

RESEARCH ARTICLE

# Impact of evidence-based pharmacotherapy (EBP) elective course on fourth year students' performance

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## Keywords

Active learning  
APPE  
Evidence-based medicine  
Journal club  
Literature evaluation  
Technique

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## Abstract

**Introduction:** Evidenced-based clinical reasoning and literature evaluation skills are essential aspects of pharmacy education and a variety of methods to incorporate these skills into the pharmacy curriculum exist. The authors sought to determine whether an evidence-based pharmacotherapy (EBP) elective course that focused on journal club presentations improved performance during Advanced Pharmacy Practice Experiences (APPEs). **Methods:** Students enrolled in the EBP course were compared to peers not enrolled in the course during the 2009-2011 academic years. Student performance in patient care, clinical reasoning, and literature evaluation domains was assessed. These domains included scores on APPEs, pharmaceutical care ability profile (PCAP), journal clubs, patient presentations, and seminars. **Results:** This analysis included 368 APPEs completed by EBP students and 2922 APPEs completed by non-EBP students. Mean scores on APPEs were 90.36% and 89.75% for the EBP and non-EBP groups ( $p=0.218$ ). Performance on other measures of clinical reasoning and literature evaluation were also comparable. **Conclusion:** The analysis of this study found that enrollment in an elective course focused on intensive literature evaluation, presentations, and clinical application did not result in measurable differences in existing performance metrics during APPEs.

## Introduction

Evidence-based medicine (EBM) is “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” and is a standard expectation in current practice (Sackett *et al.*, 1996). In order to meet this expectation, pharmacists must be competent in critically analysing and applying relevant literature to provide patient-centred recommendations and care. The inclusion and assessment of evidence-based clinical reasoning and literature evaluation skills in pharmacy education are emphasised in both the 2013 Center for Advancement of Pharmaceutical Education (CAPE) Educational Outcomes (Standards 1.1, 2.1, and 25.7) and the Accreditation Council for Pharmacy Education (ACPE) Standards 2016 (Domains 1.1 and 3.1) (Medina *et al.*, 2013; ACPE, 2015).

There have been several studies evaluating the impact of incorporating EBM and literature evaluation skills

into medical and pharmacy curriculum (Holloway *et al.*, 2004; Gonyeau, Trujillo, & DiVall, 2006; Timpe, Motl, & Eichner, 2006; Burkiewicz & Komperda, 2009; Bookstaver *et al.*, 2011; Haber & Boomersshine, 2015; Momary & Lundquist, 2017; Wang *et al.*, 2017; Burris *et al.*, 2019; Gurney, Buckley, & Karr, 2019). In all of these studies, a variety of EBM concepts and critical-thinking skills were integrated into a required or elective course within the curriculum and benefit in either knowledge, skills and/or confidence was demonstrated (Holloway *et al.*, 2004; Gonyeau *et al.*, 2006; Timpe *et al.*, 2006; Burkiewicz & Komperda, 2009; Bookstaver *et al.*, 2011; Haber & Boomersshine, 2015; Momary & Lundquist, 2017; Wang *et al.*, 2017; Burris *et al.*, 2019; Gurney *et al.*, 2019). However, only four studies have evaluated outcomes in the experiential setting (Bookstaver *et al.*, 2011; Momary & Lundquist, 2017; Burris *et al.*, 2019; Gurney *et al.*, 2019). Of these, only one reported objective measures of performance (Burris *et al.*, 2019). Pharmacy education culminates with Advanced Pharmacy Practice Experiences (APPEs), which provide

students with opportunities to apply skills learned throughout their training and demonstrate if they are “practice-ready”. Therefore, it is imperative to evaluate the impact of educational methods and strategies on performance of skills and application in this setting. Burris and colleagues assessed the impact of a journal club elective course on objective learning measures such as the Pharmacy Curriculum Outcomes Assessment (PCOA) and overall average score on clinical APPEs. After accounting for confounding variables, enrollment in the journal club elective was associated with a 2% higher score on acute and ambulatory APPEs (Burris *et al.*, 2019).

The evidence-based pharmacotherapy (EBP) elective course at the pharmacy school was created to increase students’ understanding of evidence-based pharmacotherapy and develop proficiency in literature evaluation and application of the skills learned to patient care. The course was offered as a two-hour elective that met weekly during the 16-week fall term of the third professional year and was designed as a student-directed, faculty-facilitated learning environment. Students were placed in groups to critique a clinical trial and present a journal club, each followed by a facilitated discussion on the literature’s implications in clinical practice. There was an attempt to align weekly topics with content taught in the pharmacotherapy course. Anecdotally, full-time faculty at this school shared observations that students who completed the EBP elective seem to perform superiorly on skills involving literature evaluation and critical thinking (e.g. journal clubs, patient presentations, professional seminar, etc.) compared to similar students who did not complete the elective. Therefore, the objective of this study was to compare the performance of students enrolled in the EBP elective course to that of non-EBP students on assessments conducted on APPEs during the fourth-professional year. Performance assessments included journal club presentations, patient presentations, Pharmaceutical Care Ability Profile (PCAP) scores, and the overall score earned on APPEs.

## Methods

Students enrolled in the elective EBP course during the autumn terms of 2009, 2010, and 2011 were compared to all students that were not enrolled in the elective EBP course. The course coordinator for this elective remained the same across all years of this study. Performance on APPEs, journal club presentations, patient presentations, and professional seminar presentations were obtained from the Office of

Experiential Learning via the evaluation system used during the fourth-professional year (i.e. E-value). All APPE preceptors (full-time faculty and affiliate faculty) used the same standardised rubrics to grade journal club and patient presentations. As part of an embedded professional communications course during the fourth professional year, all pharmacy students were required to satisfactorily complete a minimum of two journal clubs and two patient presentations throughout their APPEs, with an 85% average score in each presentation category. Likewise, the professional seminar was a requirement for each student during the fourth professional year. The goal was to evaluate a clinical question that required the students to critically analyse available primary literature and apply this literature to patient care.

Seminar performance was assessed with a standardised rubric and was reported as a numerical grade through 2010 and changed to a pass/fail evaluation in 2011. For the primary endpoints of APPE presentations and APPE scores (including the Pharmaceutical Care Ability Profile [PCAP], which comprised 60% of the total APPE score), continuous data were summarised using means and standard deviations. Independent t-tests were used to compare mean scores between the students enrolled in the EBP elective and those not enrolled. For the secondary endpoint of professional seminar performance, independent t-tests were used to compare mean scores for 2010, and chi-squared tests were used to compare outcomes for 2011-2012 when the course was changed to a pass/fail course. The a priori level of statistical significance was established as  $\leq 0.05$ . All statistical analyses were conducted using IBM SPSS statistics for Macintosh, version 25 (IBM Corp, Armonk, NY). Approval for this study was obtained from the institutional review board (IRB).

## Results

Three hundred and sixty-eight EBP student APPE rotations and 2922 non-EBP student APPE rotations were included in the primary analysis. The mean APPE scores were 93.14% and 92.67% for the EBP and non-EBP groups, respectively ( $p=0.113$ ). Scores on journal clubs (92.81% vs 92.27%), patient presentations (92.55% vs 92.19%), and PCAP grades (92.77% vs 92.37%) were similar between the EBP students and non-EBP students (Table I).

When the analysis was limited to full-time faculty APPE rotations, 122 EBP student APPE rotations were identified along with 948 non-EPB student APPE rotations. In this comparison, the mean APPE scores

were 90.36% and 89.75% for the EBP and non-EBP groups, respectively ( $p=0.218$ ). Scores on journal clubs (90.91% vs 89.88%), patient presentations (89.94% vs 89.76%), and PCAP grades (90.22% vs 89.64%) remained similar between the EBP students and non-EBP students (Table II). Professional seminar scores for

the 2010 class were 93.77% for the EBP students and 92.53% for the non-EBP students ( $p=0.63$ ). Likewise, the first attempt pass rate for the professional seminar for the 2011-2012 classes were similar (0.88 EBP and 0.87 non-EBP).

**Table I: Mean scores for all APPEs**

Outcome	EBP students		Non-EBP students		p-value
	N	Mean % (SD)	N	Mean % (SD)	
Journal club score	156	92.81 (4.99)	1206	92.27 (5.43)	0.231
Patient presentation score	116	92.55 (5.28)	863	92.19 (5.50)	0.508
PCAP score	368	92.77 (5.60)	2921	92.37 (5.83)	0.212
APPE final score	368	93.14 (4.75)	2922	92.67 (5.43)	0.113

PCAP=Pharmaceutical Care Ability Profile; APPE=advanced pharmacy practice experience

**Table II: Mean scores for full-time faculty APPEs**

Outcome	EBP students		Non-EBP students		p-value
	N	Mean % (SD)	N	Mean % (SD)	
Journal club score	79	90.91 (4.97)	584	89.88 (5.97)	0.145
Patient presentation score	55	89.94 (5.40)	412	89.76 (5.35)	0.805
PCAP score	122	90.22 (5.99)	948	89.64 (6.11)	0.325
APPE final score	122	90.36 (4.99)	948	89.75 (5.15)	0.218

PCAP=Pharmaceutical Care Ability Profile; APPE=advanced pharmacy practice experience

## Discussion

Incorporation of evidence-based principles into pharmacy school curriculum is critical for all educational programmes. Supported by primary accreditation bodies, these core skills should be distributed throughout required and elective courses. To the authors' knowledge, this is only the second published report on the impact of a student-driven, faculty-facilitated EBP elective on pharmacy student performance during the fourth-professional year (Burris *et al.*, 2019). Contrary to Burris and colleagues (2019), the authors did not find a statistically significant difference in several objective measures of performance including mean journal club, patient presentation, PCAP and APPE scores between students who completed the EBP elective and those who did not, despite a large sample size.

These findings support further investigation into literature evaluation pedagogies that best prepare students for APPEs. Preceptor-perceived improvement in performance on APPEs has also been previously reported for students who completed a similarly designed evidence-based medicine elective compared

to those who have not (Bookstaver *et al.*, 2011). However, no actual measures of APPE performance accompanied the survey results. Although the authors anticipated to observe a significant difference in performance based on the faculty perception at the school, and the knowledge that students electing to enroll in this course are often high performing, this was not supported with objective performance data once formally evaluated. This stresses the need for high-quality objective evaluation of educational interventions and curriculum to determine those most useful in preparing pharmacy students.

There are several factors potentially influencing why no difference was observed in this study. One major factor is variability in preceptor grading, despite the utilisation of standardised rubrics and evaluations. To account for this, the authors limited the comparison to full-time faculty, based on assessment training and although slightly lower, scores remained similar between the EBP students and non-EBP students. The variability in preceptor grading standards was also possible in the Burris and colleagues' study; however, they reported students performed about 2% higher on acute and ambulatory care APPE scores (Burris *et al.*, 2019). This

potentially points to additional internal differences within the programmes. First, Burriss and colleagues' curriculum is an accelerated programme over three years, so it may be that the principles of EBP is more thoroughly taught throughout the curriculum yielding smaller differences between those students who participated in the elective versus those who did not. Similarly, both electives utilised active-learning approaches engaging students to critically evaluate primary literature and apply to patient care. Both electives had a very similar structure beginning with assigned clinical trials, presentation of relevant background information, delivery of assigned journal club, and concluding with a faculty and student question and discussion session. Topics within both electives were also designed to align with content taught in their schools' simultaneously delivered pharmacotherapy courses.

Students were similarly assessed on their performance utilising structured rubrics and class participation. One major difference identified between the elective designs is that each student in the Burriss and colleagues described elective was required to individually present a journal club. In this elective course, three to four students worked together to present a group journal club. Additionally, students were formally assessed on clinical trials assigned each week with a quiz at the beginning of class. Possibly, this added level of individual accountability explains why different findings were observed. Since individual journal club performance in pre-APPE curriculum is resource-intensive, further exploration of strategies that both hold students accountable and adequately develop their literature evaluation ability and confidence is needed. One method to hold individuals accountable when assigned group work is to randomly assign presentation assignments. This would require all students to be equally prepared for the journal club assignment rather than only focusing on one section.

Another major factor, perhaps illuminating why no difference was observed in this study is possible grade inflation on assignments within the authors professional communications course due to the 85% minimum average requirement. Students may be given additional opportunities to complete assignments if they initially perform poorly to meet the minimum average requirement. The relatively high journal club and patient presentation averages of 92% support this theory. There may also be a need for preceptor development within this programme to standardise grading techniques and student performance expectations.

Although these results add value to the existing body of literature, there are several limitations of this study.

This study was conducted at a single pharmacy school and may not be applicable to other programmes. Although the authors attempted to account for preceptor variance, differences in performance expectations and interpretation of rubric grading scales remain a limitation to equal comparisons. There are several other confounders affecting performance measures that were not accounted for in this study such as student grade point average reflecting overall academic ability and motivation, students' previous and/or additional education, and APPE sequence and experience.

## Conclusion

The authors found that the completion of an EBP elective course that required students to evaluate and present primary literature to faculty and peers did not result in better performance on objectively measured outcomes during APPEs. While these results were unanticipated, it does highlight the need for objective measures of curriculum to determine if the educational goals are being achieved.

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