ORIGINAL RESEARCH PAPER*

Enhancing Anticoagulation Continuing Professional Development with Experiential Learning

Jeff Nagge, *PharmD*[a], **Sherilyn Houle,** *PhD*[a], **Marie Lippens,** *MEd*[b], **Cynthia Richard,** *PhD*[a], **Rosemary Killeen,** *BScPhm*[a], **Brianna Bennett,** *MEd*[c], **Annik Bilodeau,** *PhD*[c]

[a]University of Waterloo, School of Pharmacy (Kitchener, Ontario, Canada); [b]University of Waterloo, Centre for Extended Learning (Waterloo, Ontario, Canada); [c]University of Waterloo, Centre for Teaching Excellence (Waterloo, Ontario, Canada)

Keywords

Blended learning, clinical training, healthcare education, confidence assessment, survey study, pharmacists

Article History

Received 17 Dec 2024

Received in revised form 5 Feb 2025

Accepted 19 Feb 2025

Available online 01 Apr 2025

*__Original Research Papers__ are papers that report on original empirical research with a focus on teaching and learning. Papers may be qualitative or quantitative and include an Abstract, Introduction, Method, Results, Discussion, and Reference section, as well as any tables and/or figures.

Abstract

Objective: This study aims to determine the value of including practical experiential learning in a continuing professional development (CPD) course primarily for pharmacists. The Management of Oral Anticoagulation Therapy (MOAT) course blends self-paced online learning with experiential training in an anticoagulation clinic under expert supervision.

Methods: An email survey was sent to 186 graduates of MOAT in October 2017. Participants were asked to indicate their confidence in providing anticoagulation services on a seven-point Likert scale prior to taking MOAT, after completing the self-paced online module, and after the experiential component. They were also asked to identify the most important aspect of the course and describe their rationale for this selection.

Results: 125 surveys were completed for a response rate of 71.4%. Most respondents were pharmacists who had not completed advanced clinical training or a prior course in anticoagulation therapy management. Participants reported a progressive increase in their confidence in providing anticoagulation services from baseline (mean score, 2.9), after completing the online component (mean score, 5), and after the experiential training (mean score, 6.2) ($p < 0.001$ for all comparisons). Ninety percent of participants indicated the experiential component was the most important aspect of MOAT, reporting this best prepared them to translate their learning to professional practice in anticoagulation.

Conclusions: The experiential component of a blended-learning CPD course in anticoagulation management was a highly valued complement to online case-based learning.

Introduction

Experiential learning is an integral component of pharmacy education, yet these opportunities can be challenging to develop and maintain from a program perspective due to time, human resources, and budget constraints. Even worse,

after pharmacists graduate and start practicing, meaningful professional development opportunities can be hard to find. And yet, they are the cornerstone of good practice since a high level of confidence correlates to better patient outcomes (Bandura, 1997; Parle et al., 1997). As established by Kolb (1975), the experiential learning cycle encourages the creation of new learning and meaning through active experimentation. More recently, Hope et al. (2021) highlight that this experience is "transformed into knowledge and helps students to develop values, skills, and attitudes that are crucial to the development of pharmacist competence and the specific competencies required of the pharmacy graduate."

The need for training through problem-based learning and guided practice in clinical environments has been recognized since the early 2000s (Hecimovich &Volet, 2011; Frankel & Austin, 2013). This is particularly important since "unlike demographic factors and entry characteristics, these opportunities can be designed, controlled, and continuously enhanced as an integral part of curriculum development" (Hecimovich &Volet, 2011). Rosenthal et al. (2010) identify what they call "pharmacist 'personality traits,' which include a lack of confidence, fear of new responsibilities, paralysis in the face of ambiguity, need for approval and risk aversion" (p. 37). Experiential learning can help mitigate the impact of these traits, which can be exacerbated by the sometimes-strained relationship between pharmacists and physicians and the hierarchy of the medical system (Frankel & Austin, 2013).

Warfarin therapy is one space where pharmacists can not only provide support to patients to improve health outcomes and alleviate pressure on the health system but also provide more efficient care than traditional physician-based care. Indeed, compared to physician-based care, warfarin therapy managed by pharmacists is associated with improved quality of care, improved patient satisfaction, and reduced healthcare utilization (Manzoor et al., 2017; Zhou et al., 2016). However, undergraduate curricula in pharmacy are generally not designed to train students to manage warfarin therapy independently or under a delegated medical directive (Garcia et al., 2013). Continuing professional development (CPD) courses in anticoagulation management, therefore, have an important role in providing practicing pharmacists with the knowledge and skills to provide this level of care.

Prior to developing our course, a 2007 environmental scan of CPD anticoagulation programs in North America identified 10 certificate programs (Nagge et al., 2009). While multiple instructional strategies were used by these programs, none included practical experience with patients as a mandatory component (Nagge et al., 2009). There are strong arguments for including experiential training in an anticoagulation management program and expert panels recommend that clinicians who will be providing anticoagulation services have formal didactic and/or experiential training (Garcia et al., 2013). The management of warfarin therapy requires a systematic approach to dealing with uncertainty. Although learning activities such as case studies can help learners recognize various risk factors and think through decision-making, they do not allow learners to practice working systematically with patients in the clinical setting. Working alongside an expert in a clinical setting allows the learner to experience, reflect, and iterate in the spirit of Dewey's experience-based model of education (1938) and Kolb's (1975) learning cycle to adopt the necessary systematic clinical practice. Finally, an analysis of participant feedback and instructor observations from a pilot study of an earlier version of a CPD anticoagulation course offered by the University of Waterloo indicated that an experiential component was viewed as essential (Nagge et al., 2009).

Experiential training opportunities in CPD can be challenging to develop and maintain. It can be inconvenient for learners who may need to take time off from work and travel to the clinical site. It is expensive for the program, as expert clinicians are required to provide supervision. Finally, it may constrain the number of learners taking the course as clinic days are often limited and large groups of students cannot be accommodated simultaneously. Recognizing these challenges, we sought to determine the value of the experiential training portion of a novel blended learning course, Management of Oral Anticoagulation Therapy (MOAT), from the perspective of individuals who had completed the course.

Method

The MOAT course is a CPD blended-learning course developed for pharmacists, nurses, and nurse practitioners offered by the University of Waterloo in Kitchener, Ontario, Canada. The course was first offered as a pilot in 2006 and has been delivered in its current form since 2007. MOAT combines six weeks of self-paced, online learning consisting

of approximately 30 readings, several case studies, and a comprehensive knowledge assessment exam, followed by three half-days practicing in an anticoagulation clinic under the supervision of an expert educator and clinician (Figure 1).

To determine the importance of the experiential component of MOAT, a questionnaire was developed by the research team and administered by the Survey Research Centre (SRC) at the University of Waterloo. The survey questions can be found in the Appendix. A contact list was provided to the SRC that included email addresses, telephone numbers, and first and last names of 192 past registrants of the MOAT course between 2007 and 2017, who were all invited to complete the survey. Ethics approval for this study was obtained from the Office of Research Ethics at the University of Waterloo (ORE clearance #31406).

Past MOAT course participants were sent a pre-notification email from the course instructor (JN) to inform them of the upcoming online survey invitation and to encourage them to participate. The SRC then sent an initial survey invitation by email with a unique link to the survey. The SRC sent up to two email reminders and provided a telephone reminder for participants who had not completed the online survey and for whom telephone numbers were supplied in the contact list.

Our primary objective was to determine the value of the experiential component of MOAT from the participant's perspective. To accomplish this, we asked two specific questions that served as our co-primary endpoints. First, participants were asked to indicate their level of confidence in providing anticoagulation management services at three different time points: (1) prior to the MOAT course, (2) after completing the self-paced, online learning component and (3) after completing the experiential training in the anticoagulation clinic. A 7-point Likert scale was used, where 1 = not confident at all, 3 = a little confident, 5 = moderately confident, and 7 = completely confident. Differences were tested for statistical significance using the Kruskal-Wallis H-test. Second, participants were asked to select the most important aspect of MOAT among the readings, case studies, exams, and experiential components. The Wilson Score, corrected for population size, was used to determine statistical significance and confidence intervals on the

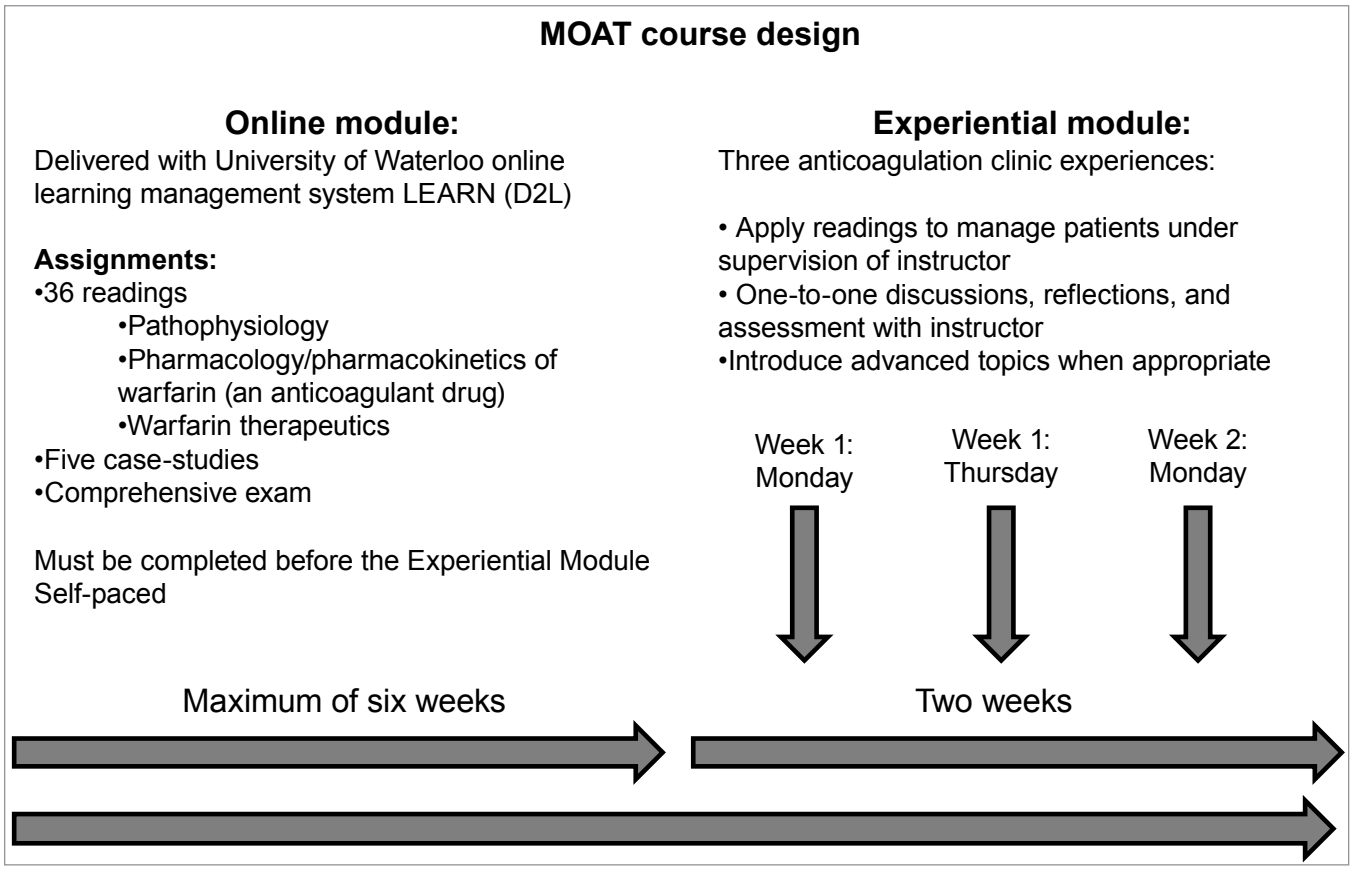

Figure 1. The Management of Oral Anticoagulation Therapy (MOAT) Course Design

Table 1: Characteristics of the Survey Respondents

When did you take MOAT?

Characteristic	Frequency, % (n=125)
In the past 2 years	49 (39%)
3 to 5 years ago	44 (35%)
More than 6 years ago	32 (26%)

How old were you when you took MOAT?

Characteristic	Frequency, % (n=125)
20-29 years	30 (24%)
30-39 years	39 (31%)
40-49 years	32 (26%)
50-59 years	21 (17%)
60 years or older	3 (2%)

What was your profession when you took MOAT?

Characteristic	Frequency, % (n=125)
Pharmacist	112 (90%)
Nurse	10 (8%)
Nurse practitioner	2 (2%)
Registered practical nurse	1 (1%)

Had you completed any advanced clinical training prior to taking the MOAT course?

Characteristic	Frequency, % (n=125)
No	90 (72%)
Yes (residency, fellowship, post-baccalaureate PharmD, or other)	35 (28%)

Had you taken a course in anticoagulation management prior to MOAT?

Characteristic	Frequency, % (n=125)
No	110 (88%)
Yes	15 (12%)

reported proportions. Chi-square tests were performed for comparisons of categorical variables. The Kruskal-Wallis H-test and the Chi-square tests were performed using SOFA Statistics version 1.4.6 (Paton-Simpson & Associates Ltd, n.d.). The Wilson score was determined using an online calculator (Dean et al., n.d.).

Qualitative content analysis was performed by three members of the research team (SH, ML, RK) based on responses to a free-text question asking respondents to provide a rationale for their ranking of the relative importance of each of the aspects of MOAT. Open coding (the reading of responses and the organization of responses into recurring themes) and axial coding (determining the presence of relationships among themes) were performed, with disagreements resolved by discussion and consensus.

Results

Data collection took place between October 12th and November 24th, 2017. A total of 186 past participants of the MOAT course were available for initial email contact. Of these, 11 stated that they did not complete MOAT and were therefore ineligible. A total of 125 surveys were completed from the eligible sample of 175, yielding a survey response rate of 71.4% (Figure 2).

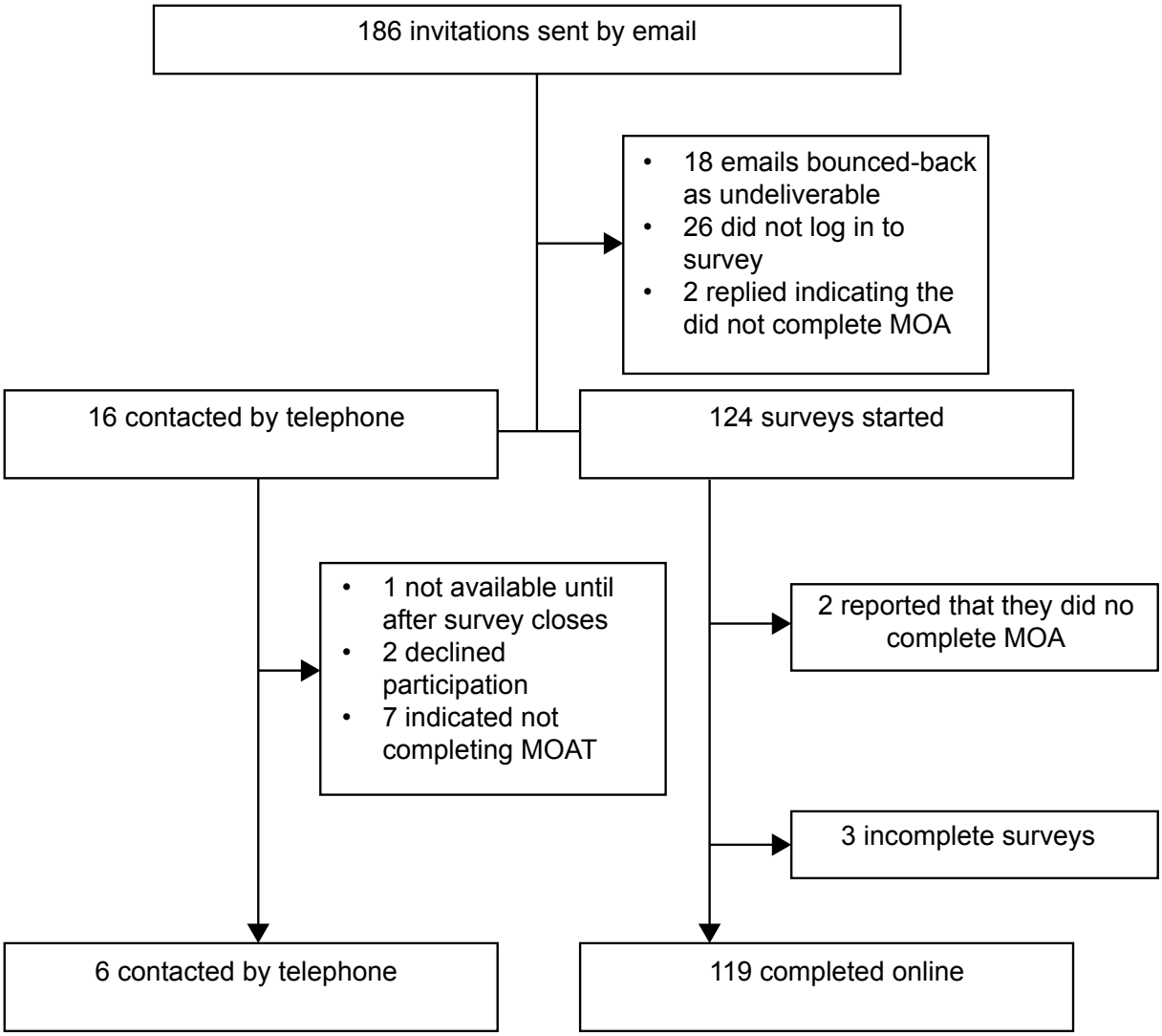

Figure 2. Final Dispositions for the 186 Survey Invitations Emailed

The demographics of survey responders are described in Table 1. Most respondents were pharmacists (90%) and had completed the MOAT course in the previous 3 years (55%). There was a similar proportion of individuals over the age of 40 (45%) and younger than 40 (55%). Most participants had not completed advanced clinical training after completing their undergraduate degrees, nor had they completed anticoagulation training programs prior to MOAT.

Respondents reported a significant progressive increase in their confidence in providing anticoagulation services from baseline (mean score on 7-point Likert of 2.9) after completing the online readings, case studies, and exam (mean score 5.0), and after completing the experiential component (mean score 6.2; $p < 0.001$ for all comparisons) (Figure 3).

There was broad consensus that the most important part of the MOAT course was the experiential component (90%, $p<0.001$). Of the remainder, case studies and readings were identified as the most important components by approximately 6% and 4%, respectively (Table 2). When participants were asked which element they would choose if they could only complete one aspect of the MOAT course, the most common response was that neither the online nor the experiential portion would suffice on their own (56%), followed by the experiential component (43%) (Table 3).

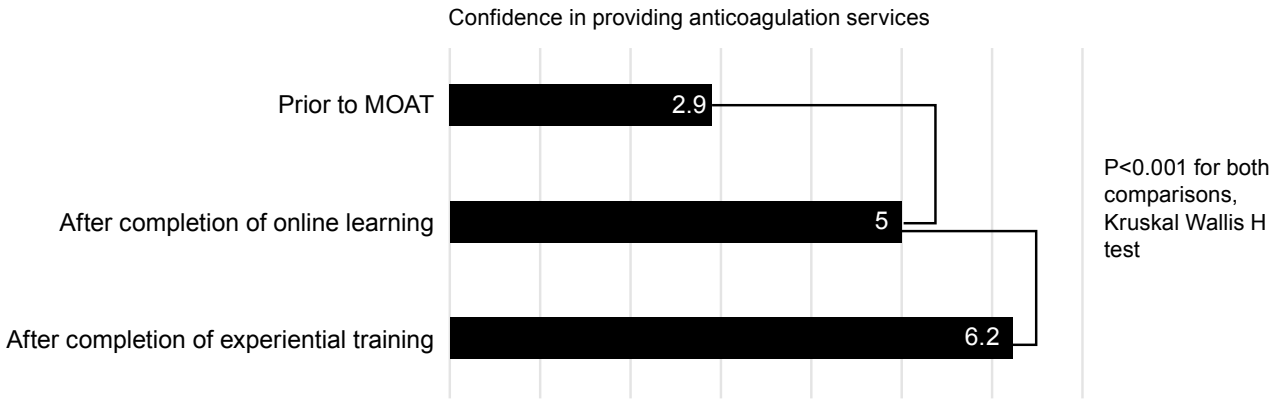

Figure 3. Respondents' self-reported confidence in providing anticoagulation services rated on a seven-point Likert scale at different time points in the MOAT course.

Table 2: Participant Choice of the Most Important Aspect of MOAT

Selection	Number, % (n = 125)
Readings	5 (4%)[a]
Case studies	7 (5.6%)[a]
Exam	0 (0%)[a]
Experiential module	113 (90.4%)[a]

[a]p<0.001, Wilson Score

Table 3:Responses to the Question "If you could only take one portion of the course (MOAT), which would you choose?"

Selection	Number, % (n = 124)
Online module	2 (1.6%)[a]
Experiential	53 (42.7%)[b]
Neither would suffice on its own	69 (55.6%)[a]

[a]p<0.001, Wilson Score
[b]p<0.05, Wilson Score
Note that one survey respondent did not complete this question

Qualitative content analysis of responses eliciting respondents' rationale for their selection of the most valuable course component resulted in 4 themes.

Theme 1: Adding competence and confidence

Respondents found value in the experiential component in terms of developing both competence and confidence to implement an anticoagulation management service in practice. While the online modules were found to offer factual information, respondents found that the development of confidence to apply that information to patient care was solidified through the experiential component.

> "Readings, of course, are a requirement beforehand to gain knowledge, but the actual building of the confidence comes from doing the actual work."

> "There is no greater teacher than experience."

Theme 2: Valuing dialogue with the instructor

Participants appreciated opportunities for dialogue with the expert instructor in real-time during the experiential component, as this allowed them to resolve questions as they arose and receive reassurance about their thought process in making therapeutic decisions.

"[The instructor's] expert advice is critical in tying everything together with the course material. Seeing patient after patient and discussing each with [the instructor] really helped prepare me for starting my own practice."

"It is also helpful to get instant feedback and have questions answered in real-time rather than trying to recall something that was read or on an exam."

Theme 3: Variety/unique cases

Exposure to a variety of scenarios and unique cases during the experiential training was found to offer more opportunities for problem-solving reflective of real-world practice than could be offered from text-based cases alone.

"Hands-on experiences in a live setting include many factors in making decisions that can often be missing in case studies."

"The on-site training reinforced the need to 'know' your patient to understand better how different lifestyle issues will contribute to fluctuations with warfarin therapy. It also allowed me to see some unusual cases."

Theme 4: Experiential training as consolidation of learning

Respondents identified that a complementary role existed for each instructional approach used, with the experiential training at the end offering consolidation of all learning across the program. Online readings offered foundational knowledge of the pathophysiology and pharmacology of anticoagulation, online cases allowed participants to apply the readings to hypothetical patients at their own pace, and the exam ensured their knowledge was solidified and they were confident with their knowledge before proceeding to the experiential component.

"Anyone can pick up a book or research paper and learn new data. The experiential on-site training was absolutely worth every minute … this practical lab pulled everything together."

"The in-person experience is like having a large volume of interactive case studies with a live facilitator to guide you—completely invaluable experience."

Several exploratory univariable analyses were performed to identify associations between baseline characteristics and responses to the survey questions. The only significant association was that those who had planned to start an anticoagulation service as a reason for taking MOAT (n=77) had greater confidence in providing these services at the end of the course compared to those who enrolled in MOAT for a different reason ($p<0.004$). Given the lack of other significant univariable associations, we did not proceed with testing in a multivariable model.

Discussion

In a blended-learning continuing professional development program for health professionals interested in anticoagulation management that includes online readings, cases, an exam, and an experiential opportunity, the experiential portion was reported as most positively influencing participants' confidence to implement the learning into practice and was rated the most valued aspect of the course by 90% of participants surveyed. Because anticoagulation services provided by non-physician providers are not common in most settings, and independent prescribing for this therapeutic area represents an addition to many pharmacists' and nurses' usual practice, participants' confidence was selected as a primary endpoint. Those who choose to complete the MOAT program are, therefore, trailblazers in their profession who need to have a sense of confidence in their abilities to join an anticoagulation practice or start their own clinic and translate the educational opportunity into practice. Participants' confidence was found to consistently improve across all components of the course, with a significant improvement noted following the experiential component. Participants reported that exposure to a variety of cases and the opportunity to have one-on-one dialogue with a clinical expert during the experiential training best prepared them to encounter unique cases in practice. As such, it represented a learning opportunity that is difficult to replicate through traditional written cases. When experiential training is not feasible, learner feedback suggests that opportunities to make cases interactive, accompanied by opportunities for students to reflect upon their decision-making process and access to a clinical expert for support and discussion should be explored.

Our results are consistent with other studies, but they are novel in this field because of the mandatory experiential component for all learners and the relatively large number of

participants included in our study with a high participation rate to capture various perspectives. Diamantouros et al. (2017) evaluated an anticoagulation training program for 37 pharmacists who had an optional shadowing experience as part of a course consisting of a workshop and readings. Only four pharmacists completed the experiential component, and all had existing practices that focused on thrombosis within a hospital setting. The researchers did not measure how important the experiential component was in comparison to the other components, but the four participants indicated that they enjoyed the opportunity to see real patients alongside experts (Diamantouros et al., 2017). Bungard and colleagues evaluated their blended-learning anticoagulation training program, which consisted of a print course, a workshop, an experiential component, and post-training mentorship (Bungard et al., 2012). Only 12 pharmacists of the 71 enrolled in the course could complete the experiential component due to resource constraints. In agreement with our findings, the 12 learners seemed to indicate that the experiential component was the most important aspect of the course.

Our results have implications for CPD planning at the University of Waterloo. The resounding support for the experiential component provides a rationale for continuing to offer MOAT in its existing format on a small scale. To ensure the best allocation of these limited spaces, this course will be primarily offered to clinicians who have definite plans to start an anticoagulation clinic or plan to begin working in one imminently. More significantly, we have developed a fully online version of the MOAT course (MOAT Online) with the use of simulated patients (SIMs) powered by generative artificial intelligence (Gen-AI) to create a virtual clinic. This virtual experiential training is designed to replicate many of the aspects valued by participants in the original MOAT course, including guidance and feedback from an expert supervisor. The primary audience for this course will be individuals who cannot attend a clinic in person or those who do not necessarily have imminent plans to offer anticoagulation services. We will repeat this survey among participants completing MOAT Online to ensure similar value is perceived by participants completing the course using SIMs, using the current study as a baseline for comparison.

There are two primary strengths of this study. First, we achieved an excellent response rate of 71%, which in itself may represent support for the value of the experiential component, as participants felt strongly enough about their experience to complete a survey, sometimes many years after completing the course. Second, the results are remarkably consistent, and there is no question that experiential training in an anticoagulation CPD course is highly valued. There are several limitations of our study. It was an observational study with no control group. Based on the results of our pilot course offering, we felt it was crucial to include an experiential portion in MOAT, so we were unable to compare the experience to participants who did not have an experiential rotation. However, our questions attempt to isolate the effect of the experiential training by using the participant as their own control. There was no formal assessment of participants' knowledge or skills at the end of the experiential portion of the course; instead, we relied on self-reported confidence to practice as our main outcome. This outcome is strengthened by the instructor's (JN) observations that, without exception, every learner performed better in terms of dosing recommendations, scheduling follow-up, and answering patient's questions at the final clinic visit than at their first. It has been nearly 10 years since some of the participants completed MOAT, so their responses may have been subject to poor recall. The consistency of the responses argues against a significant impact on the results because of recall bias. Finally, the demographics of survey non-responders were not available to compare to responders, and it is not possible to assess for systematic differences. However, given the high survey response rate observed, this is not expected to represent a limitation that may appreciably bias the results observed.

Impact

This study aims to influence healthcare educators, CPD providers, and professionals by demonstrating the significant value of experiential learning in enhancing confidence and competence. While incorporating experiential training into CPD programs presents challenges such as logistical constraints and costs, this research underscores its importance and effectiveness.

The current version of our course incorporates a virtual anticoagulation clinic with simulated patients powered by generative AI, offering a potential approach to overcoming traditional barriers in CPD training. While AI-driven simulations may provide immersive and practical learning experiences without requiring physical presence, further research is needed to evaluate their effectiveness.

We envision this research contributing to discussions on the potential role of innovative technologies in CPD programs across various healthcare fields. Future studies could explore whether such approaches enhance educational practices and impact patient outcomes. Metrics to assess their influence may include the adoption rate of experiential components in CPD programs, participant feedback, and potential correlations with clinical outcomes for patients receiving care from program participants.

Conclusion

The experiential learning component of a CPD program designed for pharmacists and nurses aiming to develop the skills to manage oral anticoagulation therapy is highly valued. Future research will evaluate whether the experiential aspect can be sufficiently replicated with artificially intelligent computer simulation to create a more accessible experiential learning option.

Conflict of Interest

None.

Funding

We received financial support for this study through the University of Waterloo's Learning Innovation and Teaching Enhancement (LITE) grant program.

Note on Contributors

Jeff Nagge, PharmD
Clinical Associate Professor, School of Pharmacy, University of Waterloo
Assistant Clinical Professor, Michael G Degroote School of Medicine, Department of Family Medicine, McMaster University
Kitchener, ON, Canada
jeff.nagge@uwaterloo.ca

Sherilyn Houle, PhD
Associate Professor, School of Pharmacy, University of Waterloo
Kitchener, ON, Canada
sherilyn.houle@uwaterloo.ca

Marie Lippens, MEd
Distance Learning Program Development Specialist
OpenEd Learning and Educational Support
University of Guelph
Guelph, ON, Canada
mlippens@uoguelph.ca

Cynthia Richard, PhD
Associate Professor, Teaching Stream, Associate Director, Curriculum, Associate Dean, Undergraduate Policy
School of Pharmacy, University of Waterloo
Kitchener, ON, Canada
c25richa@uwaterloo.ca

Rosemary Killeen, BScPhm
Director, Lifelong Learning
School of Pharmacy, University of Waterloo
Kitchener, ON, Canada
rosemary.killeen@uwaterloo.ca

Brianna Bennet, MEd
Educational Research Associate
Centre for Teaching Excellence
University of Waterloo
Waterloo, ON, Canada
bfgbennett@uwaterloo.ca

Annik Bilodeau, PhD
Educational Developer, Research and Consulting
Centre for Teaching Excellence
University of Waterloo
Waterloo, ON, Canada
a2bilode@uwaterloo.ca

References

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W H Freeman and Company.

Bungard, T. J., Schindel, T. J., Garg, S., & Brocklebank, C. (2012). Evaluation of a multi staged professional development course for practising pharmacists in anticoagulation management. *The International Journal of Pharmacy Practice, 20*(2), 107–117. https://doi.org/10.1111/j.2042-7174.2011.00171.x

Diamantouros, A., Marchesano, R., Geerts, W. H., Pennefather, P., Zwarenstein, M., & Austin, Z. (2017). Development and evaluation of a continuing pharmacy education (CPE) program in thrombosis management. *Currents in Pharmacy Teaching & Learning, 9*(5), 911–917. https://doi.org/10.1016/j.cptl.2017.05.008

Dean, A. G., Sullivan, K. M., & Soe, M. M. (n.d.). *OpenEpi: Open source epidemiologic statistics for public health*

[Online calculator]. http://www.openepi.com/Proportion/Proportion.htm

Dewey, J. (1938). *Experience & Education*. Free Press.

Frankel, G. E., & Austin, Z. (2013). Responsibility and confidence: Identifying barriers to advanced pharmacy practice. *Canadian Pharmacists Journal, 146*(3), 155–161. https://doi.org/10.1177/1715163513487309

Garcia, D. A., Nutescu, E. A., Wittkowsky, A. K., Burnett, A., Merli, G. J., & Ansell, J. E. (2013). Delivery of optimized inpatient anticoagulation therapy: consensus statement from the anticoagulation forum. *The Annals of Pharmacotherapy, 47*(5), 714–724. https://doi.org/10.1345/aph.1R634

Hecimovich, M., & Volet, S. (2011). Development of professional confidence in health education: Research evidence of the impact of guided practice into the profession. *Health Education, 111*(3), 177–197. https://doi.org/10.1108/09654281111123475

Hope, D. L., Rogers, G. D., Grant, G. D., & King, M. A. (2021). Experiential learning in a gamified pharmacy simulation: A qualitative exploration guided by semantic analysis. *Pharmacy, 9*(2), 81. https://doi.org/10.3390/pharmacy9020081

Kolb. D. A, & Fry, R. (1975). Toward an applied theory of experiential learning. in C. Cooper (ed.), *Theories of Group Process*. John Wiley.

Manzoor, B. S., Cheng, W. H., Lee, J. C., Uppuluri, E. M., & Nutescu, E. A. (2017). Quality of pharmacist-managed anticoagulation therapy in long-term ambulatory settings: A systematic review. *The Annals of Pharmacotherapy, 51*(12), 1122–1137. https://doi.org/10.1177/1060028017721241

Nagge, J., Waite, N., & Nagge, L. (June, 2009). *Description of an experiential continuing professional development program for prospective providers of anticoagulation care* [Conference session]. 7th Life-long Learning in Pharmacy Conference, Helsinki, Finland.

Parle, M., Maguire, P., & Heaven, C. (1997). The development of a training model to improve health professionals' skills, self-efficacy and outcome expectancies when communicating with cancer patients. *Social Science & Medicine, 44*(2), 231–240. https://doi.org/10.1016/s0277-9536(96)00148-7

Paton-Simpson & Associates Ltd. (n.d.). *SOFA Statistics (Version 1.4.6)* [Computer software]. Auckland, New Zealand. https://www.sofastatistics.com

Rosenthal, M., Zubin, A., & Tsuyuki, R. (2010). Are pharmacists the ultimate barrier to pharmacy practice change? *Canadian Pharmacists Journal, 143*(1), 37-42. https://doi.org/10.3821/1913-701X-143.1.

Zhou, S., Sheng, X., Xiang, Q., Wang, Z., Yushan, Z., & Cui, Y. (2016). Comparing the effectiveness of pharmacist-managed warfarin anticoagulation with other models: A systematic review and meta-analysis. *Journal of Clinical Pharmacy and Therapeutics, 41*(6), 602–611. http://dx.doi.org/10.1111/jcpt.12438

Appendix

PROGRAMMER: ALL QUESTIONS SHOULD APPEAR ON A MOBILE DEVICE WITHOUT SCROLLING HORIZONTALLY.

Q1
Approximately when did you take the Management of Oral Anticoagulation Therapy (MOAT) course at the University of Waterloo?

01 In the past 2 years (2015 - 2017)
02 3 to 5 years ago (2012 – 2014)
03 Over 6 years ago (before 2012)
04 I did not take the Management of Oral Anticoagulation Therapy course **GO TO INELIGIBLE**

INELIGIBLE
Thank you for your time but we are only interested in surveying past participants of the Management of Oral Anticoagulation Therapy course.

Q2
What was your professional designation when you started the MOAT course?

01 Nurse
02 Nurse practitioner
03 Pharmacist
04 Other, please specify: _____

Q3
Have you completed any advanced clinical training? Please select all that apply.

01 Residency
02 Fellowship
03 Post-baccalaureate Pharm.D.
04 Other, please specify: _____
05 I have not completed any advanced clinical training

Q4
Approximately how many years had you been in clinical practice when you started the Management of Oral Anticoagulation Therapy (MOAT) course?

01 0-2 years
02 3-5 years
03 6-10 years
04 11-15 years
05 More than 16 years

Q5
Since entering practice, please specify any training you took providing anticoagulation services prior to taking the MOAT course:

01 _____
02 I did not take any training in providing anticoagulation services prior to taking the MOAT course

Q6
Please indicate the reasons why you decided to take the MOAT course. Please select all that apply.

01 Planned to start an anticoagulation service
02 Planned to begin working in an existing anticoagulation service
03 General interest in continuing education
04 Other, please specify: _____

As a reminder, the MOAT course consisted of two distinct modules. The first module, also known as the online module, was comprised of a series of readings, followed by five written case studies and an online exam. The second module consisted of three experiential opportunities in the anticoagulation clinic at the Centre for Family Medicine Family Health Team. The following six questions pertain to these modules.

Q7
Prior to starting the MOAT course, please indicate the level of confidence you felt in your ability to provide anticoagulation services:

01 Not confident at all	02	03 A little confident	04	05 Moderately confident	06	07 Completely confident

Q8
After completing the online portion of the MOAT course (clinical readings, case-studies and online exam), please indicate the level of confidence you felt in your ability to provide anticoagulation services:

01 Not confident at all	02	03 A little confident	04	05 Moderately confident	06	07 Completely confident

Q9
After completing the three experiential visits to the anticoagulation clinic, please indicate the level of confidence you felt in your ability to provide anticoagulation services:

Not confident at all		A little confident		Moderately confident		Completely confident

Q10a
Please indicate what you think is the most important aspect of the MOAT course:

01 Readings
02 Case studies
03 Exam
04 Experiential (on-site) training

Q10b **(PROGRAMMER ONLY SHOW OPTIONS THAT HAVE NOT YET BEEN SELECTED)**
Please indicate what you think is the second most important aspect of the MOAT course:

Q10c **(PROGRAMMER ONLY SHOW OPTIONS THAT HAVE NOT YET BEEN SELECTED)**

Please indicate what you think is the third most important aspect of the MOAT course:

Q10d
You chose the following rankings: (PROGRAMMER SHOW ALL 4 RANKINGS). Please provide your rationale for choosing this order: _____

Q11
Knowing what you know about the MOAT course, if you could complete only one portion of the course, which would you choose?

01 Online module
02 Experiential module
03 Neither module would suffice on its own

Q12
If the experiential visits to the anticoagulation clinic were not offered, what, if any, additional supports, training opportunities, or direction would you require? Please select all that apply.

01 More readings
02 Recorded lectures
03 Video vignettes of patient interactions seen in the clinic
04 Computer simulations of patient interactions
05 Other, please specify: _____

NEW PAGE

The following questions refer to your clinical practice since completing the MOAT course

Q13
After completing MOAT, please indicate how, if at all, you used the training. Please select all that apply.

01 I began practicing in an existing anticoagulation service **GO TO Q14**
02 I started my own anticoagulation service **GO TO Q15**
03 I am planning to implement a future anticoagulation service **GO TO Q19**
04 Other, please specify: _____ **GO TO Q19**
05 None of the above **GO TO Q19**

Q14
If you joined an existing anticoagulation service after completing MOAT, how many patients are currently enrolled in your clinic?_____GO TO Q16

Q15
If you started an anticoagulation service after completing MOAT, how many patients are currently enrolled in your clinic?_____ GO TO Q16

ONLY SHOW Q16-Q18 IF 01-02 SELECTED IN Q13 ALL OTHERS SKIP TO Q19

Q16

Please indicate your primary practice setting for the anticoagulation service:

01 Community pharmacy
02 Family Health Team
03 Community Health Centre
04 Hospital
05 Other, please specify: ____

Q17

Please indicate which of the following performance metrics, if any, are tracked in the anticoagulation service in which you practice: Select all that apply.

01 Time in therapeutic range (TTR)
02 Number of hemorrhagic complications
03 Number of thromboembolic complications
04 Level of patient satisfaction
05 Level of prescriber/referrer satisfaction
06 Workflow (for example, average duration of time required to perform a specific service)
07 Other, please specify: ____
08 No performance metrics are tracked

ONLY SHOW Q18 IF 01 SELECTED IN Q17

Q18

Please enter your most recent percent TTR:_____%

Q19

Please indicate your approximate age when you started the MOAT course:

01 20-29
02 30-39
03 40-49
04 50-59
05 60 or older

Q20

In order to study the effectiveness of point-of-care International Normalized Ratio (INR) testing and warfarin management by non-physician providers, a group of researchers at the School of Pharmacy at the University of Waterloo would like to establish a community of practice for clinicians involved in these clinics. Do you consent to being contacted by the researchers to be made aware of opportunities to participate in future research? Note, your answers to this survey will remain anonymous even if you provide consent.

01 Yes
02 No

ONLY SHOW IF 01 SELECTED IN Q20, IF 02 GO TO THANK YOU

Q21

Below is the email address we have on record. **PROGRAMMER SHOW EMAIL ADDRESS.** Please update your email address if this is not the email address that you use most frequently. This information will be kept strictly confidential and will not be associated with your survey answers or shared with anyone outside of this study.

01 This email is the one I use most frequently
02 Please update my email address._____