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Research Article

Longitudinal Exploration of Strategies Advancing Continuing Professional Pharmacy Education in a Major University: an in-Depth Study on Impact

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Abstract

Background: In the dynamic healthcare landscape, pharmacists contend with the challenge of staying current with evolving knowledge. Continuing Pharmacy Education (CPE) programs, play a pivotal role in addressing this need. This study focuses on a six-year evaluation of CPE programs at a College of Pharmacy, aiming to assess the impact of a multifaceted approach on various educational outcomes.

Materials and Methods: The University College of Pharmacy Office of Continuing Professional Education implemented a multifaceted approach from 2017 to 2022. Changes included hiring a full-time coordinator, offering on-site and online programs, establishing partnerships, identifying knowledge gap through surveying participants, and enhancing digital presence beyond others. Data from this period were compared with the preceding six years (2010-2016). Evaluation metrics covered attendee the number and diversity, program growth, and professional impact.

Results: The study showcased significant improvements in various aspects of CPE programs. Pharmacist attendees increased by 816.67%, with a notable rise in non-pharmacy participants. Geographical distribution saw a surge in out-of-state and international participants. Program content witnessed a shift towards infectious diseases and pain management. The number of CPE programs and awarded hours experienced a fivefold increase, reflecting a commitment to a diverse curriculum. Participant feedback consistently indicated high satisfaction with knowledge enhancement, applicability, and program usefulness.

Conclusion: Over the six-year period, the evaluation revealed substantial advancements in our CPE programs. Increased pharmacist attendance, diversified participant engagement, and expanded geographical reach underscored the program's success. The exponential growth in program offerings reflected a commitment to diverse and extensive education. Positive participant feedback, indicating sustained impact on drug therapy management, patient safety, and public health outcomes, affirmed the enduring effectiveness of the CPE programs. While acknowledging study limitations, this comprehensive analysis highlights the success and ongoing efforts to enhance CPE programs at major university. Future research should address these constraints for a more nuanced understanding of CPE program impact.

Kew Words: pharmacy; students; survey; continuing education; professional development; participant satisfaction

Introduction

In today's dynamic healthcare landscape, where advancements occur at an unprecedented pace, pharmacists face the constant challenge of staying current with evolving knowledge and best practices. Continuing Pharmacy Education (CPE) programs play a vital role in equipping them with the necessary skills and expertise to deliver optimal patient care. Although there are non-academic institutions offering CPE, universities, with their vast academic resources and faculty expertise, are key players in the provision of high-quality CPE programs. However, the effectiveness of CPE programs

must be continuously evaluated and improved to ensure they remain relevant and meet the evolving needs. This requires a multi-faceted approach that addresses various aspects of program design, delivery, and assessment [1].

The demand for continuous learning and professional development among healthcare professionals including pharmacists is driven by several factors: Rapidly evolving medical knowledge; Increasing complexity of healthcare sciences; Emerging technologies and patient expectations among others. These factors highlight the critical role of CPE programs in equipping them with the necessary tools and knowledge to thrive in this dynamic environment.

Academic institutions with Accreditation Council of Pharmacy Education (ACPE) accredited CPE program are uniquely positioned to address the evolving needs of CPE programs through several key strengths: extensive academic resources; highly qualified faculty; diverse program offerings; collaboration and partnerships; and research and evaluation expertise. By leveraging these strengths, they can play a crucial role in ensuring that CPE programs remain relevant, effective, and accessible across diverse practice settings [2].

Several efforts have been made to improve CPE offerings. Recent studies in pharmacy education have identified key strategies for enhancing CPE programs. The integration of technology, including online platforms and e-learning modules, has emerged as a prominent approach, fostering accessibility and engagement among pharmacy professionals [3]. Personalized learning, tailored to individual learner needs, has shown promising results in increasing satisfaction and knowledge retention [4].

Furthermore, the incorporation of interprofessional education (IPE) has gained traction, emphasizing collaboration among healthcare providers to improve teamwork and communication skills [5]. Longitudinal CPE programs, extended over time, have demonstrated effectiveness in sustaining knowledge gains and promoting continuous professional development [6]. Regular assessments with constructive feedback, patient-centered approaches, and the utilization of active learning strategies, such as case discussions, have also been identified as critical elements for program success [7-9]. Additionally, cultural competence training, incorporation of robust evaluation metrics, and alignment with evolving pharmacy regulations contribute to the overall improvement and relevance of CPE programs [10-12]. These trends collectively underscore the ongoing efforts to enhance the quality and impact of CPE programs in pharmacy education.

Despite these study results, there exists a need to enhance these programs to better address participants' knowledge and skills, accommodate diverse pharmacy practices, and effectively evaluate their impact on patient safety and public health outcomes. The focus of this study is to assess the impact of the multifaceted approach on various aspects of educational outcomes including improving participants' knowledge and skills, understanding the impact on diverse pharmacy practices, assessing participant satisfaction, and evaluating the programs' influence on patient safety and public health outcomes.

Material and Methods:

For the past two decades, the University College of Pharmacy Office of Continuing Professional Education has been dedicated to delivering high-quality and up-to-date CPE programs to the DMV area, serving pharmacy and various healthcare professionals. Distinguished as the sole Accreditation Council for Pharmacy Education (ACPE)-accredited College of Pharmacy-based CPE provider in the District of Columbia, the program underwent a significant transformation approximately six years ago. Initially employing a part-time staff member to oversee the office, a strategic decision led to the subsequent hiring of a full-time professional about a year later. This transition catalyzed a series of enhancements within the program, and this paper provides an in-depth exploration of the impact of these changes on the various facets contributing to the program's success.

This study aims to achieve several objectives by examining key data from the two periods representing before and after the implementation of the multifaceted approach. First, it will explore its impact on improving the diversity and demographic trends among program attendees and practice areas across the two periods, providing insights into attendee profiles. Second, the research will delve into the progression of the CPE programs, analyzing changes in the number and focus of annual educational programs and the distribution of awarded CPE hours over the study period. Third, the study will investigate the professional impact of CPE, focusing on its influence on drug therapy management, patient safety, and public health outcomes. Lastly, the research will assess the effectiveness of the CPE programs by analyzing completion rates, participant feedback on knowledge enhancement, and the perceived applicability and usefulness of the programs.

To achieve these objectives, a multifaceted approach was implanted starting in 2017 and monitored it until 2022 (Period 2). We compared the data from this period with the preceding six years, from 2010 to 2016 (Period 1). Our strategies included i) hiring a full time office coordinator, ii) offering both on-site and online program delivery, iii) establishing collaborative partnerships with other accredited healthcare professional institutions, iv) continuously surveying participants to determine in knowledge gap to tailor content to their preferences, v) assessing feedback for continuous improvement, vi) revitalizing our digital presence, vii) conducting continues literature search for new and emerging topics, viii) integrating topics required for pharmacy license renewal particularly in the DMV area, and lastly, ix) engaging students through work-study programs among various other endeavors.

Results

The data was collected over 12 years split into two equal periods. First, we assess the improvement in its impact on the diversity of attendees in terms of overall number and practice areas across the two periods. Tabel 1 shows the attendees professional distribution. The number of pharmacist attendees in all practice areas increased by over 8-fold increase (by 816.67%) from 225 to 2064 between the two periods, indicating a significant rise.

There is a shift in ratio of the professions between the two periods. In Period 1, Pharmacy Professionals constituted in almost in all programs (97.87%), whereas in Period 2, the percentage on non-pharmacy professionals increased showing a major increase (2.1% vs. 14.4% respectively). On the other hand, non-pharmacy professionals include medical doctors, nurses, social workers, lawyers, case managers, etc.

Notably, there was also a substantial shift in the distribution in practice sites. The percentage of hospital vs. community Pharmacists saw a decrease by about 1.5-fold between the two Period (136.73% vs. 52.31% respectively). However, the representation of Pharmacy Technicians remained relatively stable around 5% in both periods. Overall, the table highlights significant alterations in the composition of pharmacy professionals between the two specified periods.

Tabel 1 data also included the changes in the distribution of respondents across different geographical regions during Period 1 and Period 2. The data was collected from our learning management system which requires to create profile, answer questions, and complete an evaluation form for each of the program they attended. In Period 1, participants in the DMV area were the primary attendees of our programs compared to those from outside DMV area (93% vs. 73.3 respectively). However, there were major surge of out of state participants in Period 2 (6.91% to 25.57% respectively). Internationally, there was no representation in Period 1 but it reaches about one percent, although still small (n=7; 1.05%) in Period 2. Another group of participants that increased significantly in Period 2 were students showing an increase in 10-folds from zero to over about ten percent.

Category	Period 1 N (%)	Period 2 N (%)
Profession		
• Pharmacists (Unspecified)	225 (53.32%)	2064 (45.20%)
• Hospital Pharmacists	116 (27.49%)	958 (20.98%)
• Community/Retail Pharmacists	49 (11.61%)	629 (13.78%)
• Pharmacy Technicians	23 (5.45%)	258 (5.65%)
• Nurses & Advanced Practice Nursing Professionals	5 (1.19%)	69 (1.51%)
• MDs, JDs, MSW, Case Managers, etc.	4 (0.95%)	159 (1.51%)
• Students	0 (0.00%)	429 (9.40%)
• Others	0 (0.00%)	55 (1.20%)
Comparative Data		
• Pharmacy Professionals	413 (97.87%)	3909 (85.61%)
• Non-Pharmacy Professionals	9 (2.13%)	657 (14.39%)
• Hospital Vs Community Pharmacist (%)	136.73%	52.31%
• Pharmacy Technicians	23 (5.57%)	258 (5.67%)
States		
• DMV (Total)	229 (93.09%)	1894 (73.38%)
○ Washinton, DC	107 (43.50%)	636 (24.64%)
○ Maryland	106 (43.09%)	969 (37.54%)
○ Virginia	16 (6.50%)	289 (11.20%)
• Other US States	17 (6.91%)	660 (25.57%)
• International	0 (0.00%)	27 (1.05%)
Cities (DMV area)		
• Washington DC	93 (75.61%)	600 (54.55%)
• Silver Spring, MD	21 (17.07%)	322 (29.27%)
• Hyattsville, MD	0 (0.00%)	69 (6.27%)
• Bowie, MD	6 (4.88%)	61 (5.55%)
• Alexandria, VA	0 (0.00%)	48 (4.36%)
• Arlington, VA	3 (2.44%)	0 (0.00%)

Table 1: Demographic data of program attendees between the two periods.

The second objective was to assess the impact of the multimodal faucet on changes in the number educational programs and awarded CPE hours over the study periods. Table 2 presents the distribution of CPE programs categorized by disease states across the two periods. Notable shifts in emphasis on specific disease states are observable between the two periods, providing insights into the evolving focus of CPE programs over time. The 3 areas that dominated during both periods were topics related to infectious diseases including HIV/AIDS. This may be influenced by continuously emerging infectious threats and the importance of staying updated on relevant practices, especially considering global events such as the COVID-19 pandemic.

The jump in pain management and opioids related topics during Period 2 is because our office received funding from REMS Producing Companies (RPC) through the Food and Drug Administration (FDA) at 3 different times to increase awareness in recognizing and management of the opioid epidemic.

	CATEGORIES	Period 1 = N (%)	Period 2 = N (%)
1	Infectious Diseases (non-HIV/AIDS)	7 (12.96%)	57 (16.76%)
2	HIV/AIDS	9 (16.6%)	75 (22.06%)
3	Pain Management and Opioids	0 (0.00)	24 (7.06%)
4	Cardiovascular Diseases	2 (3.70%)	9 (2.65%)
5	Diabetes	4 (7.41%)	7 (2.06%)
6	Mental Health	0 (0.00)	3 (0.88%)
7	Renal Disease	3 (5.56%)	6 (1.76%)
8	Educational Methods	7 (12.96%)	48 (14.12%)
9	Rheumatic Conditions	7 (2.96%)	2 (0.59%)
10	Transplant	5 (9.26%)	0 (0.00)
11	Miscellaneous/Other	10 (18.52)	109 (32.06%)
	Total	**54 (100)**	**340 (100)**

Table 2: The CPE programs by disease states between the two periods

As illustrated in Table 3, the comparison between the 53 programs presented in Period 1 and the 340 programs in Period 2 reveals a remarkable exponential increase in the overall number of CPE programs. This signifies a 5-fold growth (541.51%) in the offerings. Notably, the average CPE programs per year also has shown a significant surge from around 9 during Period 1 to approximately 57 in Period 2.

Year	Number of CPE Programs Provided
Period 1	
• Period 1 ((19 +34)	53
Total for Period 1	**53**
Period 2	
• 2017	39
• 2018	29
• 2019	39
• 2020	62
• 2021	60
• 2022	66
• 2023	45
Total for Period 2	**340**

Table 3. Total Number of Educational Programs provided by year.

Table 4 provides data on the total number of CPE hours provided and CPE hours awarded across the two study periods. During Period 1, a total of 334.5 CPE hours were awarded (Average 47.8/Year). Subsequently, in Period 2, the number of CPE hours provided and awarded increased each year, reaching a total of 548.25 CPE hours (Average 91/year). The total number of CPE hours awarded was 7,097 CPE hours which is a 12-fold increase.

Year (No. of Programs)	CPE Hours	Total CPE Hours Awarded
Period 1: (48+46.25+50+42+50.8+35.75+61.75)	**334.5**	**334.5**
Period 2	**548.25**	**7,097**
• 2017 (N=37)	46.5	404
• 2018 (N=53)	80.0	1,343
• 2019 (N=54)	85.25	1,233.75
• 2020 (N=60)	110.5	1,474.5
• 2021 (N=73)	127.0	1,581.25
• 2022 (N=74)	99.0	1,060.5

Table 4: Total number of CPE Hours Provided and CPE Hours Awarded.

Table 5 demonstrates a significant increase in the number of participants who received completion certificates between Period 1 and Period 2. In Period 1, there were 675 total attendees, while in Period 2, this number surged to 3681, indicating a substantial difference of 3006 (445.3%).

Table 5a provides a more detailed breakdown of participants participated during Period 2, organized by year. Across Year 1 to Year 6, the cumulative total for Period 2 is 3681, with varying numbers in each year: 369, 522, 708, 641, 739, and 702, respectively with an average of 614 attendees per year. These figures reflect the distribution of completion certificates over the specified years within Period 2

Period number	Period 1	Period 2
Total Number of Attendees	675	3681
Percentage of Increase	445.3%	

Table 5: Participants who received a completion certificate between the two periods**.**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total for all years
Period 2	369	522	708	641	739	702	3681

Table 5a. Participants who received a completion certificate in Period 2 by year.

The third objective was to assess the effectiveness of the CPE programs by analyzing completion rates, participant feedback on knowledge enhancement, and the perceived applicability and usefulness of the programs. For the sake of comparison, only the data from 2022 was selected as a representative, given that the averages for each year in period 2 were consistently similar.

Table 6 presents evaluation data on whether the attended program enhanced participants' knowledge. In both Period 1 and Period 2, the majority of respondents indicated that the program likely or very likely enhanced their knowledge. Specifically, in Period 1, 95.6% of participants responded affirmatively (combining "Very Likely" and "Likely" categories), while in Period 2, this positive response increased slightly to 96.0%. The data suggests a high level of perceived knowledge enhancement among attendees, with a consistent positive trend between the two periods.

Question: *Did The Attended Program Enhance Your Knowledge?"*		
Ratings	**Period 1 (%)**	**Period 2 (%)**
• Very Likely	64.4	64.2
• Likely	31.2	31.8
• Unlikely	0.4	0.4
• Not Applicable	4	3.5
Combined (Very Likely/Likely)	**95.6**	**96.0**

Table 6: Evaluation data if the program enhanced knowledge.

Table 7 presents evaluation data regarding the applicability and usefulness of the program to participants' practices in both Period 1 and Period 2. While Period 1 shows a higher percentage, it is noteworthy that both periods received high ratings, indicating the perceived applicability and usefulness of the program.

Question: *Rate the Applicability and Usefulness of This Program to Your Practice.*		
RATINGS	**Period 1 (%)**	**Period 2 (%)**
• Very Likely	63.3	60.6
• Likely	29.6	25.4
• Not Applicable	4.0	13.6
• Unlikely	0.4	0.4
Combined (V. Likely/Likely)	**92.9**	**86.0**

Table 7: Evaluation data on the applicability and usefulness of the program

Finally, the study assessed the professional impact of CPE, focusing on its influence on drug therapy management, patient safety, and public health outcomes. In both periods most participants had a very positive outlook, with over 85% considering it very likely or likely. This indicates that participants continue to believe in the positive impact of these programs on patient safety.

Question: *Rate the likelihood that the program you attended will impact patient safety in your practice.*		
RATINGS	**Period 1 (%)**	**Period 2 (%)**
• Very Likely	63.3	60.6
• Likely	29.6	25.4
• Not Applicable	4.0	13.6
• Unlikely	0.4	0.4
Combined (V. Likely/Likely)	**92.9**	**86.0**

Table 8: Participant's Rating on the Impact of the Education Programs on Patient Safety.

Table 9 focuses on the impact of the programs on drug therapy management in participants' practices during both Period 1 and Period 2. The data indicates a similarity in the responses between the two periods. In Period 1, 73.1% of participants found the programs to be very likely or likely to have an impact on drug therapy management. Similarly, in Period 2, this positive impact was reported by 70.3% of participants. Despite slight variations, the combined percentages suggest a consistent perception of the programs positively influencing drug therapy management across both periods.

EVALUATION QESTIONNAIRE	Period 1 (%)	Period 2 (%)
• Very Likely	41.4	39.2
• Likely	31.7	31.1
• Not Applicable	20.1	28.0
• Unlikely or Not Applicable	6.9	1.8
Combined Very Likely & Likely	**73.1**	**70.3**

Table 9: Effects on Drug Therapy Management in Participants' Practice

The next table demonstrates a similarity in maintaining the high satisfaction of participants on the programs' impact on public health in their practice sites in both periods. The combined percentages suggest a consistent perception that the programs are likely to positively influence public health across both periods.

Please rate the likelihood that the program you attended will impact public health in your practice."		
RATINGS	Period 1 (%)	**Period 2 (%)**
• Very Likely	36.9	42.2
• Likely	35.9	34.2
• Not Applicable	20.6	22
• Unlikely or Not Applicable	6.6	1.62
Combined (V. Likely/Likely)	**72.5**	**76.4**

Table 10: Impact of public health on participant practice.

Discussion:

Over the course of six years, in Period 2, we conducted an extensive evaluation, implementing novel strategies to enhance the impact of our programs. This evaluation covered various outcome measures, providing a multifaceted analysis of our initiatives.

These measures included: i) The number of attendees, showcasing the reach and inclusivity of our programs; ii) Diversity in practice areas, indicating the varied professional backgrounds of our participants; iii) The number of CPE programs; iv) Expansion in the diversity of topics covered, demonstrating responsiveness to a broad spectrum of professional interests; v) Enhancement of participants' knowledge, assessing the tangible impact on individual learning outcomes; vi) Improvement in the applicability of programs, ensuring practical relevance to participants' professional contexts: vi) Satisfaction of participants regarding the knowledge gained, reflecting the overall positive experience; vii) Enhancement of the applicability of the program to participants' practice sites, ensuring real-world effectiveness; viii) Satisfaction with drug therapy, evaluating the perceived impact on participants' practices; and ix) Increased impact on public health relevant to participants' practice, measuring the broader societal influence.

This comprehensive approach allowed us to gain valuable insights into the evolving success and effectiveness of our programs over the evaluated period. To gauge its effectiveness, a comparative analysis was performed with a similar timeframe preceding its implementation, explicitly encompassing data in Period 1.

Our comprehensive evaluation over two distinct 6-year periods highlighted substantial shifts and improvements in various aspects of our CPE programs. Notably, there was a remarkable increase in attendees, with a noteworthy 816.67% rise from 225 to 2064, reflecting a significant impact. The altered composition of pharmacy professionals, including an increase in non-pharmacy participants (2.1% to 14.4%), signifies a more diverse and interdisciplinary engagement.

Geographical distribution demonstrated significant changes, particularly with a surge in out-of-state and international participants during Period 2 (6.91% to 25.57%). Additionally, students' participation increased tenfold, emphasizing a positive influence on the future generation of healthcare professionals.

In terms of program content, a pronounced shift in emphasis on specific disease states occurred, exemplified by a surge in infectious diseases including HIV/AIDS and pain management and opioids-related topics during Period 2. This change was influenced by targeted funding initiatives to address the evolving landscape of healthcare, particularly in managing the opioid epidemic.

The number of CPE programs and awarded hours experienced an exponential increase, growing fivefold (541.51%) from 53 to 340 programs and showcasing a commitment to providing a more diverse and extensive educational curriculum. The average CPE programs per year surged from around 9 in Period 1 to approximately 57 in Period 2, indicating a significant expansion of educational offerings.

Participant feedback affirmed the positive impact of the programs, with high ratings for knowledge enhancement, applicability, and usefulness. The perceived positive influence on drug therapy management, patient safety, and public health outcomes remained consistently high across both periods, underscoring the enduring effectiveness of the CPE programs.

This study's insights into the impact and evolution of our continuing professional education (CPE) programs are subject to several limitations. Firstly, there is a potential selection bias as the data primarily relies on voluntary participant attendance, potentially excluding perspectives of non-participants. Data accuracy is contingent on the completeness and precision of participant records, posing a risk of introducing inaccuracies.

Participant feedback on knowledge enhancement, program applicability, and impact on practice is self-reported, introducing subjective elements and potential response bias. External factors influencing program content, such

as emerging healthcare policies or advancements, are not extensively explored. The study also acknowledges the potential influence of funding sources on program content, particularly in specific topics related to opioids. Awareness of these limitations is crucial for a nuanced interpretation of findings, and future research should address these constraints for a more comprehensive evaluation.

Conclusion:

In summary, our six-year evaluation of CPE programs highlights significant advancements and positive shifts in various aspects. Compared to Period 1, Period 2 showed notable improvements, including a substantial increase in pharmacist attendees, a diversified engagement with non-pharmacy participants, and an expanded geographical reach. The exponential growth in the number of CPE programs and awarded hours reflects our commitment to providing a diverse and extensive educational curriculum. Participant feedback consistently affirms the positive impact of the programs, with high ratings for knowledge enhancement, applicability, and usefulness. The perceived positive influence on drug therapy management, patient safety, and public health outcomes remained consistently high across both periods, highlighting the enduring effectiveness of the CPE programs. Despite these achievements, the study acknowledges limitations such as potential selection bias and data accuracy concerns. These constraints should be considered when interpreting the findings. Overall, our evaluation underscores the success of our initiatives in advancing and diversifying educational offerings, positively impacting healthcare professionals and their practices over the assessed six-year period. Future research should address these limitations for a more comprehensive understanding of the evolving landscape of CPE program impact.

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