**Experiencing a virtual patient to practice patient counselling skills**

**Abstract**

Background Virtual patients (VPs) are a safe and standardised method of simulating clinical environments but few studies have explored healthcare professional’s experiences of learning via a VP. This study explores how users experienced and used a VP that aims to teach the user to deliver non-vitamin K oral anticoagulant (NOAC) patient education.

Methods The study used semi-structured interviews with pharmacists and pre-registration trainees from a wider research study. Interview topics were based on key areas concerning VP use. Interviews were audio-recorded and transcribed verbatim before being analysed using the Framework Approach to thematic analysis. Ethical approval was granted by Keele University.

Results There was variation in the type and nature of use of the VP and in the reported learning, which included reinforcement of knowledge, an opportunity to promote reflection and, acquisition and application of knowledge to clinical, patient-facing interactions. The VP was seen as an adjunct to other education and training. The majority of users indicated that they used the VP more than once. Some users seemed to have gamified their learning with a drive to achieve perfect feedback rather than true engagement with the learning, whereas for others the learning appeared to be deep with a reflective focus.

Conclusions The VP offered an educational use as experiential learning, although the users experienced the VP differently; commonly the VP facilitated learning via reinforcement of pre-existing knowledge. The users reported that the VP had value as an adjunct to other education and training resources.

**Keywords:** Counselling, Education, Pharmacist, Virtual patient, Simulation.

**Conflict of interest:** none to declare

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**Introduction**

Virtual patients (VPs) are a sub-type of online simulation that have uses in creating safe and standardised clinical learning environments.1,2 A VP can be defined as: *‘’an interactive computer simulation of a computer programmable patient (or avatar) in a real-life clinical scenario for the purpose of medical training, education, or assessment that will respond to learner decisions.'’*3,4VPs have largely only been evaluated for use by undergraduate healthcare students.5–12 Little is known about the use of VPs by qualified healthcare professionals who work outside of formal educational courses and institutions, and who have to balance postgraduate education with the pressures of clinical practice.13–15 This is opposed to undergraduate students who have the pedagogical support of formal education and minimal or absent pressure from clinical practice.

VP applications have been designed for multiple purposes including clinical reasoning,16 counselling (patient education)9 and shared-decision making.17 They have also undergone numerous quantitative evaluations, albeit it largely in student populations, with some significant findings concerning their educational value and with largely positive findings of likability and usability.13–15 VPs have been evaluated relative to various outcomes including knowledge improvements where results have been both significant11,18 and non-significant;9 significant improvement in clinical skills on terminal assessment post-VP use;1 increased self-measured counselling competency;9and improved performance in mock patient interactions post-VP use.19 Yet, what continues to be absent is insight into how a user experiences a VP to facilitate their learning and how they consequently perceive its educational value.

VPs do not appear to have been widely evaluated using qualitative methods which may offer an advantage in establishing the experiences of using and learning from a VP with only a few small observational studies, largely using students, being reported.20–22 An earlier systematic review also concluded that new methods and approaches could contribute to better establishing the value and use of VPs in practice.14

A qualitative methodology was used in this study in anticipation of capturing the context, detail and experience-based perspectives of the participants. This study aimed to qualitatively explore the experiences of pharmacists and pre-registration trainee pharmacists when using one VP application as part of their clinical practice.

**Methods**

**The VP Design**

The VP in question was developed to teach and provide a practice opportunity to develop pharmacy students’ and pharmacists’ skills in delivering non-vitamin K oral anticoagulant (NOAC) patient education for patients with atrial fibrillation.23 NOACs require particular attention as they come with an increased risk of bleeding which needs to be communicated to patients to ensure they know when to seek medical advice.24,25 Ensuring patients have the knowledge to safely use a medicine is a cornerstone of a Pharmacist’s role26 and this can be achieved by conducting medication education with a patient to provide them with personalised, evidence-based information about their medicines(s).27 Learning to educate patients is considered a skill, referred to as counselling, of which healthcare professionals need to be suitably trained and given enough experience to practise and maintain in practice.27,28

The VP application uses animated video technology to simulate a NOAC patient education interaction (Figure 1.).23 The intended learning outcome (ILO) of using the VP was that users would be able to *‘’demonstrate how to counsel a new patient on rivaroxaban’’*. This encompasses demonstrating knowledge and communication skills relating to patient NOAC education, in particular explaining the bleeding risks associated with NOACs to a patient in an appropriate way.

The VP uses multiple choice questions (MCQs) to give the user choice in the flow and direction of the consultation. The MCQs are made up of a number of different type of question: stylistic options (such as in Figure 1.) where there are different options to deliver the same information to provide the user with an opportunity to deliver a consultation in a personalised style; ‘right’ and ‘wrong’ questions whereby there is a single correct answer for example, administration instructions for the medication; and single best answer (SBA) questions, where multiple options may be correct but there is a preferred option. Typically, this latter question type is used when the delivery of the information may have a preferred style to avoid scaring or worrying the patient, such as information concerning side effects. Using a mixture of these question types was anticipated to test the user in terms of both knowledge base on NOACs and communication skills and style.

The VP application provides personalised feedback at the end of the interaction to help improve the user’s performance and promote reflection. This feedback is colour coded in to ‘red’ and ‘green’ to indicate areas for improvement and good features respectively. The feedback is available for download and printing as a record of performance, but the user is not graded as part of use of the VP.

**The Study Design**

The evaluation of the VP used semi-structured interviews with UK registered pharmacists and pre-registration trainee pharmacists working in UK hospital and/or community sectors. Pre-registration trainee pharmacists are in the interim training year between graduating from university and joining the pharmacist register in the UK. As such, trainees are not yet fully qualified but are in a workplace-based training year. The sample of participants was recruited from an earlier quantitative study evaluating the technical design, accessibility and usability of the VP using a satisfaction survey. A convenience sample of questionnaire respondents who also agreed to be interviewed was selected to undergo an interview to explore user perspectives and experiences on their learning and the use of the VP in practice. This qualitative study does not consider the usability or technical design of the VP nor does it consider change in knowledge as an outcome, based on the focus of the VP on NOAC education being to develop a skill, which involves applying knowledge rather than simply recalling information.

**Sampling and recruitment**

Based on the finite number of questionnaire respondents (n=94) in the previous study, the homogeneity of the sample and the highly specific research question, the estimated sample size to achieve data saturation was between 15-25 interviews.29 Ethical approval from Keele University and UK Health Research Authority approval were granted prior to data collection.

Interviews were conducted using several media (face to face, telephone and video) depending on participant choice. Participants provided written consent prior to the interview and were then sent access to the VP around one week before the interview with instructions for use. Verbal confirmation of consent was taken at the start of interviews. The interviews used an iterative interview guide that developed as the interviews progressed. This was based on five key topics concerning VP use from relevant literature and gradually changed to incorporate or develop new and emerging topics.

**Interview process and analysis**

Interviews were audio-recorded and transcribed verbatim before being analysed using the Framework Approach to thematic analysis.30 This used a mixed inductive and deductive approach based on preliminary themes from the literature31,32 and a small pilot study. A pragmatic approach to data saturation was adopted whereby key themes relating to the broad topics of interest in the interview guide were saturated.33,34

All interviews were conducted by a single researcher (CR) who had undergone training in qualitative interview methods. A reflexive diary was kept to note observations and reflections concerning the interview process as part of a continuous process of reflexivity throughout the research. The reflexive diary was not part of the data collection but allowed the interviewer to reflect on meanings in the data and consider the impact of the interviewer on the construction of the data to best present the perspectives of the participants.

The data analysis process followed the stages of the framework approach as proposed by Ritchie *et al.*30 This included familiarisation with the data, coding of the data, development of a framework, and mapping of the code to the framework.31,32 This allowed the data to remain connected to the wider context for which it was presented while also allowing comparisons between interviews and interviewees.

**Results**

Participants were recruited from 14 sites across England, split between the hospital sector (n=17; 77.3%) and the community sector (n=5, 22.7%) (total n=22), and with a range in their demographic characteristics (Table 1. and eTable 1). From an analysis of the interview data using the Framework Approach, three themes relating to the user’s educational experiences of using the VP emerged, which are discussed in turn below (Table 2).

**Facilitating learning**

Considering the ILO for using the VP, the VP appeared to facilitate learning in a number of ways. A significant number of participants reported feeling more prepared to educate patients on NOACs. Feeling more prepared could encompass a number of elements but for participant 30 who was a pre-registration trainee this appeared to include learning more (knowledge) about what to tell the patient. This may reflect that pre-registration trainees have less in practice experience and are still in an educational role.

*‘’Erm, I think so [more prepared] because I feel like, erm, I know more about what information should be included.’’* [P30, hospital pre-reg]

This appeared to be representative of most participants who first picked up on increases in knowledge as one element of learning how to educate patients on NOACs:

*‘‘The main thing it focused on was erm, the, the rivaroxaban; how the counselling for that specific erm, medication is more than just general erm, counselling skills.’’* [P35, hospital pharmacist]

However, one participant added that having a baseline of knowledge on NOACs was needed to get the most out of using the tool. This does represent that those from both sectors did have enough ‘basic knowledge’ to use the tool but that there seemed to be variation in terms of experience in translating this knowledge into patient education between the qualification status of the participants with pharmacists having greater experience in adapting communication to individual patients and pre-registration trainees reporting slightly more initial knowledge and skill development.

*‘’I think it could be quite difficult to go - if you didn't have any basic knowledge to go straight into using the tool... because you do need to know about the side effects erm, like why patients might need to go to like a walk-in centre...’’* [P83, community pharmacist]

In addition, multiple participants (n=5), summarised their learning as ‘refreshment’ or reinforcement of previous learning and experiences:

*‘’Erm, I wouldn’t necessarily say that I learned it. I think it was more a refreshment…’’* [P57, hospital pharmacist]

Participants who expressed this view tended to be those who had considerable experience in practice (largely older) whereas those newer to NOAC education, such as pre-registration trainees, tended not to talk in such terms. This seemed to be due to the basic knowledge being newer to them, so there was less refreshment.

The refreshment or reinforcement included contextualising previous learning to a patient-facing interaction via the translation of previous knowledge into a suitable message to provide and deliver to a patient. This is illustrated by the following quote, in which the participant suggests that the VP offers a beneficial opportunity to practice the skill prior to speaking to a patient:

*‘’You can sit and just learn facts from a book, but you never in your head actually think about how you’re gonna get that information across to the patient. Whereas with this you’re forced to do that. So, when you do it for the first time it won’t feel like you’re actually doing it for the first-time cos you’ve already had a practice.’’* [P73, hospital pre-reg]

Despite this, most participants acknowledged that the VP was not only useful for one type of learning but that it contributed to different elements of the skill of patient education:

*‘’I think it’s hard to narrow it down to one area. I think it’s probably a good combination of consultation and, and knowledge-based skills.’’* [P75, hospital pharmacist]

Notions of confidence were also mentioned throughout, which appeared to be intertwined with the other types of learning such as reinforcement of previous learning in such a way that confidence for practice was boosted. This participant highlights that all pharmacists (and pre-registration trainees to a lesser degree) should have the necessary knowledge to use the VP but that even for qualified pharmacists a ‘confidence boost’ can be useful prior to speaking to a patient.

*‘’I think it's more of a confidence thing because they should have the knowledge to get to this stage in their career.’’*[P35, hospital pharmacist]

A frequently raised point by participants was the use of red and green colour coding to deliver ‘good’ and ‘bad’ feedback and this appeared to influence the perception of what the VP was trying to achieve. A substantial proportion of users appeared to not like this method of feedback as they perceived the colour coding to categorise the perceived severity of errors within answers unduly, whereby patient safety issues were grouped the same as improvements to general patient education skills:

*‘’Like I just feel like the red shouldn't really be red. I think they should have killer points where, you know, 'Okay, you didn't - you forgot to say to have it with, with food.’ Okay, yeah, that, that is a point. You know, that should be highlighted in red, if you've missed that… .like, 'You didn't offer me a seat' you know, and that would be red…Well, actually, you know, you gauge…they're not important points to put, to put a red, a red mark against.’’* [P35, hospital pharmacist]

Despite this, a number of participants discussed that the feedback had been useful to directly improve their practice.

*‘’I have already had a couple of consultations with patients since the first time, and I felt, you know, that it’s, I’ve kind of built in some of the um, some of the advice and some of the feedback already.’’*[P83, community pharmacist]

**The VP as an adjunctive educational resource**

The VP was largely seen as an adjunct to other education and training resources. For example, one participant discussed that the VP should be used alongside real-life experiences and not in isolation. Encouragingly this participant, despite only being a pre-registration trainee, appeared to perceive clinical practice as a learning environment in itself with the VP having a supplementary role.

*‘’You need to continue like the real-life thing, so actually having experience talking to patients in person. Erm, I feel like if you don’t really get a chance to do that then, then there is an education tool but, erm, I don’t think it should be solely relied on.’’* [P5, hospital pre-reg]

One participant noted elements of the VP that made it a more ‘useful alternative’ to roleplay for developing practical skills. The participant appeared to favour a blend of different approaches and said of the VP that:

*‘’…it probably brings an extra dimension to um, learning...it follows on from watching others, you know, and it definitely fits into, it’s showing, I mean apart from actual real life scenarios or real life… it’s a useful alternative cause I know obviously you do role play. This is again, probably allows people a bit more comfort than even a role play type scenario, because role play is sometimes a little bit inhibited in some people because they’re being observed’’* [P83, community pharmacist]

The VP was also cited to have distinct advantages over inhouse local training as it allows trainees to make mistakes in a safe environment, without causing harm to patients. Typically, inhouse training, particularly in hospital pharmacy, involves some element of observed practice conducting patient education. Participant 58 suggested that the VP has advantages as mistakes can be better identified and used for improvement in a way that there are minimal negative consequences. There are also advantages for those working in smaller teams in the community sector where inhouse training may not be possible.

*‘’we’ve got an in-house thing where they sort of talk to a colleague about [NOACs] before we let them talk to the patients but, you already know the information… it [mistakes] won’t always be picked up on. I think that virtual patient allows them [the user] to make some mistakes and, and realise a better way of saying things’’*[P58, hospital pharmacist]

**Ways of using the VP**

There appeared to be a range of ways that participants used the application, including a range in the frequency of use. The majority of participants stated that they had or would use the VP more than once, although in various ways. For some users, repeated use started with an initial in-depth use followed by a repeated use in response to an interaction in practice, possibly to self-evaluate their performance with patients. One pre-registration trainee who used the VP in this way demonstrated a level of insight into the role of practice and reflection alongside the VP, rather than simple knowledge recall or application.

*‘’Yeah, I would definitely use it repeatedly…I always learn better when I’ve had an incident with a patient… and it almost like it gives you that.’’* [P54, community pre-reg]

A minority of participants discussed that they used the VP more than once to achieve a ‘perfect consultation’ or ‘all green’ feedback. Participant 7 discussed that despite an attempt to get ‘perfect’ feedback, the use of the VP had still stimulated reflection.

*‘’I did my second attempt also because with the first one, there were still two things which were, had been highlighted in red [negatively coloured feedback] or something like that and that’s why I was thinking okay, why it’s like that…’’* [P7, hospital pre-reg]

In contrast, one participant only visualised VP use as a single interaction, possibly like a self-assessment. This individual appeared to perceive the VP use as being more about knowledge than skill development and application. This may be reflective of their pre-registration status, where they are still developing basic skills and have not yet got to the stage of practice where their skills need to be constantly practiced to be maintained.

*‘’Erm, I think I would use it once just to have where my knowledge, like where, like whether I know all the information.’’* [P30, hospital pre-reg]

**Discussion**

The findings of this study suggest that most participants perceived that they had benefitted from using the VP, but the benefits they reported varied, as did the ways they talked about using the VP. The user’s reported learning was not exclusively about increasing knowledge, as some participants initially expected, but since the ILO concerned application of knowledge into a skill, their learning also included improving their patient education skills and increasing confidence. As such, most participants benefited from using the VP in terms of a mixture of knowledge (both reinforcement and acquisition), confidence improvement and an opportunity to practice (contextualisation to a patient interaction). However, whilst most participants reported that they had or would use the VP more than once, they would do so not in isolation but alongside other forms of education and training. This appears to be an original finding as the majority of studies within the literature on VP use have attempted to identify or measure learning specifically attributable to a particular VP, whereas in reality the VP is likely to be used alongside other forms of learning to develop a knowledge base or skill set. The uses of the VP varied between the different groups of participants and their sector of practice, but significantly all reported some benefit. Pre-registration trainees reported slightly more initial knowledge and skill development compared to pharmacists, who focused more on refreshment and confidence. This appeared to be reflective of their stage of development within the topic covered by the VP. There were no significant observed differences between sector of practice.

In this study, participants specifically talked about using the VP application to reinforce or develop their learning from practice. This lack of consideration for adjunctive use was evident in the VP concept map by Hege *et al.*35 where there is no mention of a relationship between VP use and practice or other educational resources; this is one area which requires further consideration. Similarly, the findings relating to the frequency of use of the VP appear to be novel, in part, due to the methods of the previous studies that have not considered the use of VPs outside of formal educational settings or relative to practice.14

The majority of participants appeared to see value in repeated VP use and this links to the theory of experiential learning as part of a continuous cycle whereby users amend and test mental models of tasks using learning they have undertaken to refine mental models.36,37 This was especially evident when one participant discussed using the VP after an incident with a patient and others discussed positive implications for their practice from the learning.

The majority of users considered the VP as useful to reinforce their ability in practice, although this contrasts with a minority who seemed to focus on getting perfect (all green coded) feedback. This could be evidence of gamification of the learning, where the learning becomes suboptimal as there is too great a focus on game principles. This is because it restricts or removes the opportunity and time to reflect and consider the learning in a deep way as the user is pushed to the next task or level, or in the case of this minority user group, where they were pushed towards getting better feedback without the desired level of reflection and engagement with the learning.38 However, this appeared to be the case only for a small number of participants and so suggests that for most users the balance of gamification was appropriate, especially as some directly reported reflection and commented on learning relevant for practice.

The participants appeared to value getting feedback on their performance, but the ‘red’ or ‘green’ colour coded feedback seemed to have been too reductionist and misaligned with the purpose of the questions that required application of knowledge. This was because these questions were of the SBA type and so were designed to have ‘preferred’ answers but coding these as ‘green’ and others as ‘red’ seemed to have been interpreted as right versus wrong answers instead by participants.39,40 In these questions, other answers were not incorrect but were perhaps not the ideal way to deliver information to a patient. These examples of SBAs need a more constructive method of feedback that is clear to the user. This is significant as feedback is recognised to be important in that it should be developed in as much detail as the remainder of the VP.9,35,41 From an educational perspective, feedback should be delivered in the best way possible as it is during the feedback stage of experiential learning where mental models of tasks are amended and learning occurs.36 If feedback is unclear or conflicting then this may make learning difficult for the user as they cannot constructively amend their mental model of the task.

This study has a greater proportion of participants who worked in hospital compared to those who worked in the community sector. This may appear to be an unequal distribution, however this reflects that the majority of NOAC medicines are started in secondary care rather than primary care so the sample of participants represents the balance of exposure to commencement of these medicines in practice.42 Furthermore the results demonstrated little difference in terms of use of the VP between those from different sectors of practice.

This study represents a single VP application and its resulting evaluation, VPs continue to be individual applications that each require their own evaluation reflective of their design, purpose and audience. It is anticipated that there is transferable learning from this study to others designing, evaluating and using other VP applications to better inform their use. Likewise, this study discusses the educational merit of the single VP application, it was not a purpose of the study to directly compare the VP with other resources as this is already has a significant literature base.1,9,11,12,18 Rather the premise was to explore why VPs should be considered as a resource that can be used to help teach and develop patient education skills outside of formal education and training. In a similar way it was also not the role of this study to consider how the VP may be implemented to achieve the educational uses that have been described.

The findings of this study do however show that all of the users reported finding some benefit in using the VP, but there was variation in the reported experiences of using the tool and how it related to other educational resources and clinical practice. On this basis, those looking to use VPs as an educational resource should consider flexibility in their use to allow all users to use and learn from the tool in a way beneficial to them. This also covers longitudinal use of the tool over time within practice rather than a single snapshot use, and use of a VP to apply and contextualise fact-based knowledge to a patient-facing interaction.

**Conclusions**

As perceived by the users, the VP offered educational benefits as a novel form of experiential learning in pharmacy education. The most common method of how the VP facilitated learning appear to be via reinforcement of pre-existing knowledge and skills but also contextualisation of information to a patient interaction. Some users showed learning with a reflective focus, but for a minority there were signs of gamification of the learning with a drive to achieve perfect feedback rather than truly engaging with skill development. The VP was an adjunct to, and was reportedly seen as complimentary to, other learning and experiences, including those gained from practice; most users would use the resource multiple times to help sustain and reflect on patient education skills.

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**Figure legends**

Figure 1. the virtual patient interface showing the patient character and a number of multiple choice question options.

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