracetamol / acetaminophen for her (L) knee OA. This will require the student to think about the benefits:risks of the use of NSAIDs in relation to her cardiovascular risks and BP control.

**Pathologies:**

Condition	Severity	Occurrence	Duration	Probability
Hypertension	Mild-moderate	Pre-existing	Whole case	100%
Osteoarthritis (L) knee	Moderate to severe	Chronic ongoing pain and symptoms.	Whole case	100%
Asthma	Mild	Acute symptoms occur in the morning of day 1	Lasts 1-2 hours (if untreated)	100%
Asthma	Mild	Acute symptoms occur in the morning of day 2	Lasts 1-2 hours (if untreated)	75%

**Pre-existing Medication:**

Cilazapril 1 mg daily  
 Paracetamol [acetaminophen] 1000 mg every four times per day  
 Salbutamol inhaler (100 mcg/puff) prn

**Availability of drugs and laboratory investigations:**

All drugs and investigations are available for students.

**Debrief notes**

There is nothing overtly complicated in this case. However the mix of acute and chronic and silent and symptomatic conditions will test the student's cognitive load. An important discussion point for the debrief is to be self aware of their decision making process. In particular some students may aggressively treat the hypertension when in fact Amelia may have had this for more than 5 years. In addition, the student's treatment choice and reasoning for the treatment of Amelia's OA should be examined.

### Appendix C: Responses to Questionnaire 2 – IPE core competencies survey

The overall responses to the core competencies are provided below.

There are 39 core interprofessional education competencies (Anon., 2016), of which 14 were excluded from the analysis as they were deemed impractical to be met using a virtual patient interaction (*e.g.* respecting the dignity of patients). The results for the remaining 25 competencies are represented as the median score by each profession (*i.e.* per pharmacy or nursing). Each student completed a 5-point Likert scale for each of the 25 competencies. These scores were then pooled across students from the same profession and also across all students (Aggregate Score). The medians of these scores were then summarised as Low (a median score  $\leq 2.5$ ), medium (a median score  $> 2.5$  &  $< 3.5$ ), and high (a median score  $\geq 3.5$ ).

Question	Core Competencies	Pharmacy	Nursing	Aggregate score
VE1	Place interests of patients at centre of interprofessional health care delivery and population health programs and policies, with the goal of promoting health and health equity across the life span.	High	High	High
VE5	Work in co-operation with those who provide care, and others who contribute to or support the delivery of prevention and health services and programs.	High	High	High
VE6	Develop a trusting relationship with other team members.	High	High	High
VE9	Act with honesty and integrity in relationships with other team members.	High	High	High
RR2	Recognise one's limitations in skills, knowledge, and abilities.	High	High	High
RR3	Engage diverse professionals who complement one's own professional expertise, as well as associated resources, to develop strategies to meet specific health and healthcare needs of patients and populations.	High	High	High
RR5	Use the full scope of knowledge, skills, and abilities of professionals from health and other fields to provide care that is safe, timely, efficient, effective, and equitable.	High	High	High
RR7	Forge interdependent relationships with other professions within and outside of the health system to improve care and advance learning.	Medium	High	High
RR9	Use unique and complementary abilities of all members of the team to optimise health and patient care.	High	High	High
RR10	Describe how professionals in health and other fields can collaborate and integrate clinical care and public health interventions to optimize population health.	Medium	High	High
CC1	Choose effective communication tools and techniques, including information systems and communication technologies, to facilitate discussions and interactions that enhance team function.	High	High	High
CC2	Communicate information with health team members in a form that is understandable, avoiding discipline-specific terminology when possible.	High	High	High
CC3	Express one's knowledge and opinions to team members involved in patient care and population health improvement with confidence, clarity, and respect, working to ensure common understanding of information, treatment, care decisions, and population health programs and policies.	High	High	High
CC4	Listen actively and encourage ideas and opinions of other team members.	High	High	High
CC5	Give timely, sensitive, instructive feedback to others about their performance on the team, responding respectfully as a team member to feedback from others.	Medium	High	High
CC6	Use respectful language appropriate for a given difficult situation, crucial conversation, or conflict.	High	High	High
CC7	Recognise how one's own uniqueness (experience level, expertise, culture, power, and hierarchy within the health team) contributes to effective communication, conflict resolution, and positive interprofessional working relationships.	High	High	High

Question	Core Competencies	Pharmacy	Nursing	Aggregate score
CC8	Communicate the importance of teamwork in patient-centred care and population health programs and policies.	High	High	High
TT2	Develop consensus on the ethical principles to guide all aspects of teamwork.	Medium	High	High
TT3	Engage health and other professionals in shared patient-centred and population-focused problem solving.	High	High	High
TT4	Integrate the knowledge and experience of health and other professions to inform health and care decisions, while respecting patient and community values and priorities/preferences for care.	High	High	High
TT5	Apply leadership practices that support collaborative practice and team effectiveness.	High	High	High
TT6	Engage self and others to constructively manage disagreements about values, roles, goals, and actions that arise among health and other professionals and with patients, families, and community members.	High	High	High
TT7	Share accountability with other professions, patients, and communities for outcomes relevant to prevention and health care.	High	High	High
TT8	Reflect on individual and team performance for individual, as well as team, performance improvement.	High	High	High

Questionnaire – IPE core competencies. VE = Values/Ethics, RR = Roles/Responsibilities, CC = Interprofessional Communication, TT = Teams & Teamwork.