Virtual patient consultations and the use of an ePortfolio assessment to support student learning of integrated professional skills

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Abstract

Introduction: Exercise physiology is a relatively new allied health profession and requires extensive knowledge and competency to assist patients with the management of chronic disease. Providing large numbers of students with meaningful training in competency development is important but challenging. The use of filmed or virtual patient consultations (vConsults) may support the student learning process and could be a valuable method of teaching effective teamwork skills, clinical reasoning and reflective thinking.

Methods: Patient consultations were created using a virtual case study platform. The aims of the study were to determine whether virtual consultations (vConsults) can enhance the learning of professional skills and to assess their impact on student learning. Data were collected using a questionnaire and by qualitatively analysing student reflections within ePortfolios.

Results: The vConsults significantly improved student confidence ($p < 0.001$) in conducting a cancer patient consultation, developing an exercise program to service the needs of a patient and talking with medical specialists about cancer diagnosis and treatment. All students agreed or strongly agreed that vConsults were interesting and engaging. They concurred that vConsults enabled self-paced learning, provided immediate feedback, supported their ability to work in groups and clarified and justified their thoughts with respect to patient management. Student also liked vConsults potential for future use in their practice. Most students (98%) found the structure of the model interactive and easy to follow, and all stated that the content helped them to understand clinically relevant concepts and that they would like to use more virtual consultations in their future learning.

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Conclusions: Pilot testing and ePortfolio assessment showed good acceptance by students, supporting their self-directed learning, reflective thinking, teamwork skills and clinical confidence.

Keywords: clinical competency; virtual patient consultation; exercise physiology; ePortfolio; eLearning; clinical reasoning; reflection; clinical education.

Introduction

Exercise physiology is a relatively new allied health profession and requires extensive knowledge across a broad range of chronic diseases as well as extensive competencies to enable the management of patients with chronic disease (ESSA, 2012). Supporting large numbers of students to develop the competencies required to conduct and process a patient consultation is difficult. Constraints to students engaging in patient consultations include: limited staff time to supervise one-on-one patient consultations, limited access to real patients and busy clinical supervisors often conducting the consultations themselves to meet Australian healthcare (Medicare) service requirements. Often students are limited to observing a patient consultation and are unlikely to be involved in processing the information provided or making clinical decisions about patient management. Encouraging reflective practice around clinical decision-making, linked with ePortfolio pedagogy, may support student learning about gathering and evaluating information to make decisions regarding the consultation.

Virtual patients

Virtual laboratories (vLabs) have already been trialled successfully. They have shown that virtual lessons have the potential to reduce complexity by providing increased opportunities for remediation and practice, as well as guided feedback throughout the learning process (Marcus, Ben-Naim, & Bain, 2011; Polly, Marcus, Cheng, Belinson, & Velan, 2014). Virtual patient consultations (vConsults) have also been shown to support the learning process and be valuable in complementing integrative professional learning in medicine (Cook & Triola, 2009). However, it has not yet been determined if virtual patient consultations can support the learning of effective teamwork skills, clinical reasoning and reflective thinking in the field of exercise physiology. The vConsults are an application of social facilitation theory in the field of exercise physiology learning, which is described as the tendency for people to do better on tasks when in the real, imagined or implied presence of others (Forsyth, 2009). The filmed vConsults enable students to engage in meaningful learning experiences through observing an authentic patient consultation and being able to process the information provided by the patient in their own time. Clinical decisions regarding the development of a suitable exercise program to assist the patient to better manage his or her disease, given the implications of the patients' treatment and medical history, can then be made. Any information that may have been missed can be easily reviewed prior to making management decisions. Another advantage of filmed vConsults is the potential cost savings in terms of supervisor time, thus providing an efficient means for interactive learning that is flexible and cost effective. The cloud-based software Adaptive eLearning Platform (smartsparrow.com)

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was used to develop our vConsults, which were sequenced to meet students' individual learning needs. The key feature of this mode of learning is that immediate and adaptive feedback is provided to students as they progress through the lesson, processing the information provided by the patient.

The use of virtual patients in promoting student learning is evident in the field of medicine (Cook & Triola, 2009). However, whether its use can enhance student learning in the allied health domains is unknown. To address this, in our exercise physiology program, a survey questionnaire focusing on student confidence and perception in clinical decision making was developed and implemented at baseline and post vConsult use. In addition, ePortfolios were made available to allow students to monitor their learning experiences.

ePortfolios to support and enhance student learning

ePortfolios are found in many areas of higher education assessment. They can transform and enhance the curriculum and demonstrate to students and educators the connections between their learning, assessment criteria, program outcomes and graduate capabilities (Barrett, 2005). Providing students with a personal digital space enables them to document and take charge of their own learning. As ePortfolios are planned and managed by students rather than the educator, students play an active role in developing life-long skills, such as reflection, that are critical in developing competencies in exercise physiology (Butler, 2006; Cambridge, 2008).

There were several objectives for this study: (1) to develop a model for virtual patient consultation (vConsults) use in exercise physiology, specifically around the rehabilitation of patients with cancer; (2) to assess the development of higher order thinking and habit of mind using an ePortfolio pedagogy; (3) to explore student understanding of the process of conducting a patient consultation and designing a tailored exercise program that meets the needs of the patient using vConsults; and (4) whether the use of vConsults and ePortfolios facilitated the development of professional skills, including effective reflective practice and clinical reasoning skills.

Methods

Establishment and application of a vConsult model

The vConsult model was developed by filming actual patient consultations initially, then uploading them to the AeLP platform developed by Smart Sparrow (www.smartsparrow.com). The videos were then edited, and online learning materials were provided as support. vConsults were designed to provide feedback, that is, the feedback is tailored to the specific decisions/responses made by students. This is achieved by analysing keywords used by students and considering the number of attempts a student made to answer a question. Immediate constructive feedback is recognised as vital to the process of learning technical and diagnostic skills and beneficial for correcting mistakes and misconceptions (Clarke & Mayer, 2011; Dantas & Kemm, 2008; Marcus et al., 2011). The vConsult had two key development considerations: 1) the patient consultations featured patients with cancer and 2) the patient consultations were

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designed using a generic patient consultation framework, enabling students to explore various cancer case scenarios within a common framework. This framework enabled students to collectively make informed decisions for exercise prescription for patient management and rehabilitation.

The patient consultation was delivered in a consistent and integrated way and included five elements: 1) an introduction to the patient and their cancer diagnosis, 2) the cancer treatment received, 3) treatment-related side effects, 4) other existing co-morbidities and 5) physical activity history and goals for exercise. This five-part structure was developed to divide the learning process into manageable components. Students, in groups of three or four, were required to view the five aspects of the patient consultation and complete tasks and associated activities. Model answers were provided to ensure that students received feedback and to prompt students to consider aspects they had overlooked. Feedback was provided by utilising a variety of question formats (check box, multiple choice, drop-down lists), with some screens not permitting progress unless the consultation-processing task was attempted and feedback received (Figure 1). Students could review aspects of the consultation if they had missed information when they viewed it the first time. They could also visit a linked website that provided more in-depth information on any particular aspect of the consultation.

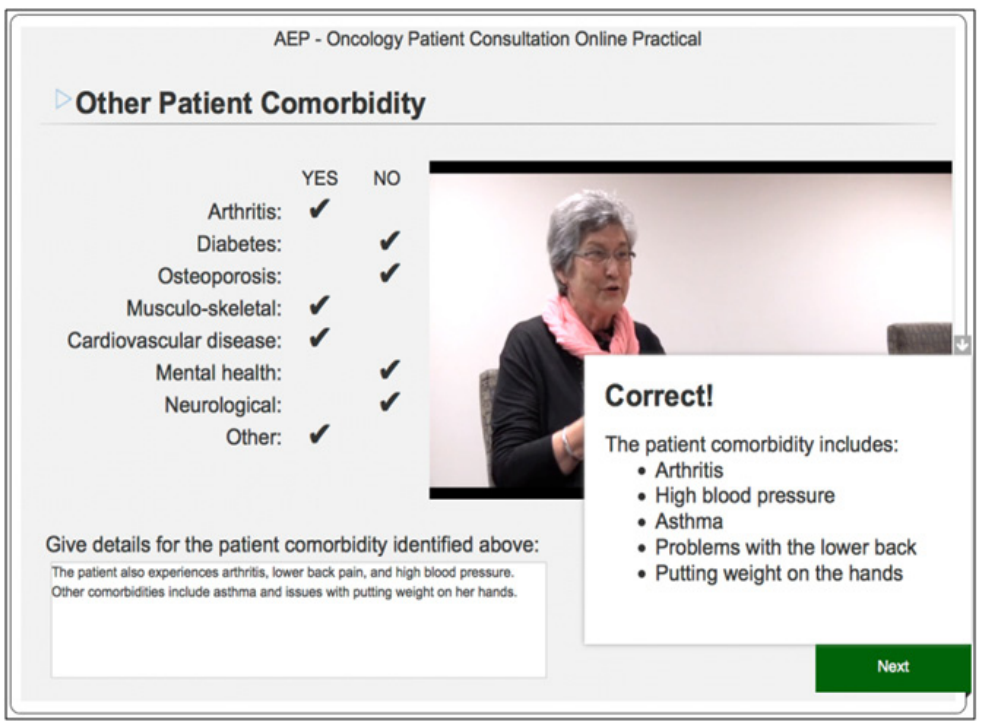

Figure 1. Patient comorbidities to consider and assess whilst watching the consultation, and feedback provided to the student.

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At the completion of the vConsults, students were provided with a summary sheet that captured the information they had gathered throughout the process. Students utilised this summary to devise a suitable management plan to assist the patient to either manage their ongoing cancer treatment or recover from treatment. Subsequently, students designed an appropriate health and fitness assessment for the virtual patient and developed an exercise program to meet the patient's needs. All assessment protocols and exercise programming required team members to justify the reasoning behind their choices. Exercise programs were created online using Pro Conditioning Professional Rehabilitation Package v2.1, developed by Exercise Software (www.exercisesoftware.com), which provided an extensive exercise bank and delivery platform to generate exercise programs.

Assessment of the virtual patient consultation model

Two student cohorts were selected for this study—an undergraduate cohort from the University of New South Wales (UNSW), Australia (UG, n = 29), and a graduate accredited exercise physiologist cohort (PG, n = 48) who were enrolled in a professional development course.

The impact of the vConsults on student learning and engagement was assessed using student rating questionnaires. The questionnaires were given pre (at entry) and post course to assess perceived student confidence in conducting a consultation with a patient who had cancer. For Questionnaire 1, students rated their perceived effectiveness on a 5-point Likert scale, 5 indicating full confidence and 1 indicating minimal confidence (Likert, 1932). Additionally, in Questionnaire 2, students provided feedback on their experience of using the vConsults (on a 4-point Likert scale), rating it for ease of use and whether it was interesting and engaging, assisted understanding of clinically relevant concepts and would be useful for future learning. The strengths of the vConsults and suggestions for improvements were requested as free text comments (Questionaire 2).

Students used the "Mahara" ePortfolio (mahara.org) to:

- document a narrative around their personal learning experience
- demonstrate reflective engagement
- reflect on their skill competency development in the areas of communication, assessment, exercise programming and teamwork
- document the clinical reasoning to justify the reasons behind their plans
- reflect on their strengths, weaknesses and readiness to practice in the profession.

These reflections on learning were collected throughout the course using ePortfolios, and the results were analysed using a content analysis methodology. The reflections in the ePortfolios were analysed by the research team using the general inductive approach, as previously described by Thomas (2006). This analysis involved multiple readings and interpretation of the reflections. The coded data was used to develop themes and a framework that captured the key aspects of the student's thoughts and experience. Each time a new code or theme emerged, the transcripts were reread and refined. The process continued until no new themes were identified.

This study was approved by the UNSW Human Research Ethics Committee (UNSW Ethics # HC13292).

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Quantitative analysis

The null hypothesis was that there would be no improvement in student confidence in the cohort before and after vConsults. Since the baseline level of confidence between postgraduate and undergraduate cohorts was not statistically different, the combined data was used for final analysis. The Wilcoxon matched pairs test was used for evaluating paired ordinal data from both pre- and post-interventions from the combined cohort. A p value (2-tail) < 0.05 was considered significant. The statistical analysis was performed using IBM SPSS Statistics v22 (IBM SPSS, Inc, Chicago, IL).

Results

Questionnaire data

Eighty percent of the participants returned completed forms (43/54).

Effect of vConsults on students' confidence to conduct a consultation with a cancer patient

The baseline results indicated, at entry level, students' confidence to conduct the various aspects of an exercise physiology-led patient consultation ranged from 2.20 to 2.65 (Table 1). The follow-up assessment demonstrated a significant increase in student confidence across all areas of the consultation with the post scores ranging from 3.45 to 4.25 (all p < 0.001).

Table 1
Students Self-Confidence (Mean Score out of 5) Before and After Using vConsults*

	All Participants (n = 43)		Undergraduates (n = 25)		Postgraduates (n = 18)	
	Before	After	Before	After	Before	After
1. Conduct a thorough cancer patient consultation	2.55	4.15	2.3	4.0	2.9	4.1
2. Develop an exercise program that would service the ongoing needs of a patient during treatment	2.60	3.95	2.0	3.9	3.0	3.9
3. Develop an exercise program that would service the ongoing needs of a patient post-treatment	2.65	4.20	2.4	4.1	3.3	4.3
4. Develop an exercise program that would service the ongoing needs of a variety of cancer population	2.45	3.95	2.0	3.7	2.9	3.9
5. Talk with oncology medical specialists about cancer diagnosis and treatment	2.20	3.45	1.9	3.5	2.5	3.3

*1 = not at all confident, 2 = not confident, 3 = neutral confidence, 4 = confident, 5 = very confident

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Students' perception of vConsults

Questionnaire data regarding the useability of vConsults by students indicated that 96% of participants either strongly agreed or agreed that vConsults were easy to interact with. In addition, when asked whether vConsults were interesting and engaging, all participants strongly agreed or agreed. All participants also strongly agreed or agreed that the vConsults helped their understanding of clinically relevant concepts and that they would like to use more vConsults in their future learning. Student feedback indicated three key points. First, they enjoyed the insight into a real-life client and were able to experience real emotions associated with the condition. Second, they enjoyed the interactive nature of the task and the discussion it created amongst peers and fellow practitioners. Third, they mentioned they liked the authentic nature of the task and how it prepared them for real practice. Improvements suggested by the participants included shortening the duration of the consultations, broadening the correct answer terminology, improving the sound quality and ensuring the answers from the patient are linked directly to the section of the video being viewed (Survey 2).

Student reflections from ePortfolios

Four broad categories emerged from the student reflections within their ePortfolios: 1) vConsults provided valuable real-life experience that reflected the complexities of patient management, 2) the use of vConsults developed exercise physiology skill competency, 3) vConsults provided learning opportunities that could be processed in manageable parts and effectively engaged the student in the learning process and 4) vConsults enabled students to link learning activities to career aspirations.

Real-life experience

Student feedback suggested that vConsults provided them with real-life experience, commenting on the richness of the experience and that the virtual patient consultation highlighted the complexities associated with patient management. In some instances, students commented on the fact that the vConsults were their first opportunity to work through the cancer consultation process.

> *Working through our virtual patient consultation, I gained extensive knowledge in regards to the cancer, not just the side effects but getting to know how people cope with a life-threatening condition and getting to know the client more than what you would on paper.* (UG participant 1)

> *What I found eye-opening was the types of information that this patient was sharing—certain struggles and insight into their life experience. It really hits home that we are helping real people. Despite the fact that it was a video, by the end, I really felt like I had actually met the patient in person.* (UG participant 6)

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Table 2
Questionnaire 2—Student Perceptions of vConsult (n = 56)

Question	Strongly agree (4)	Agree (3)	Disagree (2)	Strongly disagree (1)	% Agree/ strongly agree
1. The vConsults were easy to use	24	30	2	0	96%
2. The vConsults were interesting and engaging	34	22	0	0	100%
3. The vConsults helped me to understand clinically relevant concepts	31	25	0	0	100%
4. I would like to use more vConsults in my learning	33	23	0	0	100%

Development of exercise physiology competency

The vConsult also provided valuable insight into the interviewing skills required of an exercise physiologist. It was also valuable for students to see how an accredited exercise physiologist would process an initial consultation. In addition, it provided an opportunity for students to reflect on their own professional competency development.

> *I really enjoyed the filmed patient consult. It gave me insight into what a real consult is like, the type of questions that get asked and the different flow that interviews can take. We were able to critically analyse what was good about the consultation and, in particular, we discussed how we could deal with clients who may have difficult personalities to deal with.* (UG participant 6)

> *The consultation questions were delivered in such a way that the client wasn't overwhelmed. The client was given time and opportunity to expand on her comments, providing the exercise physiologists with a lot of additional information to assist in designing an exercise program. I found this very useful and have some good points to work on to improve my consultation skills.* (UG participant 21)

> *One thing I learnt was a great opening question, "So what brings you here today." This gives you a good indication of whether they are there because they want to be or because someone has pushed them to come.* (UG participant 19)

> *I found there were things that I wanted to know about the patient that weren't covered in the initial interview. But it got me thinking about what I would ask.* (PG participant 24)

Students were also able to link their real-life practicum experience with the vConsults process and, ultimately, reflect on how the learning opportunities enhanced each other.

> *I have been undertaking a practicum placement at a cancer clinic and found that the learning activities have complemented the placement training. I have been able to put my knowledge into practice and gained a greater understanding of who I am as an EP.* (UG participant 11)

> *Just as I have found on clinical placements, the patient in the virtual consultation sometimes went off on different tangents. Rather than following a script, this process emphasised the importance of focusing on the client, show them I am taking in what they were saying and asking follow up questions.* (UG participant 18)

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Another important skill of any allied health professional is being able to work as an effective member of a group. Reflections were provided on the students' experiences as a group member. The process enhanced critical reasoning skills when students were required to justify decisions and discuss alternative approaches.

> *Between the three of us, it was great to be able to bounce ideas off each other and explain the reasoning behind our specific assessment tool or exercise selections. There were some differing opinions and insights into what exercises should be included, which allowed us to cement a stronger stand, as you had to justify your own thoughts to other people.* (PG participant 28)

> *It was really beneficial to throw ideas around between us because you can get caught following routines just because that's what you know. My group members had different takes on the exercise programming structure, which I found very useful. This type of learning is invaluable as a practitioner-to-be.* (UG participant 13)

Student engagement

Overall, the students described their experience positively. In addition, since the consultation was divided into smaller components, students were able to process their learning more easily and prepare more effectively for a real patient consultation. vConsults also allowed the students to review the case several times, with some students accessing the consultation up to six times throughout the semester. Students appreciated the fact that they could work at their own pace, gaining additional information upon each viewing.

> *I found the virtual patient consultation fantastic. It was great to be able to listen in small sections and take notes. It enabled us to replay sections, ensuring that we had all the relevant information. In doing this, our group developed a better understanding of the needs of the client and started brainstorming ideas for exercise prescription.* (PG participant 26)

> *We watched the entire consultation more than once, which was really effective. During the first watch, we gathered the majority of the information that she was providing when answering the consultation questions. In the second round, we shifted our focus to the patient as a person, the aspects of her personality, her gestures and tone of voice when addressing the different aspects of her experience.* (UG participant 18)

> *The more I watched the interviews, the more information and cues I pick up on. This is really starting to emphasise just how much you miss during these types of situations, and as novice exercise physiologist how much practice it will take to become efficient at these interviews.* (UG participant 12)

Link to professional career aspirations

Working with vConsults exposed students to possible career areas they could specialise in within the exercise physiology profession.

> *Having had our first experience working with a cancer patient, I can honestly say with some conviction that this is the field I want to take a career in.* (UG participant 9)

> *Overall, this experience of working with the virtual patient has made me see that cancer therapy with exercise is a rewarding and challenge-filled path to undertake, and I am excited for what the future holds in this particular career field.* (PG participant 33)

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Discussion

A major challenge in exercise physiology and many other allied health disciplines is securing quality opportunities for student learning. Even within work-integrated learning, students don't always have opportunities to conduct patient consultations and determine the implications of the consultation for exercise participation. This study developed a virtual patient consultation model, using video from a real interaction with a patient with cancer, for teaching and learning in exercise physiology. The virtual consultation overcame a key obstacle for learning—the limited opportunities to conduct and process face-to-face patient consultations. Additionally, the vConsults had the benefit of cases being able to be used by multiple students from different cohorts, that is, undergraduate students and graduate accredited exercise physiologists already practicing in the field.

In our virtual consultations, students viewed consultations between an accredited exercise physiologist and real patients. In addition, the resource required students to make clinical decisions (evaluation) and appeared to have actively engaged our students. The flexibility of viewing time and location also made it convenient for students to use. Although a vConsult would never replace a real patient consultation, it provides an ideal basis for scaffolding student learning. vConsults enable students to learn about the important steps of conducting a patient consultation and processing the patient information in preparation for entering a practicum or real-world environment.

This model enabled students to work through a patient scenario at their own pace and review information. It also directed students to links for additional information. The quantitative data indicated that a majority of participants agreed that the vConsults were interesting and engaging, assisted them in understanding clinically relevant concepts and assisted their learning by breaking the consultations into manageable sections. The responsive online learning also fostered active engagement with the scenario, as all decisions and plans needed to be justified within the group. Importantly, research shows that when active learning occurs, the impact on student learning outcomes can be significant (Cherney, 2008). Consistent with our findings, research centred on improving the student experience using online-based adaptive workshops concluded that students improved their understanding in response to the personalised feedback received and that individual learning needs were catered for (Vassar, Prusty, Marcus, & Ford, 2014). Vassar et al.'s research also concluded that through the use of adaptive tutorials, the students had a more enjoyable learning experience.

Another educational benefit of the virtual patient consultation was that it enabled students to receive immediate feedback as they progressed through the consultation. In a busy work-integrated learning environment, students don't often get an opportunity to conduct and process consultations, and more importantly, supervisors don't have time to provide feedback on each aspect of the consultation. Providing meaningful feedback to students has been described as one of the most important characteristics of clinical teaching, but it is sometimes challenging to find adequate time to deliver it within busy work-integrated learning environments (Curtis, Helion, & Domsohn, 1998; Lauber, Toth, Leary, Martin, & Killian, 2003).

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Students also commented on the effectiveness of the group learning environment in developing teamwork and clinical reasoning skills. When working through the case management, students were required to clarify and justify their thoughts to others and described learning from the approaches of other students. In support of our findings, Edelbring, Dastmalchi, Hult, Lundberg and Dahlgren (2011) reported a perceived benefit to clinical reasoning skills from working on virtual patient cases with a partner and discussing patient management approaches in medicine. Research also supports the notion that communities of learning provide the condition for free and open dialogue, critical debate, negotiation and agreement, which are the hallmark of higher education (Garrison & Kanuka, 2004). Working in small groups with peers and not facing a real patient enabled open discussion in a more supportive learning environment.

A second outcome from this research was the effective use of ePortfolios to capture student reflections on learning. Reflection and reflective practice are increasingly noted as essential attributes for becoming competent healthcare professionals (Abrami & Barrett, 2005; Barrett, 2005; Epstein & Hundert, 2002; Leece, 2005). In this study, participants were required to reflect upon the relationship between their educational experience and their personal and professional development. The ePortfolio improved student awareness of degree-specific and transferable skills and enabled them to practice and consolidate skills in exercise physiology patient consultation, clinical reasoning, teamwork, exercise programming and patient management. The student reflections acknowledged that the vConsults provided them with a real-life scenario that moved beyond a written medical history. It highlighted to students the unique ways in which patients deal with their cancer diagnosis and treatment, and the complexities associated with the management of serious and potentially chronic disease. Whilst the primary referral may be in response to a cancer diagnosis, there are usually multiple comorbidities that need to be considered in the patient's management strategy. The complex nature of the real scenarios in the vConsult allowed students to be exposed to the complexities of the clinical world, albeit through a filmed scenario, and to be confronted with some of the issues that they will face in professional practice. Such learning is critical for placement and workplace readiness.

Although student feedback and reflections indicated the usefulness of the vConsults, some students struggled with the technology associated with the learning platform. Therefore, it is vital that all students be provided with sufficient guidance to ensure that the technology does not detract from the learning experience. The relatively small sample size (which did not include a control group to compare learning outcomes) was a limitation. Additionally, the self-reported nature of the student responses and the fact that the investigators were evaluators of the data, and therefore not independent observers, were other limitations of the study.

Conclusion

Our development of a virtual consultation resource for exercise physiology with embedded competency training is innovative within this setting. The benefits of our vConsults resource were that it allowed students to engage in a meaningful learning experience by observing an authentic patient consultation, process the information

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provided by the patient, make clinical decisions regarding the implications of the patient's treatment and medical history in order to develop a suitable exercise program, and receive feedback and guidance from expert consensus. Pilot testing and ePortfolio assessment showed good acceptance by students, supporting self-directed learning, reflective thinking and skill competency development. Future work should expand on applying this model for use with other chronic disease conditions, with undergraduate teaching and continuing education programs, and within other allied health professions. It could also focus on the transfer of learning to the clinical setting.

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