Utilising a simulated clinical rotation elective to prepare pharmacy students for experiential education

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Abstract

Objective: The purpose of this study was to evaluate the impact of an Introduction to Internal Medicine (ITIM) elective course on student preparedness for experiential education. **Methods**: A one-credit elective was offered to second and third-year professional students. It was designed to simulate a typical day as a fourth-year student on rotation while utilising a simulated electronic health record. Upon completion of the course, a survey was sent to assess student preparedness for rotational activities. The students' reported level of preparedness was compared to their preceptors' assessment of these same survey items. **Results**: Thirty-six students and their preceptors responded to the survey. Students rated their preparedness highly, with 80% responding as moderately prepared or higher in navigating a patient chart, identifying patients' problems, presenting a patient, and identifying treatments for common disease states. Preceptors also noted that over 90% of the students were moderately or much better prepared than students who did not complete the elective. **Conclusion**: Students completing the ITIM elective course demonstrated high levels of preparedness for a variety of rotational activities from patient care to professional communication.

Introduction

Transitioning from didactic learning to experiential curriculum in professional education can be difficult for any student regardless of grade point average, extracurricular involvement, or previous professional experience. The Doctorate of Pharmacy programme (Pharm.D.) at the Campbell University College of Pharmacy & Health Sciences (CPHS), like many schools of pharmacy, has recently undergone a curricular shift in order to aid in this transition from the classroom to real-world practice. The curriculum has progressed from a more traditional programme with disciplined-based courses to an integrated programme (i.e. courses progress from the basic to clinical sciences during one course rather than over multiple years). In this curriculum shift, faculty were encouraged to develop new electives focused on the application of material to better prepare students for experiential education (ACPE, 2020).

Previous studies support the use of simulated electronic health records (EHRs) as a tool to aid in application-based learning (Vyas, Bray, & Wilson, 2013). A study conducted at the University of Kentucky College of Pharmacy documented a significant improvement in student documentation and writing skills through Subjective, Objective, Assessment, Plan (SOAP) notes after the implementation of an EHR platform into a Patient Care Laboratory course (Divine, Jones, & Gokun, 2020). Another qualitative review conducted at Midwestern University, Chicago College of Pharmacy, utilised simulation-based learning to teach cardiovascular topics (Kolanczyk, Borchert, & Lempicki, 2019). While the sample size was small, students who enrolled in two one-hour focus group sessions were able to benefit from the real-world applicability, reporting improvements in confidence and execution of a standardised patient encounter (Kolanczyk, Borchert, & Lempicki, 2019). Student perceptions on preparedness for clinical practice also

appears to increase with the use of simulated learning; however, two studies did not find a correlation between perception of preparedness and actual performance when assessing the impact of a simulated EHR (Hardy & Marshall, 2017; Smith & Scholtz, 2018). Additionally, students' perceptions of clinical skills, communication, and satisfaction were enhanced after practising with a virtual EHR (Coons, Kobulinsky, & Farkas, 2018).

While there are studies regarding the use of EHR's and simulation-based learning in the classroom setting, there is a lack of information related to students' subsequent performance on Advanced Pharmacy Practice Experiences (APPEs). The purpose of this study was to evaluate the impact of the Introduction to Internal Medicine (ITIM) elective course's impact on experiential education while describing the qualitative themes that emerged from student and preceptor perceptions of the course.

Methods

Educational activity and setting

A one-credit hour elective was offered to second and third-year professional students (P2/P3) enrolled at CPHS. The ITIM elective was designed to simulate a typical day as a fourth-year student on an inpatient internal medicine APPE rotation (Figure 1). ITIM was offered in the spring semesters of 2019 and 2020 and consisted of five three-hour sessions; ITIM utilised EHRGo, which is a customisable electronic health record and learning platform (EHR Go, 2020). Instructors in this course created patients with common internal medicine disease states in the EHRGo platform, such as community-acquired pneumonia, heart failure, and hyperglycemic emergencies. Students received access to patient electronic health records on the day of each class session to better emulate real-time patient care and were not required to review patient charts outside of class. Students were split into groups of three to four, containing both P2s and P3s. In these groups, pharmacy students were encouraged to collaborate with one another while reviewing patients in real-time. During the first portion of the class, students reviewed two patients, asked clarifying questions to the "*provider*" as portrayed by the instructor for the day, and verified/rejected medication orders. Interventions and recommendations identified by student groups were recorded on the patient care record document (Appendix 1), which was submitted for a grade at the end of each class session. After a complete review of both patients, one student presented each patient as if presenting to a preceptor or provider. Feedback on presentation content and style was given at this time. The remainder of the class was used to solidify the application of the disease states through topic discussions, similar to those given during APPE rotations. The lecturer would present each core disease state that was present in the patients reviewed that day. Prior to the next class, an individually written SOAP note was due for each patient. Written feedback was provided on each SOAP note and sent back to the student.
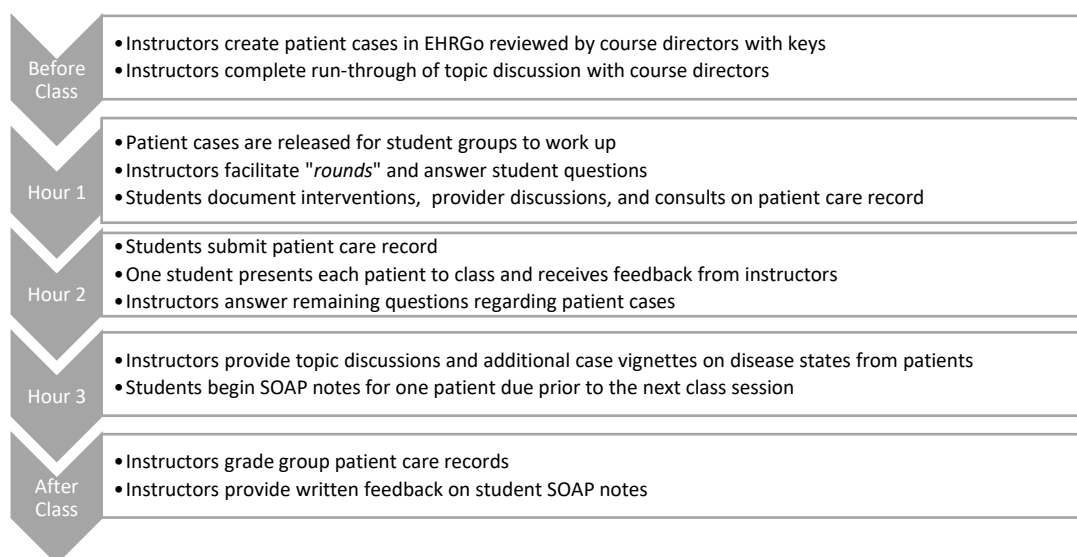

Figure 1: Introduction to internal medicine elective course flow

To be included in this study, students had to be a P2 or P3 enrolled in the ITIM elective during the spring 2019 term or P3 in the spring 2020 term.

Study description

This study was a mixed-methods analysis utilising data collected during the course and preceptor surveys for the ITIM course. The data consisted of survey responses deployed via Qualtrics to students upon completion of the course and to the students' internal medicine APPE preceptors, who were asked to complete the survey after the identified students' rotation. All responses were anonymous and only collected in aggregate. This study was granted exempt status by the IRB. Surveys included 12 items on a six-point ordinal scale related to perceptions of student preparation for the internal medicine rotation, including their ability to navigate a patient chart, evaluate, and present patients. The ordinal scale ranged from one-point, not prepared at all, through six-points, very prepared. The students' perceptions of their preparedness were then compared to the preceptor perceptions of these students. Preceptors were also asked to compare the students who completed the elective to their students who did not complete the survey. Additionally, baseline demographics and student perceptions on the impact of individual components of the elective course were collected in the student survey. Finally, students and preceptors were given the opportunity to provide additional comments related to the elective. Preceptor and student surveys were compared using a Wilcoxon Rank Sum test for ordinal data. Descriptive statistics were also used to examine responses within each group. Open-ended questions were analysed via thematic analysis, utilising the Braun and Clarke Methodology (Braun & Clarke, 2006). Data analyses were performed using JMP-14 PRO (SAS. Cary, NC).

Results

The surveys were sent to 43 students and their respective internal medicine APPE preceptors. Survey results were available for 36 students (83.72%), with preceptor responses available for 34 of those students. Of the students who responded, 13 (36.11%) completed pharmacy school in 2020 and 23 (63.89%) completed pharmacy school in 2021. The majority of students had a GPA between 3.5-3.79 (33.33%), with no students having below a 3.0 GPA. Table I shows other demographic information collected from student participants.

Table I: Student demographics

Characteristic	N=36
Female – N(%)	31 (86.11)
Age, years – N(%)	
20-25	23 (63.9)
26-30	10 (27.8)
>30	3 (8.3)
Graduation class – N(%)	
2020	13 (36.1)
2021	23 (63.9)
Year taking elective course – N(%)	
P2	22 (61.1)
P3	14 (38.9)
Pharmacy school GPA – N(%)	
≥3.8	8 (22.2)
3.5-3.79	12 (33.3)
3.25-3.49	9 (25.0)
3.0-3.24	7 (19.4)
<3.0	0 (0)

P2 = Second professional year; P3 = Third professional year

A comparison of student perceptions to preceptor perceptions focused on key internal medicine concepts and activities revealed that both students and preceptors found the course helped prepare them for rotation with few differences in the perceptions from each group (Table II). All of the preceptors felt the students were at least slightly prepared to start their internal medicine rotations, while all but one of the students were in agreement. Over 50% of preceptors and students also rated themselves as very prepared to identify patients' primary problems.

Students rated their preparedness highly with 80% or more of "*moderately*" and "*very prepared*" in navigating a patient chart (80.6%), identifying patients' secondary and tertiary problems (88.9%), presenting a patient (83.3%), and identifying treatments for common disease states (80.6%). For higher-level skills, students still felt prepared, with over 50% ranking their preparedness as moderately prepared or higher on identifying medication errors and problem orders (69.5%), assessing the appropriateness of pharmacotherapy (72.2%), developing an evidence-based treatment plan (69.5%), managing their time to review all required patients (61.1%), recommending alternative therapy (55.6%), and making recommendations to providers (55.6%). No students rated themselves as moderately unprepared or not prepared at all for any survey items, while no more than two students rated themselves as slightly unprepared for any item.

Table II: Comparison of student and preceptor perceptions of preparedness for the internal medicine APPE rotation

Survey item	Student response, median (IQR), N=36	Preceptor response, median (IQR), N=34	p-value
Starting the IM rotation	5 (5-5.75)	5 (5-6)	0.0902
Navigating a patient chart	5 (5-6)	5.5 (5-6)	0.1807
Identifying a patient's primary problem	6 (5-6)	6 (5-6)	0.9317
Identifying a patient's secondary and tertiary problems	5 (5-6)	5 (4.75-6)	0.7458
Identifying medication errors and suboptimal orders	5 (4-5)	5 (4-6)	0.2422
Presenting a patient	5 (5-6)	5 (5-6)	0.6157
Identifying treatments for common disease states	5 (5-6)	5 (5-6)	0.5560
Assessing appropriateness of pharmacotherapy	5 (4-6)	5 (5-6)	0.1163
Developing an evidence-based plan	5 (4-6)	5 (5-6)	0.4471
Recommending alternative therapy options	5 (4-5)	5 (4-6)	0.2149
Managing time to review all required patients	5 (4-5)	5 (5-6)	0.0067
Making recommendations to providers	5 (4-5)	5 (4-6)	0.0138

Scale: 1 – Not prepared at all; 2 – Moderately unprepared; 3 – Slightly unprepared; 4 – Slightly prepared; 5 – Moderately prepared; 6 – Very prepared

Preceptor ratings of their students' preparedness were statistically similar to the students' self-ratings. Of note, there were higher percentages of "*very prepared*" ratings in every item except developing an evidence-based treatment plan, with 33.33% of students and only 29.0% of preceptors choosing this rating. In contrast, there were two statistically significant differences in survey items where the preceptors rated higher than the students. Of the preceptors responding, 88.1% rated students' preparedness for managing their time to review patients at moderately prepared or higher compared to 55.6% of the students ($p = 0.0067$), and 70.6% of preceptors rated students' preparedness for making recommendations to providers at moderately prepared or higher compared to 55.6% of the students ($p = 0.0138$).

Student data related to perceptions of the impact of the components of ITIM on their learning and rotation performance based on a sliding scale from 0-100 was also available (Table III). Students perceived all ITIM course activities as having a strong impact on their learning and rotation performance, evidenced by ratings of over 70% for each category. Most notably, they found the topic discussions most helpful, with a mean score of 92.9.

When asked to compare the students who completed the elective course compared to those who did not complete their rotation, preceptors validated the purpose of the course in preparing students for rotation. Thirteen (38.2%) rated their student(s) as "*much better*" and 18 (52.9%) as "*moderately better*" in terms of preparedness compared to students who did not take the course who were also on their rotation. No preceptors had a student from the elective rotation that was rated as less prepared, and only three students were rated as "*about the same*" (2.9%) or "*slightly better*" (5.9%) than students who did not take the elective.

The thematic analysis of written responses from preceptors (n = 26) concerning perceptions of student performance on internal medicine APPEs revealed a central theme of good preparedness from preceptor perceptions. Each individual code from the thematic analysis could map back to this latent theme. This was supported by underlying semantic themes of improved problem prioritisation, time management, and confidence in communication relative to their peers (Figure 2). Comments included statements such as:

"*This was clearly my most prepared student all year. She knew how to navigate charts, communicate with pharmacists and providers, and was confident in her patient presentations at a much earlier stage*".

Another preceptor stated:

"*This early in rotation, my student stood out among the group. They were able to work through patients more efficiently and was far better at presenting them than their peers*".

One preceptor even noted that while one student from the elective struggled on their rotation:
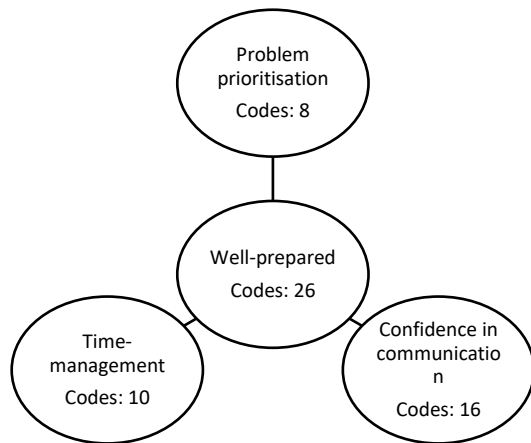
"*they probably would not have passed without this course*".

Figure 2: Thematic map of preceptor responses (Problem prioritisation Codes: 8; Well-prepared Codes: 26; Time-management Codes: 10; Confidence in communication Codes: 16)

Figure 2: Thematic map of preceptor responses

Communication was coded the most frequently with 16 responses including the students' ability to communicate. An analysis of student responses (n = 34) concerning their perceptions of their APPE performance revealed the top latent theme of self-confidence. This theme was supported by the semantic themes of understanding the patient workup process, improved baseline clinical knowledge, and having previous practice with verbal and written patient presentations (Figure 3). Seven students also directly mentioned the topic discussion component of the course being helpful in their preparation. One student commented that:

"*This elective prepared me very well! It was similar to what we actually did during IM, so I'm very glad that I took the course!*".

Another stated:

"*This course gave me a leg up. While the EHR may not be necessary to use, the process I took away from this course was invaluable*".
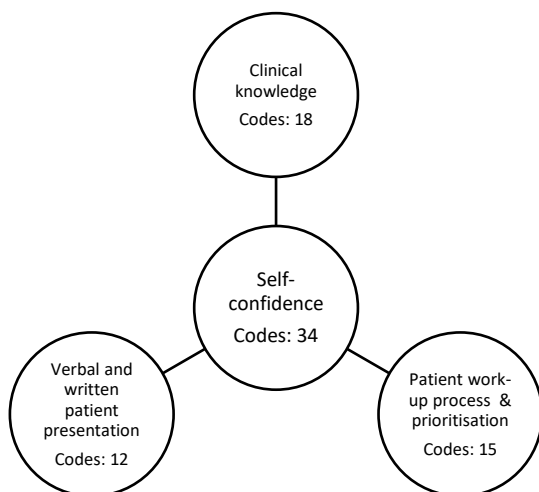
Figure 3: Thematic map of student responses (Clinical knowledge Codes: 18; Self-confidence Codes: 34; Verbal and written patient presentation Codes: 12; Patient work-up process & prioritisation Codes: 15)

Figure 3: Thematic map of student responses

Discussion

Building a simulated rotation learning experience into an elective course proved to be effective in preparing students for success on their APPEs, which was also supported by their preceptors. The authors found that students felt prepared for three major areas in this survey (patient care, time management, and communication) as they began their internal medicine APPEs. This is supported by having no survey items, with more than two students rating themselves as slightly unprepared or worse. Interestingly, the items with the lowest student scores, managing time and making recommendations to providers, were rated significantly more highly by the preceptors. However, preceptors consistently rated each item except navigating the patient chart higher than the students. This is likely due to the lack of comparison for the students, whereas the preceptors included in this survey have at least eight students per year. Over 90% of preceptor responses also indicated that the students who completed the elective were at least "*moderately better*" prepared for their rotation than students who did not.

Throughout the one-credit hour elective course, a number of educational tools and activities were utilised to provide a more realistic experience. As demonstrated in the results, the topic discussions provided the most meaningful contribution to student preparedness. This was reflected in the qualitative and quantitative results. These topic discussions were informal, but very interactive, utilising only a whiteboard, facilitator, and oral case vignettes. In addition to this closing activity, students also rated completing the daily patient care record very highly. This was the document utilised in completing a patient workup, where students were responsible for recording their interventions, provider communication, order verification, and consult dosing activities. In-class patient presentations were also scored highly. Refining or creating, this skill is something often overlooked until APPEs; however it is important when tying the patient care process together. Student interaction and active learning were there common themes among the highest rated activities in the course. The lowest rated activities were EHRGo patient workups and in-class order verification. Student comments related to these ratings explained the lower scores. Multiple students remarked that while using EHRGo was beneficial, it was very dissimilar to the system utilised at their rotation site. Students also noted that they were not responsible for order entry on their internal medicine rotations. It is likely a culmination of all the activities that led to the success of the course, because students were able to begin to learn the entire process of completing an internal medicine rotation as compared to a previous study that assessed the impact of only a simulated EHR on student preparedness for clinical

practice (Smith & Scholtz, 2018). Like the authors' survey, this study found that students' perceptions of preparedness were improved through the implementation of a simulated EHR in a skills course series; however, they did not see a significant improvement in student performance (Smith & Scholtz, 2018).

The qualitative responses support the conclusions garnered by the survey results. Of the preceptors who provided additional commentary, all could be linked back to the students in the elective being well-prepared for rotation. Student responses were centred more around the boost in confidence the elective provided. At the authors' institution, internal medicine is a required two-month learning experience that can be very intimidating for students. However, through increased application of their knowledge, patient presentations, and improving their patient care process, the students felt more prepared moving into their APPEs.

This study is not without limitations. Due to the nature of the elective course, the sample size is limited because the course is capped at 25 students per year. However, the authors feel that it is important to keep the course small to allow for maximum student interaction. The primary facilitators for the course also vary from week to week and year to year as residents are utilised. In order to maintain consistency, a facilitator guide has been created, and the course directors have remained the same. Lastly, students may take the course as a second or third-year pharmacy student, and may have their internal medicine APPE as late as March of their fourth-year. Due to the small sample size, it was not possible to analyse if the timing had any impact on the results.

Conclusion

Utilising simulated rotational activities improves student preparation and confidence for APPEs. Students completing the ITIM elective course demonstrated high levels of preparedness for a variety of rotational activities, from patient care to professional communication. Preceptors also found these students to be more prepared for their rotation as compared to those who did not complete the course. These data support the increasing use of simulated pharmacy practice experiences throughout didactic curricula.

Disclosure statement

The authors have no potential conflicts of interest or financial disclosures. This study was granted exempt status by the Campbell University Institutional Review Board (IRB #557).

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