Walking the mile - Fostering diabetes self-management and psychosocial skills among pharmacy students through a hybrid advanced diabetes certificate elective course

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Abstract

Background: Pharmacy school curricula contain required course content in diabetes management. However, patient-care skills like effective communication, lifestyle counselling, and the provision of healthy coping strategies require additional training opportunities that are not typically afforded in the required diabetes curriculum. **Methods:** A 2-credit hour elective course was created to provide third-year pharmacy students with first-hand experience in diabetes self-management and the psychosocial aspects of diabetes care. The course includes the certificate training programme "*The Pharmacist and Patient-Centered Diabetes Care*" offered by the American Pharmacists Association (APhA). **Results:** 110 pharmacy students completed four-course cohorts. Average capstone assessment scores were 92% for the patient case and 88.3% for hands-on diabetes management skills. 99.1% of students successfully obtained the APhA certificate with an average final assessment score of 85%. Students demonstrated an understanding of the psychosocial and behavioural aspects of diabetes care through simulation and case-based activities. **Conclusion:** The course had a positive impact on pharmacy students' proficiency in diabetes care and self-management skills, as evidenced by their performance within the APhA certificate programme. Through simulation activities, students gained firsthand experience and demonstrated an understanding of the psychosocial aspects of diabetes care.

Introduction

According to the Centers for Disease Control and Prevention, approximately 37.3 million people in the United States have diabetes, which accounts for 11.3% of the US population (Centers for Disease Control, 2022). As a result, education regarding diabetes management is an important aspect of the pharmacy curriculum. It is defined as a tier 1 curricular component (students should receive education and training on this topic to prepare them to provide collaborative, patient-centred care upon graduation and licensure) by the 2019 American College of Clinical Pharmacy (ACCP) Pharmacotherapy Didactic Curriculum Toolkit (Flannery *et al.*, 2020).

In addition, the American Association of Colleges of Pharmacy (AACP) Curricular Outcomes and Entrustable Professional Activities (COEPA) document for New Pharmacy Graduates highlights patient advocacy, empathy, and the provision of "*whole person care*" as important skills for new pharmacy graduates to possess (Medina *et al.*, 2022). Pharmacists are the most accessible and frequently visited healthcare professionals in the US, and among adult patients diagnosed with diabetes, it is estimated that 88.2% use oral or injectable medications to manage their diabetes

(Manolakis & Skelton, 2010). As a result, pharmacists are uniquely positioned to provide appropriate disease management and psychosocial support to patients with diabetes.

Within the required pharmacy curriculum, emphasis is placed on pharmacotherapy management and disease complication prevention. However, skills like effective communication and interviewing, evaluation of mental well-being, assistance with cost management and service development are not typically included due to time constraints. Diabetes elective courses have been created to provide more comprehensive exposure to diabetes care concepts and have assessed empathy among pharmacy students via role-playing and empathy scales (Ryan *et al.*, 2007; Westberg *et al.*, 2010; Sterret *et al.*, 2012; Kerr *et al.*, 2015).

There is a gap in the literature as it relates to the incorporation of an accredited certification programme and hands-on simulation activities to develop diabetes care and psychosocial skills. To address this gap, the authors created and offered a hybrid advanced diabetes elective course that incorporates an accredited certification diabetes programme for pharmacists, along with activities and scenarios in which students provide diabetes care and self-manage diabetes. The objective of this study is to describe course components, student performance metrics and perception of an advanced diabetes care certificate elective course.

Methods

The Advanced Diabetes Care (PHAR 7204) elective is a two-credit-hour hybrid certificate course offered in the Autumn term of the third-year pharmacy curriculum. Completion of the required Endocrine and Male and Female Health Integrated Pharmacotherapy course is a prerequisite for the course. The course has a maximum enrollment of 30 students per cohort and utilises several activities and assessment techniques to teach diabetes-related patient care topics and self-management skills, as outlined in Figures 1 and 2. Students also complete a capstone objective structured clinical examination (OSCE) at the end of the course and receive a certificate from the national "*The Pharmacist and Patient-Centered Diabetes Care*" programme developed by the American Pharmacists Association (APhA), which is integrated into the elective course.

The Pharmacist and Patient-Centered Diabetes Care programme was originally designed with practising pharmacists as the target audience and provides effective and evidence-based training in comprehensive diabetes management. When completed by registered pharmacists, the APhA certificate programme is comprised of an online self-study portion and a live portion. The self-study portion consists of reading six modules and successfully completing a self-study examination with a grade of 70% or higher. The live portion consists of an eight-hour programme that includes reinforcement and application of learning through the use of worksheets and patient cases followed by brief instruction and hands-on practice in; measuring blood pressure, completing a diabetic foot exam, using vial and pens to demonstrate insulin preparation and administration, and obtaining a blood glucose reading with a glucometer. The pharmacist then enters values obtained online and successfully completes a shorter examination with a score of 70% or higher to receive the certificate. In addition to the certificate, the pharmacist earns eight contact hours of continuing pharmacy education (CPE) credit as approved by the Accreditation Council for Pharmacy Education.

To incorporate the requirements of The Pharmacist and Patient-Centered Diabetes Care certificate programme into the elective course, the assessments, self-study modules and live programming were separated into five sections. Students complete a pre-assessment quiz as a required component of the APhA certificate course prior to the first day of class. The quiz was for a baseline self-assessment, and grades were not factored into the overall course performance. Each section was divided into a required 2-hour online session (assigned APhA self-study modules completed prior to the in-class session) and a required 3-hour in-person session. The in-person session begins with a quiz on the assigned self-study materials and is followed by a 1-hour live presentation pertaining to the self-study modules. Following the presentation, the students participate in hands-on activities or discussions to solidify the concepts. This pattern continues for subsequent sessions, and in the fourth live session, students practice and demonstrate the hands-on skills described in the APhA live training. These skills are further evaluated in the patient assessment and patient education portions of the final OSCE. Following the OSCE assessment, students complete the online APhA self-study examination and evaluation to complete the APhA certificate course requirements and obtain their certificates.
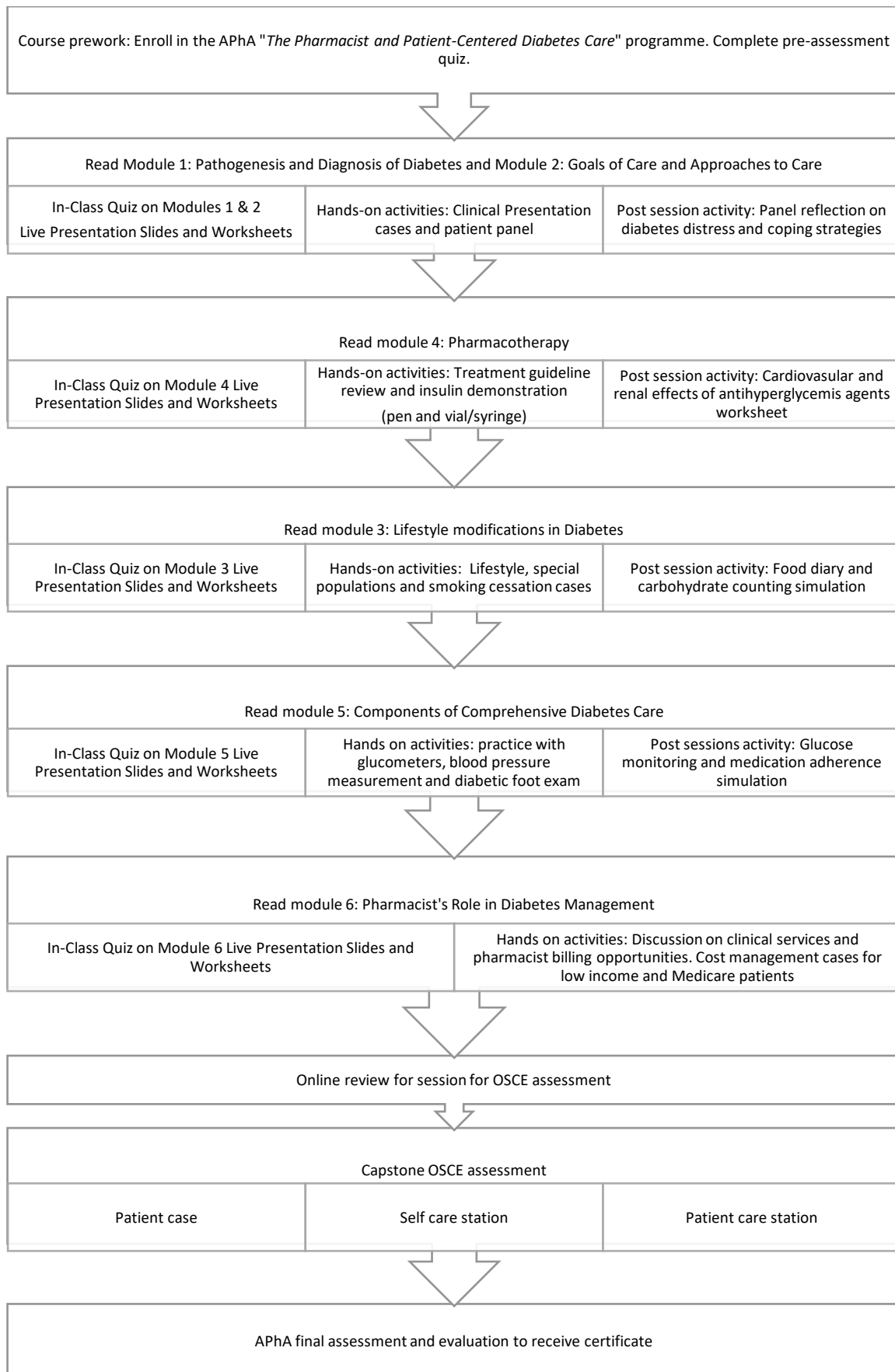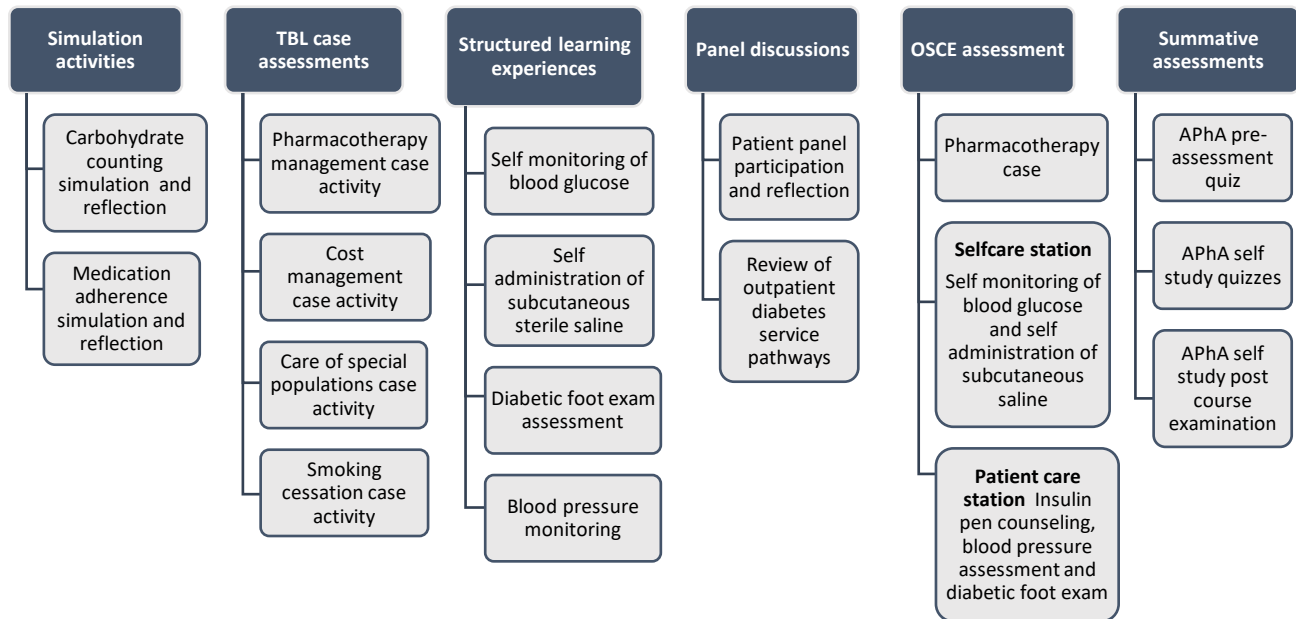
Course prework: Enroll in the APhA "*The Pharmacist and Patient-Centered Diabetes Care*" programme. Complete pre-assessment quiz.

Read Module 1: Pathogenesis and Diagnosis of Diabetes and Module 2: Goals of Care and Approaches to Care

In-Class Quiz on Modules 1 & 2 Live Presentation Slides and Worksheets	Hands-on activities: Clinical Presentation cases and patient panel	Post session activity: Panel reflection on diabetes distress and coping strategies

Read module 4: Pharmacotherapy

In-Class Quiz on Module 4 Live Presentation Slides and Worksheets	Hands-on activities: Treatment guideline review and insulin demonstration (pen and vial/syringe)	Post session activity: Cardiovasular and renal effects of antihyperglycemis agents worksheet

Read module 3: Lifestyle modifications in Diabetes

In-Class Quiz on Module 3 Live Presentation Slides and Worksheets	Hands-on activities: Lifestyle, special populations and smoking cessation cases	Post session activity: Food diary and carbohydrate counting simulation

Read module 5: Components of Comprehensive Diabetes Care

In-Class Quiz on Module 5 Live Presentation Slides and Worksheets	Hands on activities: practice with glucometers, blood pressure measurement and diabetic foot exam	Post sessions activity: Glucose monitoring and medication adherence simulation

Read module 6: Pharmacist's Role in Diabetes Management

In-Class Quiz on Module 6 Live Presentation Slides and Worksheets	Hands on activities: Discussion on clinical services and pharmacist billing opportunities. Cost management cases for low income and Medicare patients

Online review for session for OSCE assessment

Capstone OSCE assessment

Patient case	Self care station	Patient care station

APhA final assessment and evaluation to receive certificate

Figure 1: Advanced Diabetes Care elective course roadmap (duration of 8 weeks)

Simulation activities	TBL case assessments	Structured learning experiences	Panel discussions	OSCE assessment	Summative assessments
Carbohydrate counting simulation and reflection	Pharmacotherapy management case activity	Self monitoring of blood glucose	Patient panel participation and reflection	Pharmacotherapy case	APhA pre-assessment quiz
Medication adherence simulation and reflection	Cost management case activity	Self administration of subcutaneous sterile saline	Review of outpatient diabetes service pathways	**Selfcare station** Self monitoring of blood glucose and self administration of subcutaneous saline	APhA self study quizzes
	Care of special populations case activity	Diabetic foot exam assessment		**Patient care station** Insulin pen counseling, blood pressure assessment and diabetic foot exam	APhA self study post course examination
	Smoking cessation case activity	Blood pressure monitoring			

Abbreviations: TBL = Team Based Learning; APhA = American Pharmacists Association; OSCE = Objective Structured Clinical Exam

Figure 2: Assessment techniques utilised within the course

For some of the in-class course activities, students take the role of the provider and make recommendations and/or provide education regarding care through Team-Based Learning (TBL) case activities that explore the following patient care variables: dietary restrictions and drug-food interactions, low-income status, obesity and cardiovascular disease comorbidity and private versus government assisted insurance coverage. For other activities, students take the role of a patient with diabetes and adhere to guideline-recommended care, including following a simulated oral and injectable medication regimen, calculating carbohydrate counts for meals, and self-monitoring blood glucose levels to enable them to experience the behavioural changes associated with diabetes care and develop psychosocial skills like empathy.

Students participate in two simulation activities to gain firsthand experience with diabetes self-management skills and the psychosocial and behavioural aspects of diabetes care. The first simulation activity explores the concept of nutrition and carbohydrate counting. Students are provided with a nutrition diary and instructed to count and document their carbohydrate intake for three consecutive weekdays (they are to take a picture and calculate the grams of carbohydrate consumed with each meal and snack). The students utilise carbohydrate counting skills to set a daily carbohydrate target based on their desired weight goal, which is to be divided between three meals and two snacks and created in accordance with the guidelines

provided by the "*Lifestyle Modification in Diabetes Module*" in the APhA certificate programme. Students are encouraged to use the MyPlate method and prioritise a healthy eating pattern that includes a variety of low-glycemic vegetables and fruits, healthy protein from plants and animal sources and whole grains. Following the activity, the students turn in their nutrition diary and complete a 200-word reflection assignment based on their experience.

The second simulation activity explores blood glucose monitoring, the impact of physical activity and behaviours on blood glucose levels, insulin management calculations (insulin sensitivity factor and insulin to carbohydrate ratio) and barriers to medication adherence. The students simulate the experience of a patient with type 2 diabetes on Metformin 1000 mg twice daily, basal insulin at bedtime and bolus insulin before meals. The students complete this activity over two weekdays and are instructed to log into the learning management system Canvas twice a day to "*administer*" their metformin pill via timed quizzes set at 8 am for the morning administration and 7 pm for the evening administration. They also must respond to blood glucose readings and scenarios that are emailed to them at random three times a day between the hours of 7 am and 8 pm. The students have +/- 1 hour to complete the timed quizzes to be marked as adherent to the prescribed dose. Preset emails are timed to be released at random to the class with details about their current blood glucose reading and behaviours that affected their

reading (e.g. they just completed an exercise, they were at a birthday party and had a slice of cake), their blood glucose goals and medication details. Students are to respond via email to address the blood glucose reading, and readings indicating hypoglycemia (blood glucose < 70mg/dL) have to be responded to within 1 hour for successful resolution. Following the activity, the students complete a 200-word reflection assignment based on their experience.

The OSCE assessment comprises a 20-minute pharmacotherapy case (closed book), a 20-minute patient care station and a 10-minute self-management station. 15 minutes are allotted for a transition period between each station. OSCE performance in the hands-on assessment (self-care and patient care stations) is evaluated by standardised rubrics modified from the APhA programme (Appendix A and B), and the patient case was developed and validated among practising ambulatory care faculty within the college. Training and instruction manuals for the patient, grader and facilitator roles are utilised to maintain standardisation within the OSCE assessment.

Students earn the APhA certificate upon successful completion of all requirements embedded in the course. However, successful completion of the APhA certificate programme was not a requirement for passing the elective course (i.e. students could elect not to take the final APhA post-course examination, as was the case with one student). In addition, the comprehensive capstone OSCE assessment is not "*high stakes*," and students could successfully pass the course if a cumulative final course grade of 70% or more is attained. Remediation opportunity is not provided for the OSCE assessment; however, students have two tries to successfully pass the APhA final assessment. The course grades breakdown is as follows: 16% for five weekly online module quizzes, 60% for the in-class activities, 20% for the capstone comprehensive OSCE and 4% for professionalism.

Due to the COVID-19 pandemic and the shift to remote learning by the institution, the course was transitioned to 100% online delivery for the 2020 cohort. Class sessions were conducted virtually through the Zoom platform. In addition, the OSCE assessments were conducted virtually with the assistance of virtual patients and simulation platforms. Supply kits were created and distributed to the students at the beginning of the course during a required in-person experiential activity on campus. For the blood pressure assessment, the "*Practical Clinical Skills*" online platform operated by MedEdu LLC was utilised to provide the Korotkoff sounds and virtual sphygmomanometer, and students performed a self-demonstration for the placement of the cuff and stethoscope. Lastly, the students completed a self-diabetes foot exam with the monofilaments provided in their supply kit. The students were able to complete the patient case, insulin counselling, self-injection and self-monitoring of blood glucose stations virtually with no modifications.

Descriptive statistics were utilised to analyse student performance in the course and the APhA The Pharmacist and Patient-Centered Diabetes Care certificate programme. The University of North Texas Health Science Centre North Texas Regional Institutional Review Board provided approval as an exempt research study.

Results

A total of 110 students enrolled and completed four cohorts of the course from 2018 to 2022. As detailed in Table I, the students consistently performed well on summative assessments throughout the course. The mean overall course grade was 92.6%, with no failures recorded. For the capstone OSCE assessment, the mean pharmacotherapy case score was 92%, and the mean score for the hands-on assessment was 88.3%. 99.1% of enrolled students successfully completed the requirements for the APhA certificate programme (one student opted out of completing the APhA final examination and was not awarded a certificate). The mean APhA course final examination score was 85% (70% required to pass). The course was well received, as evidenced by student comments and a mean post-course evaluation score of 4.7 over a 5.0 scale (average survey response rate of 50%, ranging from 24% to 71% across the four cohorts). In comparison to overall course outcomes, there was no significant difference in student performance outcomes in the 2020 cohort despite a change in course delivery to virtual learning due to the COVID-19 pandemic ($p = 0.498$).

Table I: Select assessment outcomes from four student cohorts

	2018 (n=28)	2019 (n=29)	2020 (n=25)	2022 (n=28)	Overall (n=110)
Mean course grade; 100-point scale (SD)	94.2 (2.22)	89.0 (5.15)	93.6 (2.45)	93.6 (4.18)	92.6 (4.33)
Mean capstone OSCE assessment score - patient case; 15-point scale (SD)	13.5 (1.73)	13.6 (1.41)	13.8 (1.03)	14.7 (0.33)	13.8 (1.33)
Mean capstone OSCE assessment score hands-on skill assessment; 35-point scale (SD)	30.6 (2.15)	30.0 (2.34)	33.6 (1.85)	29.8 (3.64)	30.9 (3.04)
Completion rate for the Pharmacist & Patient-Centered Diabetes Care certificate programme	100%	96.5%	100%	100%	99.1%
Mean assessment score for the Pharmacist & Patient Centered Diabetes Care certificate programme; 100-point scale (SD)	81.1 (8.04)	87.7 (5.83)	82.9 (7.41)	88.1 (10.6)	84.8 (8.66)
Mean course evaluation scores; 5-point scale (SD)	4.86 (0.07)	4.59 (0.11)	4.69 (0.09)	4.59 (0.04)	4.68 (0.14)

SD – standard deviation

Select course evaluation comments (anonymous)

- My biggest takeaway from the course was developing a greater sense of empathy for patients with diabetes. The activities were designed to provide us with firsthand experience calculating insulin doses, counting carbs, taking our own blood glucose and injecting ourselves with insulin. The food diary activity was the most meaningful to me. After counting carbs for a couple of days, I gained greater awareness of my own eating habits and decided to make a change. Since that assignment, I have started a diet and exercise regimen and have lost 10 pounds! If I can provide a recommendation, it would be to go into a little more depth with the pharmacotherapy. However, I thought that this was a great course overall.

- This is one of my favorite classes the school has to offer. I feel more confident with my knowledge of diabetes. I appreciate how they taught the class and gave me a new perspective on diabetes. My favorite class was the day we learned about insurance billing and solving real-life scenarios.

- I enjoyed the class and the in-class activities. I loved that it was open discussion and we were able to ask questions.

Course evaluation comments for the virtual course in 2020

- It was no doubt difficult to coordinate the testing for some of this course, given that it involved physical demonstrations, but they pulled it off well.

- The course went well as an online course, allowing us to focus on it when we needed to and had the time to do so.

- Efficient use of online materials especially with integration of the materials provided through APhA training.

- No complaints, and adjustments were made for it to be taken care of well remotely.

All of the students successfully completed the self-management simulation activities. As noted in select reflection comments highlighted in Table II, students expressed an understanding of the psychosocial and behavioural concepts highlighted in the simulated activities and were able to reflect on how the experiences will change their approach to patient care as clinical providers.

Table II: Select student comments from course activities across four cohorts

Patient panel reflection activity
- I will improve my ability to provide quality patient centred care to patients with diabetes by making empathy key whenever I relate/talk with them. This class has made me understand what these patients go through, I want to be that kind clinician who will help them through their journey and make life easier for them in my own little way.
- I will put myself in the shoes of those who have diabetes, it's one thing to know about the disease, but another to understand the daily struggles. I learned that there are many challenges that come with the disease, so I ever come across a situation where I can help a diabetic patient such as counsel or help them understand what going on, I would be glad to help.
- I could be more empathetic while helping patients manage their diabetes after knowing the stories of real patients. Also, understanding the challenges patients might be facing while managing their. diabetes could be very beneficial in providing patient

centred care. While recommending any lifestyle modifications to patients, it would be nice to know if there are any factors in their life which could be a hindrance to follow the recommendations.
Food diary and carbohydrate counting simulation reflection activity
• The last three days have been overwhelmingly amazing to have realized how much of an effect could be put into making sure that all my food consumptions are been recorded and accounted for. I feel so humble and have high compassion towards their challenges.
• Thank you for this challenging assignment. It taught me that I can do whatever I set my mind up to do. It also made me feel and understand the daily struggles of patients with diabetes, this has greatly increased my compassion for this group of people.
• This made me open my eyes to how empathetic we need to be when giving patient lifestyle modifications.
• The three-day period we were intentional with our diet was insightful. The last few days we were preparing for an exam. For me exam preparation comes with a lot of stress eating, not eating, energy drinks and a combination of many other bad eating habits. In a way I didn't realize how hard it would be to eat. As a person whose diet is heavily impacted by emotions, I can't imagine the stress of HAVING to maintain consistency or risking serious health complications. This experiment gave me more empathy for patients. I think as a person who does not have diabetes, it is much easier to suggest changes and subconsciously pass judgment if they aren't met. This experiment has motivated me to finding quick options for patients that are appropriate for their nutritional needs and filling.
Medication adherence and blood glucose monitoring reflection activity
• This exercise was a wake up call for how difficult adherence can be. Staying on track was manageable because I set an alarm to remind me. The metformin was easier to track than the insulin. However, in the long run it can be very hectic and easy to forget and keep track of daily tasks and remembering insulin before every meal. This helps me in understanding the struggle patients go through having to make this a lifestyle.
• This week's assignment allowed me to experience a day in the life of a diabetic. It made me realize how difficult it is to adhere to medications regimens especially when you are busy. As a pharmacist we stress the importance of adherence to manage the disease, but now I realize how hard it may be at times to remember to administer meds and even harder when there are taken multiple times a day. I also realized how it may be difficult for some patients to calculate correction doses, therefore it is imperative for healthcare providers to provide counseling to patients when they receive new medications.
• My main take away from this experience was that, once again, it would be very difficult and require a complete change of lifestyle for me if I was ever diagnosed with diabetes. As someone with little structure in my daily routine, this required a conscious effort to complete. I understand now that diabetic patients have a loss of some freedoms that I take for granted. Also, it was almost frightening to look at my email and hope I wasn't hypoglycemic, so I can only imagine how stressful and taxing it is for diabetic patients who physically experience hypoglycemic episodes. This course has really opened my eyes to challenges presented to patient's living with diabetes.
• This activity was very difficult for me to keep up with, if I am being honest. I think it was a great activity for us to participate in to understand what our future patients go through having to check blood sugar and adjust accordingly. It was difficult for me because for both days, my blood sugar was my alarm clock to wake up. I can see why as a patient checking blood sugar first thing in the morning can be easily missed. This was a very informative activity and I enjoyed being a diabetic for 2 days.

Discussion

Throughout the delivery and evaluation of the course, several lessons were learned. First, the integration of the APhA certificate programme and hands-on simulation activities helped develop students' understanding of diabetes care and the psychosocial skills needed to assist in patient management. It was also learned that a hybrid approach to course delivery, combining online modules with live didactic teaching, was an effective strategy for accommodating the multifaceted nature of diabetes management education.

However, there were limitations associated with this course. Course faculty encountered some difficulty with recruiting graders and simulated patients for the capstone OSCE, which was completed over 4 hours, with 12 stations and required 25 participants (graders, simulated patients, and facilitators). The OSCE also required detailed planning, training and supplies to provide an accurate representation of patient care

activities and settings. Refer to Appendix C for additional advice on implementing the course and Appendix D for a list of supplies utilised within the course.

The cost was also another potential limitation to the implementation of the course as one of the courses faculty needed to be certified as a trainer for the APhA "*The Pharmacist and Patient-Centered Diabetes Care*" certificate programme in order to offer it within the pharmacy curriculum. All three of the course faculty completed the "*train the trainer*" APhA programme to be certified to deliver the content. This cost was covered using professional development funds allocated to faculty at the college. In addition, the cost of the certificate programme, supplies for the class sessions, and the OSCE assessment were factored into the student fee for the course.

Although the course was designed to be comprehensive, the complexity and multi-disciplinary nature of diabetes care presented challenges in fully addressing every aspect within a single elective course. To mitigate this,

the course was offered only to third-year students who had already completed the endocrine portion of the integrated pharmacotherapy sequence. This ensured a baseline level of knowledge of diabetes care and facilitated a more focused and advanced exploration within the elective course. Additionally, one student chose not to take the final APhA post-course examination, which was an element beyond the control of the course facilitators.

To ensure the continued delivery of the content, the college will maintain collaboration with APhA and other reputable organisations. In addition, validated assessment tools like the Jefferson Scale of Empathy will be integrated within the course to better assess the course's impact on student empathy.   Moreover, the course faculty is considering the integration of more diverse patient-case scenarios and advanced clinical problem-solving tasks into our course offerings. These elements will provide students with more challenging, real-world scenarios, fostering deeper learning and a greater breadth of experience.

The experiences learned from this course have paved the way for several prospective directions. Currently, the college offers certificate courses in immunisations, medication therapy management, point-of-care testing, and advanced diabetes management. The success and feedback from these courses, particularly from the diabetes elective, have prompted us to explore an "*advanced community practice emphasis*" pathway. This pathway seeks to enhance the skills of students who desire a career in outpatient pharmacy practice.

Conclusion

In conclusion, the integration of the APhA's "*The Pharmacist and Patient-Centered Diabetes Care*" certificate programme into a hybrid advanced diabetes elective course has proved to be an effective strategy to augment pharmacy students' understanding of comprehensive diabetes care while providing them the opportunity to complete a nationally recognised certificate programme. This model provides students with opportunities to understand patients living with diabetes through first-hand activities and empathy expression through assigned reflections, which are traits of increasing value in today's healthcare environment (Parker *et al*., 2019). The course structure and assessment components allow for delivery through a hybrid approach of online and in-person instruction, as well as online delivery for remote learning situations, without a negative impact on student learning and performance. Despite some limitations, the course has shown considerable success and potential for

enhancement, creating a foundation for these future advancements in pharmacy education related to chronic disease management.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

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Appendix A: Assessment rubrics for the patient care assessment OSCE station

Expectations	Performed	Not performed
Identifies self		
Verifies patient's name and states the purpose of the encounter		
Blood pressure assessment		
Verbalizes the following with the patient • Patient has not ingested caffeine or tobacco in the last 30 minutes • Patient has been resting for at least 5 minutes		
Verifies that the patient's feet are flat on the floor (no crossed legs)		
Verifies that the patient's back is supported (resting on the back of the chair) or sitting upright		
Verifies that they have selected the appropriate cuff size • Width of bladder in cuff should be ~40% of arm circumference OR • Length of bladder in cuff should be ~80% of arm circumference		
Demonstrates that the blood pressure cuff is placed about 1 inch above the elbow crease		
Verifies the patient's typical blood pressure reading OR states that they would estimate the systolic blood pressure using the patient's radial pulse		
Places the bell or diaphragm of stethoscope over their own brachial artery		
The student states that they are inflating the cuff to 20-30 mm Hg above typical systolic estimate		
The student states that they are deflating the cuff by 2–3 mmHg/second		
Blood pressure reading is within 4mmHg of reading obtained by grader Blood pressure reading obtained _____		
Diabetic foot exam		
Washes or sanitizes hands before performing assessments		
Student inspects both feet for abnormalities		
Student completes questionnaire provided		
Uses monofilament to assess sensation on both feet		
Medication education - Insulin pen		
Informs patient of medication's generic and brand name		
Gathers all needed supplies • Insulin pen • Insulin pen needle • Alcohol wipes • Sharps container		
Instructs patient to wash or sanitizes hands before opening insulin pen cap		
Checks the insulin pen reservoir to make sure the insulin is clear, colorless and has no particles in it		
Attaches the insulin pen needle to the pen device • Wipes the pen tip (rubber seal) with an alcohol swab • Remove the protective seal from the new needle, line the needle up straight with the pen, and screw the needle on		
Primes the pen device using a test dose of 2 units		
Selects the dose of 10 units using the dial and window		
Mentions to cleans injection site with alcohol swab and allows to dry		

Expectations	Performed	Not performed
Counsels to insert needle at 90 degree angle and inject insulin by pressing the injection button all the way down (do not inject content)		
Counsels to count to 10 slowly before removing needle		
Explains to patient appropriate injection sites (abdomen, outer thigh or back of the arm)		
Puts the outer needle cap back on the needle and unscrew the needle from the pen		
Puts the pen cap back on the insulin pen and explains to store at room temperature		
Disposes of pen needle in sharps container. Disposes of alcohol swabs in trash		
Explain the importance of proper disposal: • Used pen needles in a sharps container (or anything impenetrable container) • Pen needle wrapper and alcohol swabs in trash		
Communication Expectations	Performed	Not Performed
Uses appropriate non-verbal expression • Maintains appropriate eye contact • Avoids distracting behaviours		
Uses language appropriate to patient's health literacy • Uses clear, jargon-free language • Uses applicable analogies, examples		

Excellent	Very good	Satisfactory	Unsatisfactory
3	2	1	0
Demonstrates outstanding mastery of assessment skills; provides concise and complete medication education	Demonstrates good mastery of assessment skills; provides complete medication education	Demonstrates average mastery of assessment skills; provides extraneous information consistently given, medication counseling is not always in logical manner	Demonstrates poor mastery of assessment skills; has no grasp of information and medication counseling is illogical in sequence of presentation or severely lacking

Additional comments. Please provide comments below if the student receives a "*satisfactory or unsatisfactory*" global presentation score.

Appendix B: Assessment rubrics for the self-care assessment OSCE station

Expectations	Performed	Not Performed
Gather all needed supplies		
Obtaining a fingerstick blood glucose sample		
Cleanses hands with sanitizer		
Prepares meter by inserting test strip		
Cleans testing site with alcohol wipe		
Allows site to dry thoroughly before testing		
Select site slightly off center of finger, near side or tip		
Prick selected site firmly with lancet		
• Keep hand below the level of the heart		
Squeeze the finger gently near puncture site until a large drop of blood forms		
• Do not "*milk*" the finger or squeeze it excessively		
Cleans out testing site and applies bandage if needed		
Disposes of alcohol wipes and test strips in trash can		
Disposes of lancets in the sharps container		
Vial and syringe self-injection		
Sanitizes hands		
Checks vial for lumps, crystals, discoloration		
Opens vial and wipes top of insulin vial with alcohol swab		
Injects appropriate volume of air into vial		
Turns vial and syringe upside down; remove appropriate amount of insulin		
Makes sure there are no air bubbles in syringe		
• Gently taps out air bubbles		
Cleans injection site with alcohol swab and allow to dry		
Injects saline in abdomen, outer thigh or back of the arm		
Positions syringe at 90°angle (45°if very thin)		
Inserts needle into subcutaneous layer and inject insulin		
Counts to 5 slowly before removing needle		
Disposes of used syringes in sharps container		
Disposes of syringe caps and alcohol swabs in trash		

Global skill assessment

Excellent	Very good	Satisfactory	Unsatisfactory
3	2	1	0
Demonstrates outstanding mastery of assessment skills	Demonstrates good mastery of assessment skills	Demonstrates average mastery of assessment skills	Demonstrates poor mastery of assessment skills

Additional comments. Please provide comments below if the student receives a "*satisfactory or unsatisfactory*" global presentation score.

Appendix C: Implementation steps for the advanced diabetes course

Timeline	Activity	Comments
4 weeks prior	• Contact the American Pharmacist Association for enrollment codes and instruction • Incorporate required certificate elements into the course structure	• Coordinate course supplies • Recruit patients from the community for the patient panel activity • Incorporate APhA module weekly quizzes into Canvas ® learning management platform
Week 1	• Clinical presentation and complications worksheet • Patient panel discussion and reflection	• Coordinate parking and remuneration for panelist (incorporated into course fees)
Week 2	• Pharmacotherapy of diabetes cases (insulin and non-insulin therapies)	• Coordinate supplies for insulin pen and vial/syringe demonstration
Week 3	• Nutrition counseling, physical activity and smoking cessation case activity • 3-day carbohydrate counting simulation activity and reflection	Special populations case activity • Students participated in TBL case assessment with the following patient variables: low-income status, food-drug interactions, obesity and cardiovascular disease comorbidity Carbohydrate counting simulation activity • Students adhered to set carbohydrate goals for 3 days (45g to 75g per meal and 15g to 20g per snack) and documented meals (pictures encouraged) in a nutrition diary • A reflection activity was completed following the activity
Week 4	• Cardiovascular and micro-vascular complications case activity • OSCE preparatory session – self monitoring of blood glucose, self-administration of subcutaneous saline and insulin pen counseling • Medication adherence simulation activity	• Coordinate supplies for the OSCE preparatory session (supplies incorporated into course fees) Medication adherence and insulin management activity • Students were emailed blood glucose readings at random from 7am to 8pm to respond with their treatment plan within an hour for 2 days • Students documented administration of "twice daily Metformin" in a series of timed Canvas® quizzes
Week 5	• Discussion of clinical service pathways for diabetes management • Cost management considerations case activity	Special populations case activity • Students participated in TBL case assessment with the following scenarios: caring for geriatric population, insurance considerations (government versus private)
Week 6	• Comprehensive OSCE assessment • Post OSCE assessment	• Create and validate patient cases • Create and validate assessment rubrics • Recruit and train graders, simulated patients and facilitators • Create OSCE schedule • Secure assessment location and set up supplies • Conduct OSCE assessment • Conduct APhA post-session assessment and evaluation

Appendix D: List of supplies utilised within the advanced diabetes care elective course

Quantity per learner	Item	Notes
2 pairs	Non-latex & non-powder gloves	Need a box of small, medium, and large sizes
3	Bandaids or bandages	
4	Alcohol swabs	
3	Cotton balls	
2	Sodium Chloride 0.9%	Sterile single dosage vial 10 ml or smaller; Check expiration date
3	BD Safety Lok 1cc 29G ½" or BD Ultrafine 3/10 cc 30G ½"	
1	Insulin injection demo pens	For demonstration purposes only, not for self-injection
3	Ultra-fine pen needles	For demonstration purposes only, not for self-injection
1	Glucometer with manuals	
3	Test Strips	Should be able to be used with selected meters at programme; check expiration date
3	Lancets	Must be single use safety lancets
2	Monofilaments	
Supplies provided by the college and not included in course fees		
1	Diabetic foot	
10	Double teaching stethoscopes	
10	Sphygmomanometer	Need small adult, adult, large adult and extra-large adult sizes
10	Sharps container	