Original Article

Increasing Hospital Pharmacist Clinical Competence in Intensive Pharmacotherapeutics Using a Novel Pharmacist Clinical Educational Program

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ABSTRACT

Background: Intensive pharmacotherapeutics (IP) is the application of multiple evidence-based practices applied at a patient-specific level, creating the overall best treatment plan in medically complex patients. To practice at this level, a high level of clinical knowledge and competency is paramount.

Objective: The goal of the pharmacist clinical educational program was to develop an engaging, challenging, and interactive program, which was concise but intense, to improve pharmacists' clinical knowledge and critical thinking skills.

Methods: A 12-week educational series was developed and successfully implemented. The primary outcome was a comparison of the proportion of accepted clinical interventions per total number of medication orders reviewed by hospital pharmacists during and after the pharmacist clinical educational program to a 3-month baseline. The secondary outcome was to anonymously gauge participant satisfaction with the program.

Results: The proportion of accepted clinical interventions increased from 6.4% (at baseline) to 9.1% and 8.7% in the 3 months during and 3 months immediately after the educational program, respectively ($P < .01$). The overall acceptance rate for clinical interventions remained $>90\%$ for all periods. Approximately 94% of respondents ($n = 16$) indicated that the program met their educational needs.

Conclusions: The development of a clinical educational program to engage, challenge, and incentivize pharmacists is an essential tool to elevate the practice of IP. By maximizing existing resources, programming can be provided in an efficient and cost-effective manner. As health systems continue to merge on a national level, the methods described here demonstrate a means to provide critical education for both clinical and organizational competency.

Key Words—education, intensive pharmacotherapeutics, pharmacist clinical competence, pharmacy

Hosp Pharm—2015;50:776–782

High-quality education programming is essential to pharmacists practicing in the hospital setting. Traditional continuing pharmacy education (CPE) programs, required to maintain pharmacy licensure, are generally well attended but often only engage participants in passive learning. The development of high-impact clinical educational programs that engage, challenge, and

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incentivize pharmacists is essential to elevate the practice of pharmacy. Although creation of these advanced educational programs is essential, hospitals often have limited resources to dedicate to providing pharmacists with the training to support their ability to deliver the safest and highest quality of pharmacy services.

To address this need, the leadership of the Bassett Medical Center (BMC) Pharmacy Department performed a needs assessment of the pharmacists' clinical pharmacy knowledge and skills in preparation for a transition from a traditional hospital pharmacy model to a decentralized hospital pharmacy model. BMC, a 180-bed, acute care inpatient teaching hospital located in Cooperstown, New York, is the hub of the Bassett Healthcare Network. The network is an innovative, integrated health care system, serving a rural 9-county region of upstate New York. The BMC provides hospital-based care and has sophisticated diagnostic, surgical, and procedural capabilities. The BMC Pharmacy Department provides professional, individualized inpatient and outpatient services through the use of a decentralized pharmacy practice and implementation of advanced clinical pharmacy practices in anticoagulation, infectious disease, internal medicine, oncology, and pain management. The Bassett Healthcare Network also includes 6 affiliate hospitals providing care across 5,000 square miles, each with stand-alone pharmacy departments overseen by a regional pharmacy operations director.

The decentralized pharmacy model at BMC is built upon the core principal of intensive pharmacotherapeutics (IP). IP is the process of integrating evidence-based practice on a patient-specific level by creating an overall best treatment plan in medically complex patients.¹ The principles of IP, when integrated in partnership with a pharmacist-driven advanced medication reconciliation program, have the potential to significantly improve patient outcomes and reduce hospital costs, while elevating the pharmacist to be a leader on the interdisciplinary health care team.²⁻⁵

To achieve IP goals, BMC determined that a higher level of clinical knowledge and competency for attending pharmacists was paramount. Attending pharmacists, formerly staff pharmacists, earn this title change as a result of the advancing level of pharmacy practice and clinical responsibility associated with IP implementation. The BMC Pharmacy Department chose to invest the resources necessary to cultivate the professional needs of their staff by developing a clinical educational program. This program, based in pharmacotherapy and policies, was aimed at directly

supporting advanced clinical practice in IP. Clinical educational programs to meet these or similar goals have not been described in the literature.

METHODS

BMC chose an integrated team comprised of pharmacy management, clinical pharmacy specialists, and attending pharmacists to aid in the development of the clinical educational program. The program was completely designed, developed, and implemented by employees of the health system, with administrative support through the Accreditation Council for Pharmacy Education (ACPE) accreditation process provided by the Albany College of Pharmacy and Health-Sciences (ACPHS) Office of Continuing Education and Professional Development. A voucher system was used between ACPHS and the hospital based on a mutual agreement from the experimental program, covering the total costs of the program. There were no local implementation fees, as existing institutional technology (phone, computer, and internet) was maximized and free teleconferencing software was utilized.

Hospital pharmacists determined the therapeutic topics that would be covered in the clinical educational program from those most commonly encountered during the practice of IP (Table 1). Sessions were delivered by live presentation or through self-study to all on-site and off-site pharmacists via teleconferencing ($n = 35$). The sessions were accredited through the ACPE policies and procedures for a "regularly scheduled series" (RSS).⁶ Completion of all the educational sessions and self-assessments was mandatory for all pharmacists, although only the live sessions were accredited for ACPE-CPE credit. To meet ACPE requirements, individual program evaluation was required and was processed by ACPHS.

Each BMC attending pharmacist was responsible for preparing and presenting a topic to their colleagues; this created accountability for disease state management and provided a point person for ongoing real-time patient management questions after the clinical educational program was complete. Topics were chosen by the attending pharmacists approximately 12 weeks prior to the start of the series; time and resources were made available during future scheduled shifts for preparation and mentoring. Speakers developed a 25- to 30-minute overview of key points and clinical pearls to share and discuss with the pharmacy team, with case-based and active learning techniques strongly

Table 1. Pharmacist clinical educational program topics by month presented, percent rates of pharmacist attendance, and participant evaluation of individual topics

Month presented	Clinical educational program topics	Percent rates of pharmacist attendance (actual attendance/total no. of pharmacists)	Individual topic evaluation, ^a median (range)
Month 1	Anticoagulant dosing (warfarin, low molecular weight heparins)	62.9% (22/35)	5 (4-5)
	Evaluation of laboratory values	57.1% (20/35)	4 (4-5)
	Acute vs chronic renal insufficiency/renal failure/estimating glomerular filtration rate	54.2% (19/35)	5 (4-5)
	Pharmacokinetic primer	51.5% (18/35)	4 (3-5)
	Aminoglycoside/vancomycin dosing	45.7% (16/35)	5 (3-5)
	Deep vein thrombosis prophylaxis and treatment	42.9% (15/35)	5 (4-5)
	Atrial fibrillation	40% (14/35)	5 (4-5)
Month 2	Diabetes	42.9% (15/35)	5 (4-5)
	Medication reconciliation strategies	40% (14/35)	5 (4-5)
	Evaluation of drug-drug interactions	37.1% (13/35)	4 (4-5)
	Intravenous-to-oral conversions	31.4% (11/35)	4 (3-4)
	Fluid and electrolytes	28.6% (10/35)	4 (4-5)
	Heparin-induced thrombocytopenia	28.6% (10/35)	5 (4-5)
	Gastrointestinal prophylaxis	25.7% (9/35)	5 (4-5)
	Discharge counseling strategies	25.7% (9/35)	4 (3-5)
Month 3	Chronic obstructive pulmonary disease and asthma	28.6% (10/35)	4 (4-5)
	Sepsis	17.1% (6/35)	5 (4-5)
	Neutropenic fever	17.1% (6/35)	5 (4-5)
	Congestive heart failure	14.3% (5/35)	4 (3-4)
	Refresher on chart documentation	14.3% (5/35)	5 (4-5)
	Falls: risk assessment and interventions based on Beer's Criteria	8.6% (3/35)	5 (4-5)
	Opioid conversion/pain management strategies	8.6% (3/35)	5 (4-5)

^aParticipant rating of each individual session, assessed immediately after the session using a scale of 1 to 5, where 1 = *poor*, 2 = *fair*, 3 = *good*, 4 = *very good*, and 5 = *excellent*.

encouraged. To assess the learning of the didactic material, a self-assessment tool was developed for each session, with competence level set at a 90% correct response rate.

A senior member of the clinical pharmacy service was appointed to be the clinical educational program coordinator and was responsible for clinical and administrative duties associated with the program implementation. To enhance collaboration and facilitate collegiality between the attending pharmacists and the clinical pharmacy specialists, each attending pharmacist presenter ($n = 19$) was given the

opportunity to collaborate with the clinical educational program coordinator to determine individual topic content, develop the live and written presentations, and hone presentation skills. Honorarium was not provided to presenters, as participation was an expected part of their appointment.

The predefined goal of this program was to develop an engaging, challenging, and interactive program that was concise but intense to improve pharmacists' clinical knowledge and critical thinking skills. The primary outcome measure was a comparison of the rates (%) of accepted clinical interventions

during and after the pharmacist clinical educational program to the 3-month baseline. Statistical analysis was performed using the test of 2 independent binomial proportions.

Participants' assessment of program impact was a secondary outcome. Two anonymous surveys were administered to participants — one was administered immediately following each individual live program, and one, which assessed the program overall, was administered approximately 6 months after the clinical educational program ended.

RESULTS

Twenty-two sessions, held during a 30-minute interval during the day and evening shift scheduling overlap, were provided over 12 weeks in this clinical educational program. A total of 126.5 hours of CE was awarded. The voucher system covered the total cost of the program; the actual costs were \$1,500 for 11 hours of CPE programming and \$1,897.50 for awarding of CE certificates and submission to the CPE Monitor Service, the National Association of Boards of Pharmacy (NABP) pharmacist CPE tracking center.

The overall acceptance rates of proposed clinical interventions remained consistent, at greater than 90% before, during, and after implementation of the clinical educational program. The rates (%) of accepted clinical interventions as a proportion of total medication orders reviewed made by the attending

pharmacists participating in the clinical educational program statistically increased during and after program implementation (Table 2). The proportion (%) of accepted clinical interventions increased from 6.4% (at baseline) to 9.1% and 8.7% in the 3 months during and 3 months immediately after the educational program, respectively ($P < .01$). Standardizing these proportional rates across total number of medication orders equated to approximately 1,844 and 1,737 more clinical interventions in the 3 months during and 3 months immediately after the educational program, respectively.

The initial pharmacist assessment survey, administered immediately after each individual educational session, indicated that all sessions were positively received. Individual topics achieved either an overall median evaluation of 4 (*very good*) or 5 (*excellent*) on a scale of 1 to 5, where 1 = *poor*, 2 = *fair*, 3 = *good*, 4 = *very good*, and 5 = *excellent*. Attendance varied per individual topic, with a mean 32.9% of total pharmacist attendance per session (mean 4.6 participants per session; range, 3-22) (Table 1).

The 6-month survey evaluation indicated that pharmacists overall felt that the program met the predefined program goals (response rate, 48.6%; $n = 17$). Approximately 94% of respondents ($n = 16$) indicated that the program met their education needs and helped them stay abreast of new health care developments. About 81% ($n = 14$) of pharmacists responded that presenting in this series improved their collegial

Table 2. The proportion of accepted pharmacist clinical interventions for medication orders before, during, and after implementation of the educational program as compared to total number of medication orders reviewed

	Before the pharmacist clinical educational program (baseline - 3 months)	During the pharmacist clinical educational program (3 months)	After the pharmacist clinical educational program (3 months)
Proportion of accepted pharmacist clinical interventions, % (no. of accepted interventions/ total no. of orders reviewed)	6.4% (4,601/71,659)	9.1% (6,282/69,340)	8.7% (6,674/77,135)
<i>P</i> values for rates (%) compared to baseline	N/A	<.01	<.01

Note: Statistical analysis was performed using the test of 2 independent binomial proportions, comparing the proportion (%) of accepted clinical interventions to total number of reviewed medication orders during and after implementation of the pharmacist clinical educational program to the 3-month baseline before implementation. The acceptance rates of proposed clinical interventions remained consistent, at greater than 90% before, during, and after implementation of the clinical educational program.

relationships with members of the pharmacy team. Seventy-five percent of respondents ($n = 13$) felt they were able to recall the best practices and standards of care related to the therapeutic topic that was presented and integrate best practices/standards of care and solutions to identified medication safety issues related to the topic as a result of program participation (Table 3).

DISCUSSION

The clinical education program developed by BMC met the predefined goal of creating an engaging, challenging, and interactive program, which was concise

but intense, to improve the pharmacists' clinical knowledge and critical thinking skills. The primary and secondary outcomes, which were increased proportion of accepted clinical interventions during and after the implementation of the program and overall participant satisfaction with the program, respectively, were achieved. A direct link between education of this nature and increased rates of accepted clinical interventions have not previously been reported the literature.

As a marker of program effectiveness, the proportion of accepted pharmacist clinical interventions was assessed before, during, and after the program implementation. The timing of the clinical educational

Table 3. Pharmacist evaluation of the overall clinical educational program as assessed 6 months after program

Evaluating metric	Yes (%)	No (%)	Unsure (%)
The presentations and any supplemental instructional materials were free from bias or commercialism.	100	0	0
Having both the live and electronic presentations to complement each other is an effective means of learning.	100	0	0
This activity met my educational needs.	94	6	0
This activity will help me stay abreast of new health care developments.	94	0	6
The presenters effectively responded to questions and comments.	94	0	6
This activity met my need for increasing clinical intensive pharmacotherapeutics knowledge.	88	12	0
This activity will help me promote high quality and safe medication use.	88	6	6
This activity will help me identify medication safety issues related to the therapeutic topic presented.	88	0	12
The format of the live presentations is an effective means of learning.	88	0	12
The format of the electronic presentations is an effective means of learning.	87	0	13
This activity will help me promote optimal patient care outcomes.	82	6	12
The presenters were able to convey their knowledge of the subject.	82	0	18
Presenting in this series improved collegial relationships with members of the pharmacy team.	81	0	19
Presenting in this series aided my personal professional development.	80	7	13
I was able to interact with the presenters and other participants in an effective manner.	76	6	18
This activity will help me recall the best practices and standards of care related to the therapeutic topic presented.	75	0	25
This activity will help me integrate best practices/standards of care and solutions to identified medication safety issues related to the topic.	75	0	25
The clinical pharmacy specialists were available for guidance and feedback, if desired.	69	0	31
	Median		Range
Overall, how would you rate this activity/program on a scale of 1 to 5, with 1 = <i>poor</i> , 2 = <i>fair</i> , 3 = <i>good</i> , 4 = <i>very good</i> , and 5 = <i>excellent</i> ?	4		2-5

Note: $n = 17$ respondents; 48.6% response rate.

program coincided with planned attending pharmacist scheduling changes to better position pharmacists to be active members of the health care team and increase their opportunities to utilize the clinical knowledge and critical thinking gained from the clinical educational program in the provision of IP. The documented proportion of accepted clinical interventions increased during the educational program and remained elevated after the program. Qualitatively, the scope and clinical level of the interventions also greatly increased. This is a testament to the impact of the clinical educational program, as pharmacists with less overall clinical experience but with clinical educational program training entered into the IP practice rotation in the 3 months after the educational program and the proportion of accepted interventions and the overall acceptance rate remained statistically elevated.

This phenomenon was also supported by the results of the 6-month program evaluation by the attending pharmacists. The majority of attending pharmacists indicated that the information learned during the clinical educational program added value to their practice. Despite 81% ($n = 14$) of attending pharmacist respondents indicating the clinical educational program improved their collegial relationships with members of the pharmacy team, 31% ($n = 5$) of respondents indicated that they did not feel that the clinical educational program coordinator, a clinical pharmacist, was available for guidance and feedback. Anonymous comments from the survey revealed that the respondents did not take advantage of the mentoring, as they felt this would place additional workload on the clinical educational program coordinator (40%) or felt that the mentoring services were not necessary for the creation of a quality presentation (60%). As initially structured, the mentoring process was voluntary. In the future, a structured mentoring system between presenters and the clinical educational program coordinator may better support the attending pharmacist presenters, improve collegial relationships, and standardize the quantity and quality of information presented.

Several lessons were learned and warrant consideration when a similar program is being implemented. Evaluation of the departmental and individual needs revealed that it can be difficult for pharmacists to attend on-the-job in-service education programs during or after a busy workday, even if these activities contribute to their continuing professional development. Likewise, scheduling to maintain coverage of all necessary

pharmacist activities can be challenging, especially if the education is provided to all pharmacists simultaneously. A downward trend in the attendance was noted from early to the late presentations (Table 1). Vacations scheduled at the time of program delivery also prevented full attendance at the live sessions. The high value that attending pharmacists placed on these sessions was further evidenced by the fact that 100% of the pharmacists unable to attend the live sessions completed these modules via the self-study option.

The greatest strength of the program is its ability to be generalized to a variety of hospital pharmacies. This program was successfully implemented in a geographically challenging area to pharmacists of varied training and experience, and it was able to support IP initiatives in both larger and smaller hospitals across a health care network. These challenges, being some of the most significant challenges to face health care institutions, did not prohibit this program from meeting its goals.

Although this program proved successful, the lack of data regarding the rates of rejected clinical interventions is a significant limitation. Due to differences and limitations within various electronic health records (EHRs), we were not able to obtain these data; this may impact the replication of the assessment of the same outcome measures in institutions with different EHRs. Additionally, there is little to no standardization within the health care system to allow the quality and relative clinical importance of pharmacy interventions to be tracked; this limits the direct comparison of changes to pharmacist interventions across health care institutions. We report a qualitative increase in the clinical complexity of accepted pharmacist interventions, but we do not have standardized data on this outcome, which precludes a more in-depth analysis of the quantity and type of intervention posed and accepted.

Future directions for this program include the development of a partner program designed to capitalize on the knowledge gained in the clinical education program. A pharmacist clinical skills laboratory to capitalize on the active learning in the application of the knowledge gained in the pharmacist clinical educational program will be key to continuing the development of hospital pharmacists. Ideally, the pharmacist clinical skills laboratory will provide real-time, hands-on education on evaluating clinically complex patients and performing IP assessments, which will further elevate the practice of pharmacy.

CONCLUSIONS

The development of high-impact clinical educational programs to engage, challenge, and incentivize participants is essential to elevate the practice of pharmacy. By maximizing existing resources, such programming can be provided in an efficient and cost-effective manner. This type of education was well received by pharmacist participants and is an effective means for improving their clinical knowledge and IP skills, while supporting an increase in the proportion of accepted highly clinical recommendations made by hospital pharmacists. As health systems continue to merge on a national level, the methods described here demonstrate a means to provide critical education for both clinical and organizational competency.

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