ABSTRACT

Drug formularies are a necessary part of medication management in hospitals and health systems. The system-level P&T committee at BJC HealthCare, a multihospital health system in St. Louis, Missouri, developed an approach to standardization of a system-wide formulary using available layered learners to complete the work in an expedited manner before implementation of a system-wide electronic medical record. The formulary standardization work was allocated to reviewers—including pharmacy students, residents, clinical pharmacy specialists, and pharmacy leadership—according to the complexity of the drug class under review, and a pharmacist was assigned to oversee and support the learner (student or resident) as class reviews were performed. The reviewer prepared a review of the drug class, developed recommendations for formulary agents and therapeutic interchanges, and presented recommendations to key stakeholder groups in the organization before a final decision by the system P&T committee. Using this approach, 27 therapeutic class reviews were conducted in 15 months, and 153 of 346 individual agents reviewed (44%) were retained on the formulary. The alignment of formulary medications and interchanges in the 27 classes resulted in an estimated $1.185 million savings in supply costs in the 12 months after implementing the changes. Standardization of the formulary and therapeutic interchanges can be expedited by using a layered learner model, and this model can be used in other health systems to accelerate the formulary review process.

Keywords: formulary, layered learners, cost-savings

INTRODUCTION

Drug formularies are an integral part of successful medication management within hospitals and health systems. The American Society of Health-System Pharmacists (ASHP) guidelines1 specifically outline the need for a formulary management process, as well as a P&T committee to manage the formulary within an institution. In addition, the guidelines call for a standardized formulary “among components of integrated health systems when standardization leads to improved patient outcomes and safety.”1 Formulary standardization with a unified P&T committee across multiple hospitals has been described as a time-intensive and potentially contentious process,2–4 but a more streamlined formulary and medication management system can reap benefits related to patient safety, cost containment, and improved drug utilization.5,6

BJC HealthCare, a multihospital health system in St. Louis, Missouri, formed a centralized, system-level P&T committee in 2011. The committee’s initial efforts focused on clinical alignment of processes to promote appropriate utilization, with less emphasis on formulary standardization. After formation of the system P&T committee, the combined formulary for the BJC system consisted of any product purchased by any BJC hospital in the prior 12 months, which comprised 1,854 unique medications, independent of the drug form, dose, or route. By 2015, BJC HealthCare had begun work on implementing a new electronic medical record (EMR) system, and the need for a more streamlined formulary became readily apparent. As the system moved toward an integrated, single-platform EMR, the priorities of the system P&T committee shifted toward simplifying the formulary, including development and standardization of therapeutic interchanges across the system while maximizing clinical and financial benefit. The committee recognized a significant challenge in completing this work in the short period required for EMR implementation. Given that pharmacy students and residents were already embedded in facilities across the organization, the system P&T committee sought to leverage their skills to expedite formulary standardization.

The purpose of this paper is to describe how a multihospital health system approached standardization of formulary and therapeutic interchanges over a 15-month period by working through the subcommittees supporting the system P&T committee and by using a layered learner approach to complete the task in an expedited manner before implementation of the system-wide EMR.

METHODS

Setting

BJC HealthCare is a nonprofit health care system consisting of 15 hospitals, including adult and pediatric academic medical centers that serve as the primary teaching hospitals for Washington University School of Medicine, as well as community hospitals in urban, suburban, and rural communities. Additional comprehensive services include home health, behavioral health, and an employed medical group. BJC hospitals serve as teaching sites for pharmacy students (introductory and advanced pharmacy practice experiences) from area colleges of pharmacy and pharmacy residents in postgraduate year (PGY) 1 and PGY 2.

BJC HealthCare developed a system-level P&T committee in 2011 in response to a need for resource conservation and
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Impetus for Change

Among the 15 hospitals in BJC HealthCare, there were four separate EMR systems for the inpatient settings and multiple systems within ambulatory locations. As the system planned a transition to a new single-platform EMR, the pharmacy specialty team was approached by the system-level EMR implementation team to assist with simplifying formulary products by reducing the number of similar items and standardizing therapeutic interchanges. Product classes with high variation, a more complex build in the new EMR system, or no current clinical panel were identified for review by the EMR implementation team. These included: 1) angiotensin-converting enzyme inhibitors; 2) angiotensin II receptor blockers; 3) beta blockers; 4) topical anesthetics; 5) topical steroids; and 6) minerals, vitamins, and electrolytes.

The timeline was the primary challenge in meeting the project goals. The EMR team requested that the standardization work be completed within 12 to 18 months in order to meet the EMR go-live deadline. Previous class reviews and standardization work had required four to 16 weeks for completion. Given the volume of work and limited time, the system P&T committee had three aims: reduce the overall time needed for standardization work, utilize all available resources, and complete the work correctly the first time to avoid appeals to decisions.

Layered Learning Practice Model

Given the short timeline, BJC’s system P&T committee employed a concept known as layered learning to assist with standardizing the formulary. Layered learning has been implemented in a number of practice settings as a team-based approach to care delivery that incorporates clinical pharmacists, pharmacy residents, and pharmacy students, allowing for expansion of pharmacy services while providing valuable clinical experiences to residents and students. The P&T committee recognized the formulary standardization tasks as an opportunity to engage students and residents in order to adhere to the EMR implementation timeline. In addition, the formulary standardization work aligned well with learning objectives for PGY-1 residents.

Students who assisted in the efforts were located at a community facility for a general hospital rotation or at BJC HealthCare’s corporate offices for a medication safety and outcomes rotation. Students were given dedicated time during their rotation to complete the project. Pharmacy residents were located in both community and academic practice settings (three facilities). For PGY-1 residents at the academic hospital, the projects were part of the six-week management and drug information rotation; for community hospital residents, the projects were completed during either their longitudinal or focused management rotation. There was flexible time within each rotation to complete the project. For PGY-2 residents, projects were completed along with the clinical responsibilities of the rotation to simulate the typical workflow of a clinical specialist. PGY-2 residents primarily aided with new product reviews in their area of specialty training.

Employing the layered learner approach, the formulary standardization effort was allocated to students, residents, clinical pharmacy specialists, and pharmacy leadership according to the complexity of the drug class under review (Figure 2). Class complexity was determined by a number of factors, including potential or known barriers to change and conflicting clinical evidence. Students were assigned less-complex drug classes (e.g., minerals and electrolytes), while residents and pharmacists reviewed increasingly complex drug classes. A pharmacist was assigned to oversee and support the learner (student or resident) as class reviews were performed. The amount of supervision and assistance in completing work differed according to the learning stage of the individual; students were closely supervised, while residents were given more independence.

The therapeutic class review assignments were shared across BJC hospitals to decrease the burden on any single hospital, and assignments were coordinated by the co-chair of the
Out the health system. Recommendations were given to the appropriate clinical panel or the pharmacy specialty team for initial review and discussion as a group. Additional feedback was requested and discussed among relevant stakeholders (physicians, nursing, and other ancillary support teams) over the ensuing weeks. Feedback was discussed again with the clinical panel and modifications were made to the initial recommendations. Lastly, the system P&T committee reviewed and voted on the final recommendations. Figure 3 outlines the process steps.

**Outcomes**

Descriptive statistics on the number of therapeutic class reviews that were performed, as well as the total number of unique agents that were reviewed, are reported. The total of unique agents does not include variations in form, dose, or route. Only the inpatient setting and hospital infusion clinics were affected by the formulary changes and are included in the analysis; retail pharmacies, home care, and medical group practices were not impacted.

Supply cost-savings were determined by calculating the difference between the patient volume-adjusted cost 12 months prior to the implementation of a formulary change and 12 months post-change. A patient volume-adjusted calculation was chosen to ensure that savings were due to the intervention and not due to volume fluctuations. Purchasing data from both time periods for the medications undergoing class review were divided by adjusted admissions in each period. Total admissions were adjusted using inpatient and outpatient pharmacy revenue to account for outpatient areas not included in the admission count, such as ambulatory surgery or the emergency department. The volume-adjusted differences in costs by medication class were multiplied by adjusted admissions to calculate total savings.

**RESULTS**

Over the 15-month study period (May 2015 to July 2016), 27 therapeutic class reviews were conducted. These reviews were performed in six departments by personnel ranging in skill level from pharmacy students to senior pharmacy management; 15 learners participated in the class reviews. The average time to conduct a class review to a P&T decision was 6.9 weeks (range, two to 16 weeks). Twenty-six of the 27 class reviews were accepted on initial presentation to the system P&T committee. A total of 346 unique agents were reviewed during the study period, with 153 items (44%) being retained on the formulary, and 193 agents (56%) classified as nonformulary. In addition to the formulary deletions, several additional dosage forms and sizes were removed to simplify the order entry and product selection process within the future EMR. As of October 2016, 1,571 unique items remained on the BJC formulary, a reduction of 283 items (15%) compared with the 2012 formulary. This includes new items added during this period. Overall, the alignment of formulary medications and interchanges in the pharmacy specialty team. Those preparing class reviews were provided with available existing data, which included the drug purchase history and copies of interchanges in use throughout the system. The individual reviewer was expected to prepare a review of the drug class, to develop recommendations for formulary agents and appropriate therapeutic interchanges when applicable, and to present the findings to stakeholders through-

![Figure 2 The Layered Learner Approach to Class Reviews](image)

![Figure 3 Process for Class Reviews](image)
approach, the team has become more successful in obtaining
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DISCUSSION
The standardization of formulary and therapeutic interchanges
can be expedited by using a layered learner model, in combination with a robust, shared responsibility in the review process. This model can be used in other settings to accelerate the formulary review process. Beyond standardization, this project achieved several other accomplishments. The system-level P&T committee now has a regular cadence for class reviews, a continuous project pipeline, and a better understanding of the approval pathway. The process has also generated a standard review template based on the Joint Commission’s standards for selecting medications and an implementation checklist, thus improving the overall efficiency of product reviews.

While the use of layered learners is not a novel concept, employing students and residents to aid in formulary standardization across a multihospital system has not been described previously. Prior examples of layered learners in the pharmacy setting have incorporated students and residents in direct patient care, such as patient education and medication reconciliation, though engaging learners in administrative tasks has also been reported. The use of layered learners did create some challenges, as multiple preceptors across system facilities had different views and desires for learning experiences. However, engaging students and residents in this task ultimately provided a new and valuable learning experience while completing necessary work for the organization. This type of innovation is increasingly encouraged as a means of expanding the duties of hospital pharmacies when time and resources are limited. As BJC continues to utilize this approach, the team has become more successful in obtaining the necessary information for layered learners and more clearly defining preceptor expectations. One of the greatest benefits for hospital-level preceptors is an increased appreciation for the challenges and opportunities at other facilities within BJC’s complex health system.

Challenges associated with system-wide formulary standardization were largely related to the different needs of the individual facilities, such as utilization of premixed medications versus admixture in the pharmacy, as well as differences in the patient populations and prescribing patterns across facilities. Facilities varied in regard to participation in clinical research, generating differences of opinion among prescribers on the importance of certain medications on the formulary. The leverage of the system P&T committee, led jointly by academic and community physicians, helped diminish some of these challenges, as did the formal process for appeals. In addition, the system P&T committee was well established for a number of years prior to this standardization process, which allowed the team to embrace this work more easily and establish a plan for completion.

The system P&T committee continues to be presented with ongoing challenges, including drug shortages, pricing escalations, and costly specialty medications. As BJC HealthCare seeks to evolve to a more consistent formulary, it has recognized that consistent and diligent reviews of therapeutic classes are a requirement to ensure that new contracting opportunities are maximized. In addition, many medications have now become branded generics, as many agents are now produced by a limited number of manufacturers. This presents unique opportunities for pharmacy leaders to work with prescribers to fully understand how these medications are utilized and to identify any potential alternatives that may lessen the financial impact to the health system. As hospitals continue to deal with a growing number of high-cost specialty and niche medications, it is increasingly important to ensure that robust processes are in place to review these novel therapies. There is often limited or no available evidence to support therapeutic standardization or interchanges in these drug classes. A strong understanding of third-party payments, including location of services rendered, will be a critical competency for pharmacy leaders now and in the foreseeable future.

There are some limitations to this analysis. The data are retrospective and were not initially collected for study purposes. In addition, the analysis was not designed to fully detect the impact of standardization on costs or patient outcomes. The cost analysis is limited by inability to account for savings due to contract changes. It is unknown how many patients may have utilized home medications due to the removal of their home agents from the formulary, nor did the team evaluate possible adverse drug events that may have occurred due to therapeutic interchanges during transitions of care. Finally, the outcomes of this project focused on standardization of the formulary and less on the experience of the layered learners. Next steps by the team may involve evaluating student experiences through a survey or other means to ensure the outcomes of the learning experience are upheld.

CONCLUSION
Concurrent with the establishment of a system P&T committee, the use of multiple layers of pharmacy personnel can provide effective and timely formulary standardization within a large health system. The use of layered learners is an important tool, as it allows students and residents to serve as pharmacist-extenders. While this work was performed within a multi-hospital system, any institution with students or residents that maintains a formulary may find value in this process. Other institutions should explore opportunities to expand learning experiences to include formulary standardization.

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