TEACHERS' TOPICS

Development of a Pharmacy Capstone Course From Focus Groups to Advanced Patient Care

Jeannie Kim Lee, PharmD, Janet H. Cooley, PharmD, Natalee E. Tanner, PharmD,
Courtney N. Hanauer, PharmD, Danielle M. Schiefer, PharmD, Richard N. Herrier, PharmD

University of Arizona College of Pharmacy

Objective. To describe the development of a capstone course using qualitative results of focus groups and to determine the impact of the course using a pre- and postcourse surveys.

Design. A course titled Advanced Patient Care was developed using themes emerged from 3 stakeholder focus groups and implemented with case-based sessions, interactive exercises, and Objective Structured Clinical Examinations (OSCEs). Pre- and postcourse surveys were conducted to assess the students' confidence and knowledge in managing 8 commonly-encountered conditions.

Assessment. During the 2-year course implementation, a total of 169 students participated in the pre- and postcourse surveys (87.6% response rate). The mean total confidence score increased significantly from 54.3 ($\pm$9.2) to 69.0 ($\pm$8.6, $p<0.001$), and the total mean knowledge score increased significantly from 6.3 to 6.9 ($p<0.001$).

Conclusion. The capstone course, fueled by focus group findings and implemented using interactive sessions and simulations, positively impacted students' confidence and knowledge for clinical practice experiences and professional practice.

Keywords: Capstone course, pharmacy curriculum, pharmacy student, focus group, survey

INTRODUCTION

The practice of pharmacy is constantly evolving. We have seen the practice of pharmacy shifting to emphasize patient-centered care and pharmacists playing a vital role as a provider in health care teams.[1-3] The 2011 report to the US Surgeon General makes the argument for the recognition of pharmacists as health care providers, which is based on evidence that pharmacists who "manage disease through medication use and deliver patient care services" demonstrate favorable outcomes.[1]

There is a need in doctor of pharmacy (PharmD) curricula to teach this level of care and prepare our students to be practice-ready to provide patient-centered care. In a 2011 update, the Accreditation Council for Pharmacy Education (ACPE) Standards reinforced such teaching with curriculum guidelines for schools and colleges of pharmacy to teach to professional standards so that PharmD graduates can provide patient-centered care.[4] Additionally, the most recent Center for the Advancement of Pharmacy Education (CAPE) Educational Outcomes present a framework to help define a graduate

from PharmD programs that can provide patient-centered care.[5] These national organizations provide guidance, but it can be challenging for individual schools and colleges of pharmacy to find ways to meet these expectations effectively and efficiently.

At the University of Arizona College of Pharmacy, the Curriculum Committee charged a sub-committee to create a capstone course as a venue for students to harness didactic and early experiential education and to apply their training to patient cases and simulations using critical thinking. The capstone course was designed to meet the ACPE standards and prepare the students for their Advanced Pharmacy Practice Experiences (APPEs) and beyond. Capstone experiences or courses have been used by other colleges of pharmacy in both didactic and experiential instruction.[6-8]

It was important to create the course strategically so that it better reflected pharmacy practice and the connection between education and the real clinical world. Additionally it was important to solicit insights and feedback from a variety of stakeholders. One way to make this connection was through the use of focus groups among the various stakeholders.[9,10] Focus groups can be helpful in collecting qualitative data and generating new ideas.[10] In this case, the focus groups were conducted among key

Corresponding Author: Jeannie Kim Lee, PharmD, University of Arizona College of Pharmacy, 1295 N. Martin Ave., P.O. Box 210202, Tucson, AZ 85721-0202. Tel: 520-626-9419. Fax: 520-626-7355. E-mail: jlee@pharmacy.arizona.edu

stakeholders to both reinforce envisioned plans and stimulate new ideas for the capstone course development.

In this paper, we describe the design of the capstone Advanced Patient Care course using focus groups, share the course content, and present the evaluation data from a 2-year implementation of the course on student self-confidence and knowledge.

DESIGN

Three focus groups were assembled to determine information and clinical skill sets the student pharmacists would need to be successful in APPEs and clinical practice. A total of 14 subjects participated in a 90-minute session in 3 separate stakeholder groups: (1) fourth year PharmD students who were on clinical practice experiences (n=5); (2) new practitioners, including pharmacy residents, who graduated from the same PharmD program (n=4); and (3) APPE preceptors who had been actively precepting the pharmacy students from the program for at least 2 years (n=5). Table 1 shows the major themes that emerged as important areas for the capstone course and were seriously considered during the Advanced Patient Care course development. Specific learning techniques were the most frequently discussed topic among all groups, with hands-on training and clinical application being the most commonly discussed subtopics.

An assessment tool (pre- and postcourse survey) was designed to measure the impact of the course on preparing the students for their clinical practice experience and future professional practice. The central hypothesis was that this course would positively impact the students' self-assessed confidence level and clinical knowledge. Specifically, the pre- and postcourse survey was designed during the capstone course development to assess the student's self-confidence and knowledge in managing the 8 commonly encountered conditions, which were the focus of the course. The survey was pilot-tested with the students who took the initial elective course and was modified and used in the required course implementation. The students' level of self-confidence in clinically managing patients with the specified disease states was measured using 17 questions on a 5-point Likert-type scale, while their knowledge was assessed using 8 multiple-choice questions. There were no questions regarding polypharmacy or depression/anxiety as these sessions were added after the 2-year implementation of the capstone course. Demographic variables included: age, gender, students' work experience length and setting, and grade achieved in prior pharmacotherapeutics courses. The self-confidence items were developed based on the survey structure used by Blouin et al in their study on the effect of a review course on emergency medicine residents' self-confidence.[18] The

8 knowledge-based questions centered on medication recommendations and therapeutic goals that would deem the disease controlled. The 10-minute pre- and postcourse surveys were administered during the first class session and last class session, respectively, when the course coordinator was not present. Students who were absent on either of the survey days were excluded from the study. A coding scheme was used to match the pre- and postsurveys, similar to Blouin study process, which maintained anonymity of the participants. The pre- and postcourse survey results were compared using a paired t test.[19,20] For all comparisons, the a priori alpha level was 0.05. Both the focus groups and survey study were approved by the University of Arizona Human Subjects Protection Program and Institutional Review Board.

The capstone course learning objectives are shown in Table 2, which are mapped to the 2013 CAPE Educational Outcomes[5] as well as Bloom's Taxonomy[11] and Fink's Taxonomy.[12] Standardized scoring and assessment rubrics are used to verify competencies in areas such as: conducting a patient interview for acute and chronic disease management, performing medication reconciliation, and assisting the patient to improve medication adherence; understanding therapeutic goals, evaluating disease control and complications, and appropriately applying practice guidelines for each diagnosis; identifying, resolving, and preventing drug-related problems; and recognizing the pharmacist's role in an interprofessional team during rounds or care plan meetings.

The Advanced Patient Care course was developed and implemented as the capstone course of the University of Arizona College of Pharmacy in Tucson, Arizona (a single-campus environment). The course was tested as a 2-credit, pilot elective course in the spring 2011 semester and implemented as a 3-credit required course in the spring 2012 semester (a single 170-minute learning session per week). Registration for the 25 slots in the pilot course overflowed within minutes of its announcement, which may have meant there was a sense of need for such course experience among the students. The capstone course, a prerequisite to APPEs, was offered to the third-year PharmD students (up to 100) in the semester just prior to APPEs. Such course placement served as a good environment for testing students' clinical comprehension and application.

The Advanced Patient Care course was coordinated by one clinical faculty member who had practice experiences in ambulatory care, home care, and acute care settings. The faculty member was a Board Certified Pharmacotherapy Specialist and Certified Geriatric Pharmacist and maintained active clinical practice as part of interprofessional teams in Home-Based Primary Care at

Table 1. Focus Group Results Used to Develop the Capstone Course

Major Theme	Discussion Points
Specific learning techniques	Use active learning techniques to engage students
	• Involve students rather than give lectures
	• Focus on small groups
	• Conduct student teaching
	Use technology
	• Videotape students for self-evaluation
	Interact with "real patients"
	• Develop listening and communication skills
Specific drugs or diseases	Increase exposure to infectious diseases and antibiotics use
	• Learn empiric therapies
	• Identify antibiotics for patients with decreased renal and hepatic function
	• Identify common infections in the inpatient setting and intravenous medications used
	Practice pain management
	• Dose conversion
	• Patient Controlled Analgesia (PCA)
Specific patients	Manage patients with multiple comorbidities
	• Treat the whole patient
	• Provide transitions of care
	Manage patents with polypharmacy
	• Perform medication reconciliation
	• Screen for drug interaction
Clinical skills	Evaluate and apply clinical guidelines
	Prioritize important problems
	Workup patient previsit and preround
	Evaluate lab values
	Document using SOAP[a] notes
	Keep up with current literature
	Apply or evaluate statistics
	Recommend common doses
	Convert PO to IV and IV to PO[b]
Professionalism	Improve professionalism
	• Prepare for clinical and interprofessional practice
	• Know how to handle responsibilities
	• Determine if reasonable expectations are placed on students
	Handle constructive criticism
	• Put students on the spot and challenge them
	• Teach it is okay to say "I don't know"
	• Force them to commit to an answer even if it is wrong
	• Provide an opportunity to be wrong and learn from it

[a] SOAP = subjective, objective, assessment, plan.
[b] PO = by mouth; IV = intraveneous.

the Veteran's Affairs Health Care System and University Medical Center-based clinic. A full-time teaching faculty member, who had extensive practice experience in the Indian Health Service, served on the curriculum subcommittee during the course development and assisted the course coordinator during in-class exercises and Objective Structured Clinical Examinations (OSCEs). Each of the commonly encountered conditions targeted in the capstone course was covered by a pharmacist expert who either was in practice at the time or had practiced in the specific area. All speakers were either clinical faculty members or preceptors of the college (and therefore a stakeholder of our students' success) and were recruited by the course coordinator.

A large classroom (120-student capacity), fully equipped with audio-visual teaching technology and flexible for small group formation, was used for the course. The OSCEs were held in the college of pharmacy clinical

Table 2. Learning Objectives of the Advanced Patient Care Course and Their Alignment with 2013 CAPE Educational Outcomes, Bloom's Taxonomy, and Fink's Taxonomy

Learning Objectives for Advanced Patient Care Course		CAPE Educational Outcome Domains[5]	Bloom's Taxonomy[11]	Fink's Taxonomy[12]
Using patient interviews/visits, verify competencies in:	Asking open-ended questions	3.6	K, Ap	FK, Ap
	Establishing expectations/goals of the visit	3.6	K, Ap	FK, Ap
	Acquiring thorough chief complaint history	2.1	K, Ap	FK, Ap
	Conducting a patient visit as the primary provider for a patient with a chronic condition	2.1	K, Ap	FK, Ap
	Obtaining pertinent medical history, complete medication history, important social and family histories	2.1, 3.6	K, Ap	FK, Ap
	Assisting patients in improving medication adherence or other behavioral changes	3.1, 3.2	Ap, An	Ap, I, HD, Ca
	Performing medication reconciliation and generating a complete list of current medications including Rxs, OTCs, vitamins, and herbals	2.1, 2.2	C, Ap	FK, Ap
Using patient cases, patient encounters, or OSCE/CSA-type experiences, verify competencies in:	Identifying therapeutic goals, evaluating disease control, and identifying complications in patients with the 8 conditions, including risk stratifications	1.1, 2.1	K, C, Ap	FK, Ap
	Appropriately applying practice guidelines for diagnosis and treatment of the 8 diseases in order to select suitable therapeutic options	1.1, 2.1, 3.1	C, Ap, An	FK, Ap
	Using patient's lifestyle, co-morbidities, adherence, and preferences to formulate an optimal pharmacotherapy regimen	2.1, 3.1	An, S	Ap, HD
	Adjusting medication regimen to meet therapeutic goals and avoid adverse effects	2.1, 3.1	C, An, S	Ap
	Ordering/interpreting pertinent labs and setting self-monitoring parameters for the 9 conditions	1.1, 2.1	K, An, S, E	FK, Ap, HD
	Explaining monitoring and follow-up plans for medications used	3.2, 3.6	K, C	I
	Clearly communicating educational information regarding disease management and pharmacotherapy using literacy-sensitive language and tools (eg, show-and-tell method)	3.2, 3.5, 3.6	Ap, S	Ap, I, HD, Ca
	Verifying patient understanding of medication use (eg, teach-back method)	3.6	C, An, E	Ap, HD

(*Continued*)

laboratory and college of medicine teaching laboratory. The pharmacy laboratory contained a central sitting area that accommodated 25 students with 7 individual patient examination rooms in front and on the side. The college of medicine laboratory contained a central reception area surrounded by 10 individual patient examination rooms. We also utilized small group rooms adjacent to this laboratory for the previsit planning portion of the OSCEs.

The primary objectives of the capstone course, with its interactive activities, followed "learner-focused"

Table 2. (*Continued*)

Learning Objectives for Advanced Patient Care Course		CAPE Educational Outcome Domains[5]	Bloom's Taxonomy[11]	Fink's Taxonomy[12]
Using patient cases and peer simulations, verify competencies in:	Identifying pharmacist's role in an interprofessional team during rounds or care plan meetings	3.4	K	HD, I
	Incorporating pertinent physical findings and lab values in therapeutic decisions	1.1, 2.1	Ap, An, S	Ap
	Evaluating medication profiles and identifying drug-related problems (DRPs; including drug without indication, untreated indication, correct dose, adverse drug reaction, drug interaction, allergies/intolerances, nonadherence)	1.1, 2.1	C, An, E	FK, Ap
	Making recommendations to resolve DRPs and prevent future DRPs	1.1, 2.1, 3.1	S	Ap
	Effectively communicating and justifying pharmacotherapy recommendations to collaborative health care team	3.4, 3.6	E	Ap, I, HD
	Thoroughly yet concisely documenting patient encounter and pharmacotherapy recommendations using SOAP format	2.1, 3.6	K, C, Ap	FK, Ap
Using basic physical exam, point-of-care testing, and standardized scores, verify competencies in:	Obtaining vitals (eg, BP, P, pain)	2.1	K	FK
	Assessing patient health through inspection/observation and focused examination (eg, edema, monofilament test, skin lesions such as "drug rash")	2.1	An, E	FK
	Operating devices appropriately (eg, peak flow meter, glucometer, lipid monitor)	2.1	K, Ap	FK, Ap
	Assessing cognitive function via interview (eg, MMSE)	2.1	C, E	FK, Ap

Abbreviations: EO=meets education outcomes; K=knowledge; Ap=application (appears in both Bloom's and Fink's Taxonomy with varying definitions); E=evaluation; An=analysis; S=synthesis; C=comprehension; FK=foundational knowledge; In=integration; HD= human dimension; Ca=caring; L=learning how to learn.

andragogy rather than "teacher-focused" pedagogy[13] (see Table 2). The class sessions consisted of patient case (real or simulated) discussions, case-based simulations (paired or triad exercises), case-based small group exercises (4 to 5 in each group), and OSCEs. Each session covered by the expert faculty member or clinician was required to be case-based with brief updates when necessary, without duplicating pharmacotherapeutics lectures (eg, when a new clinical guideline has been released). If the speaker recognized a gap in student knowledge during an interactive case-based activity via puzzled looks or lack of interaction, they presented a brief review and pointed to resources students could use to bridge the gap. Thus, using knowledge and comprehension as foundation, application, analysis, synthesis, and evaluation were emphasized in the capstone course.

The established philosophy and procedures of the capstone course were maintained by the course coordinator who worked directly with each expert speaker during session development on active learning strategies and assisted in the classroom during session implementation. The coordinator also interfaced often with students to ensure optimal learning in the course, starting even before the course began. Approximately 3 weeks prior to the first

day of the class, the course coordinator e-mailed the third-year students a "How to Prepare for Advanced Patient Care Course" memo, which illustrated the purpose of the course, and previous course materials to organize and review before the capstone course.

The Advanced Patient Care course originally focused on 8 commonly occurring acute and chronic conditions. After the 1-year pilot implementation as an elective course, where several speakers honed their case-based session skills and various in-class exercises were tested for feasibility and time, the 3-credit required course content was finalized. There are now 15 expert speakers in the capstone course, and each speaker or a pair of speakers lead a 60- to 90-minute session comprising the following topic areas: (1) review of patient interview and subjective, objective, assessment , plan (SOAP) note writing, (2) health care statistics review, (3) hypertension cases, (4) dyslipidemia cases, (5) diabetes cases, (6) acute coronary syndrome cases and acute care rounds, (7) heart failure cases, (8) pain management cases, (8) asthma/chronic obstructive pulmonary disease cases, (9) common infections cases, (10) community pharmacy practice cases, (11) polypharmacy cases, and (12) depression/anxiety cases. The sessions for polypharmacy cases and depression/anxiety cases were added after the 2-year implementation of the course because these were identified by preceptors and graduating students as areas of need. The case-based sessions were highly interactive and intentionally designed for student engagement. For example, many speakers used the cases to poll students to assess their clinical knowledge, to assign small group activities to apply the clinical knowledge, and to have students analyze patient data to design patient-centered pharmacotherapy plans, propose monitoring plans, and document the plans using SOAP notes.

Diverse and creative in-class exercises were conducted in the course to supplement the case-based speaker sessions. Students earned participation points for 10 exercises, which were incorporated into their final grade along with their OSCE grades. Examples of the in-class exercises included writing SOAP notes (individual assignment), interviewing patients (paired teams), identifying drug-related problem on a patient profile (2-3 students in each team), conducting patient, preceptor, and student simulation (triad teams), taking a paper OSCE (5-6 students in each team), simulating psychiatry patient interviews (15-18 students in each team), and interviewing real patients (large class).

OSCEs replaced written examinations in the course because we sought to provide realistic simulations to prepare the students and assess student competencies. OSCEs have been studied as an assessment tool for competencies and problem-based learning in pharmacy programs.[14-16] Because there was no budget allotted for the capstone course, utilizing standardized patients in the OSCEs was not viable. A study of the pharmacy OSCE found that using first-year students as standardized patients was feasible, and the reliability and validity of the faculty member and student ratings did not change when compared to using standardized patients.[17] We decided to use the second-year student volunteers, who were in the second of the 3 pharmacotherapeutics series and had a fairly good knowledge-base to play the patient comfortably. Additionally, the volunteers could apply what they learned through the OSCE experience in the next year when they were enrolled in the capstone course. Finally, it was logistically possible because the second-year students did not have conflicting classes during the OSCE sessions.

Each OSCE was designed to fit 100 students completing the entire process within a 3-hour period of class time. The process included previsit planning (15 minutes), patient encounter (20 minutes total [10-minute patient interview, 5 minute presentation to preceptor and 5 minute patient counseling]), SOAP note documentation (20 minutes), and SOAP grading (5 minutes). Therefore, each student had 1 hour to complete their OSCE from start to finish. Up to 17 students participated in each of the 6 OSCE blocks. One OSCE coordinator oversaw the process in the pharmacy laboratory (7 patient rooms), and the college of medicine laboratory required 2 coordinators because of the higher number of patient rooms used (10 total) and coordination of the adjacent previsit planning areas (4 rooms). Inside each patient room, a preceptor observed and evaluated patient interaction and clinical decision making using a rubric developed specifically for the OSCE. After the student finished documenting the patient encounter using a SOAP note, they self-graded it using a key and a grading rubric. Following the OSCE session, the course coordinator reviewed and standardized grading by multiple and diverse preceptors and students. Eighty percent of the OSCE grade came from the patient encounter portion and 20% from the SOAP note documentation.

EVALUATION AND ASSESSMENT

One hundred sixty-nine third-year students who completed both the pre- and postcourse surveys were included in the analysis (87.64% response rate). The demographic characteristics of the participants are shown in Table 3.Tthe majority of participants were between 18 and 35 years of age with the male to female ratio of 65:101. Most students had 2 or more years of pharmacy work experience, the majority in community/retail

Table 3. Demographic Data of Pre- and PostCourse Survey Participants

Parameter	n=169
Age	
18-25	82
26-35	76
36-45	7
46-55	0
59-65	1
No response	3
Gender	
Male	65
Female	101
No response	3
Year of pharmacy work experience	
≤ 1	43
≥ 2	116
No response	10
Settings in which students reported work experience	
Institutional/Hospital	33
Community/Retail	92
Other	33
No response	46
Pharmacotherapeutics I Grade	
A	136
B	25
C	2
No response	6
Pharmacotherapeutics II Grade	
A	84
B	72
C	7
No response	6

settings, and grades for the 2 previously completed pharmacotherapeutics courses were similarly distributed.

The summary of pre- and postcourse survey comparisons are shown in Tables 4 and 5. Prior to participating in the capstone course, students' total mean confidence score was 54.3 ($\pm$ 9.2) out of a possible 85, while at the completion of the course, the total mean confidence scores increased significantly to 69.0 ($\pm$ 8.6, $p<0.001$). The lowest and highest mean confidence scores on the precourse survey were for serving as a pharmacy member of an acute care team during rounds (item 11) and taking a complete medication history (item 1), respectively. In the postcourse survey, the lowest mean confidence score remained the same, whereas the highest mean confidence scores were shared among the following items: taking a complete medication history (item 1), educating patients on hypertension management, including medication regimen history (item 3), educating patients on dyslipidemia management, including medication regimen history (item

4), and providing chronic disease and medication education to patients and/or caregivers (item 17).

Prior to participation in the capstone course, students' total mean clinical knowledge score was 6.3 ($\pm$ 1.1) out of a possible 8, which increased significantly to 6.9 ($\pm$ 1.1, $p<0.001$) at the completion of the course. In the precourse survey, the lowest knowledge score was on "proper medication selection for heart failure" (item 5) with a mean of 38% correct responses. However, students displayed a significant increase in knowledge in this area on the postcourse survey resulting in a mean of 72% correct responses ($p<0.001$). Other items that demonstrated a significant increase in the percent of correct responses included medication selection for pain management (item 6) and medication selection for infectious disease (item 8). After the capstone course ended, a request for comments was sent to students while on their APPE. The feedback highlighted the importance of and effectiveness of elements of the course including simulation activities (taking the OSCE, writing SOAP notes, evaluating medication profiles, generating therapeutic plans, presenting to preceptors, and educating patients), in preparing the students for clinical practice experience. Additionally, a preceptor who had extensive experience working with the college's third-year students on Medication Management Center practice experience commented, "I absolutely feel like those students who practiced applying the generalizations we make in therapeutics to individual patients in the Advanced Patient Care course did much better when they had to apply these concepts to real patients."

DISCUSSION

The capstone course was designed to equip students with tools for critical thinking and application of clinical knowledge and skills using simulated activities. The systematic approach of course design from focus groups to pilot testing to implementation resulted in not only a comprehensive syllabus that mapped directly to multiple domains in the CAPE Educational Outcomes,[5] but was well received by students and preceptors.

The primary finding of the pre- and postcourse surveys was a significant increase in students' level of confidence for all items after participating in the capstone course. The largest increase in confidence score occurred for 3 items: serving on an acute care team (item 11), conducting an initial and follow up visit for patients with dyslipidemia (item 14), and conducting an initial and follow-up visit for patients with type II diabetes (item 15). Item 11 was rated the lowest in the precourse survey; therefore, it had a wider gap for improvement. The results of items 14 and 15 were not surprising because the course specifically focused on disease management, with an

Table 4. Student Self-Confidence Rating Pre- and PostAdvanced Patient Care Course

Abbreviated Item Description[1]	PreTest[2]	PostTest	*P* Value[3]
Take a medication history	3.8 (0.8)	4.4 (0.6)	<0.001
Assess for drug-related problems	3.2 (0.7)	4.1 (0.7)	<0.001
Educate patients on hypertension	3.6 (0.8)	4.4 (0.6)	<0.001
Educate patients on dyslipidemia	3.6 (0.8)	4.4 (0.6)	<0.001
Educate patients on diabetes	3.4 (0.7)	4.2 (0.9)	<0.001
Educate patients on heart failure	2.8 (0.8)	3.7 (0.8)	<0.001
Educate patients on asthma/COPD	3.3 (0.8)	4.2 (0.6)	<0.001
Educate patients on coronary artery disease/ myocardial infarctions	2.9 (0.8)	3.7 (0.8)	<0.001
Educate patients on common infections	2.8 (0.8)	3.7 (0.9)	<0.001
Educate patients on pain management	3.1 (0.9)	3.6 (0.9)	<0.001
Serve on acute care team	2.2 (0.8)	3.4 (0.8)	<0.001
Provide chronic disease management service	3.0 (0.8)	4.1 (0.8)	<0.001
Conduct an initial and follow-up visit for patient with increased blood pressure	3.2 (0.9)	4.3 (0.7)	<0.001
Conduct an initial and follow-up visit for patient with hyperlipidemia	3.1 (0.8)	4.3 (0.7)	<0.001
Conduct an initial and follow-up visit for patient with type II diabetes	3.0 (0.8)	4.2 (0.8)	<0.001
Perform medication reconciliation	3.7 (1.1)	4.2 (0.8)	<0.001
Provide chronic disease and medication education	3.4 (0.8)	4.4 (0.7)	<0.001
Total Mean Score	54.3 (9.2)	69.04 (8.6)	<0.001

[1] Students were asked "How confident are you that you can:" and responded using a 5-point scale: 1=Not at all confident to 5=Very confident.
[2] Data reported as mean (standard deviation).
[3] *P* value using a *t* test.

emphasis on direct patient care. The smallest change, although still significant, was in students' self-confidence when educating patients on pain management, including formulating a medication regimen (item 10) and performing medication reconciliation (item 16). This suggested a need for better coverage and more practice in pain management and medication reconciliation. Because pain management is very complex, with even seasoned pharmacy clinicians having difficulties, there was no OSCE session based on a pain case, which limited students'

hands-on practice in pain management. Overall, students felt more confident when consulting patients regarding disease management and recognizing therapeutic goals and complications after completion of the capstone course.

The total mean score for clinical knowledge increased significantly, but this was not true for every item examined. Students displayed a significant increase in knowledge regarding the management of heart failure (item 5), the proper selection of pain medication (item 6), and infectious disease (item 8). The largest increase

Table 5. Student Knowledge Pre- and PostAdvanced Patient Care Course

Primary conditions assessed by the knowledge question	PreTest[1]	PostTest	P Value[2]
Asthma/ COPD	0.86 (0.34)	0.87 (0.34)	0.842
Hyperlipidemia	0.92 (0.26)	0.97 (0.17)	0.057
Hypertension	0.89 (0.32)	0.89 (0.31)	0.62
Type II Diabetes	0.92 (0.27)	0.88 (0.33)	0.18
Heart Failure	0.38 (0.49)	0.72 (0.45)	<0.001
Pain Management	0.83 (0.37)	0.93 (0.25)	0.004
Coronary Artery Disease	0.77 (0.42)	0.77 (0.42)	1
Infectious Disease	0.66 (0.47)	0.80 (0.40)	0.005
Total Mean Score[3]	6.23 (1.1)	6.9 (1.1)	<0.001

[1] Data reported as mean number correct for each item (standard deviation).
[2] *P* value using a paired t-test.
[3] Total possible score equals 8.

in knowledge pertained to the management of heart failure. The students displayed a non-significant decrease in knowledge regarding the management of diabetes (item 4) in the postcourse survey, and some of the knowledge scores resulted in no difference. This is likely due to high baseline levels, which may imply that students were retaining curriculum content covered prior to the capstone course, a desired pattern. Yet, with only 1 question being assigned to each of the 8 conditions, the interpretations of the findings were limited.

To our knowledge, this was the first study to attempt to demonstrate the benefits of an innovative capstone course in a PharmD curriculum. However, studies have been done using similar pre- and postinstrumentation to assess the level of confidence following an event. James et al evaluated pharmacy students and the use of simulated patients in teaching consultation skills.[21] Confidence was determined using a 4-item assessment that was measured on a 5-point Likert scale. Perceived difficulty was also determined using a 4-item assessment but was measured on a 7-point negative differential scale. Postprogram confidence levels increased significantly from 13.7 ± 3.4 to 14.5 ± 3.2, with 82% scoring high on the confidence scale ($t=5.9$, $p<0.01$).[21] Whereas, perceived difficulty decreased significantly from 15.8 ± 4.5 to 13.7 ± 4.1 ($t=4.0$, $p<0.01$).[21] These results were similar to current pre- and postcourse evaluation in that they demonstrated how pharmacy students' perceptions of patient encounter improved when adopting programs using simulated patients.

A prospective study conducted by Blouin et al evaluated the impact of the Canadian National Review Course in Emergency Medicine on individuals' self-assessed confidence.[18] They evaluated 46 postgraduate, fifth-year emergency medicine residents over a period of 2 years after a course that lasted 3 and-a-half days. All course participants were administered a pre- and postcourse confidence questionnaire that used a 5-point Likert-type scale. The course significantly increased the residents' overall self-confidence ($p<0.001$), confidence in their knowledge and its application ($p<0.001$), and confidence in their study strategies in both the recognition of their knowledge ($p<0.001$) and its application mastery ($p<0.001$).[18] Even though this was a much shorter course compared to the current semester-long capstone course, both evaluations found that confidence levels were significantly increased as a result of participation.

Neither course implementation nor the pre- and postcourse evaluation may be generalizable to other PharmD or health professional courses, yet some learned lessons may be translatable. In the process of drafting this article, we realized that some contents covered in the capstone course were not reflected in the learning objectives to be mapped to the CAPE Educational Outcomes[5] or Fink's Taxonomy.[12] For instance, even though specific contents in the course dealt with patient advocacy and caring for the patient, the learning objectives needed to be modified to include these. We also learned of the outcomes that were only slightly touched upon in the capstone course and students may need better exposure, such as cultural competency and interprofessional collaboration (CAPE outcomes[5]). Whereas, "learning how to learn" (Fink's Taxonomy[12]) was not covered in the capstone course, though students should have discovered this earlier in the curriculum. Cultural competency will be addressed in another course students participate in prior to the capstone course, so competency assessment will become the focus. We envision developing an interprofessional OSCE to assess collaboration readiness of our health professions students, which will fill the gap. Although acquiring and retaining knowledge on commonly encountered conditions is important for PharmD students, being confident in what they know can help them focus on areas in which they are less knowledgeable or comfortable when providing direct patient care. The capstone course was shown to have a positive impact on student confidence across all items assessed, including those that addressed direct patient care.

SUMMARY

Focus group findings provided excellent insight and direction for the development and implementation of a capstone course within a PharmD curriculum. The capstone course consisted of multiple active learning strategies for application of clinical knowledge and skills and simulated activities and OSCEs for assessment and evaluation. When evaluated using pre- and postcourse surveys, the student knowledge level for certain conditions and the students' self-confidence level for clinical management increased significantly after participating in the capstone course. The capstone course proved to be a valuable addition to the curriculum that helped cultivate students who were ready to practice advanced patient care.

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