NOTE

Analyzing methods for improved management of workflow in an outpatient pharmacy setting

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Purpose. The results of a workflow analysis at a large central outpatient pharmacy are reported, with theoretical modeling of potential efficiencies attainable through workflow enhancements.

Summary. In keeping with concepts of "lean health care," a time–motion analysis was conducted at a central outpatient pharmacy that dispenses an average of 250 prescriptions per day. Through direct observation over an eight-week period, pharmacists' dispensing-oriented activities were categorized as either value-added (i.e., centered on direct pharmacist–patient contact and, hence, providing increased value to the patient) or non-value-added. The workflow analysis suggested opportunities to derive more value from pharmacists' time by shifting their efforts away from non-value-added activities (i.e., technical dispensing functions) toward value-added activities: engagement of patients on entry into the pharmacy, pharmacist order verification, and patient counseling. The theoretical application of two models of enhanced workflow indicated that model A (expansion of pharmacy technicians' standard duties to include prescription preparation, stock-container retrieval, and prescription processing) could reduce pharmacists' non-value-added time by about 55%, or more than six minutes per prescription, with an even greater (74%) potential reduction offered by model B (technician performance of checkout procedures in addition to expanded standard duties). Although the research site was atypical in its high staffing level relative to prescription volume, the findings suggest that similar workflow enhancements might be applicable in a range of community practice settings.

Conclusion. Through analysis of existing workflow in an outpatient pharmacy, opportunities to optimize the use of value-added pharmacist time in the dispensing process were identified.

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Rising prescription drug use, a growing elderly population, and reduced reimbursement rates have pressured the pharmacy profession to meet societal prescription needs by creating more comprehensive and efficient pharmacy services. As demand for prescription medications continues to grow, improving workflow management in outpatient pharmacy settings (i.e., community pharmacies and hospital outpatient pharmacies) is vital to providing a higher quality of patient care.[1] From 1994 to 2009, the number of prescription drugs dispensed annually in the United States increased by 86% (from 2.1 billion to 3.9 billion) while the U.S. population grew just 14%.[2-4] Adapting to the pressures of a more complex health care system may require fundamental changes to drug distribution models, including reducing the role of pharmacists in technical dispensing activities and emphasizing increased pharmacist–patient interactions.[5,6]

Research has shown a need for improved workflow in outpatient pharmacy settings to help pharmacists more effectively use their time for direct patient interaction rather than technical dispensing activities. According to the results of an independent study published in 1999, pharmacists were spending just 31% of their time performing clinical activities associated with drug therapy, whereas over 60% of their time was being spent performing tasks that

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could be transferred to ancillary personnel.[7] Results of a survey conducted in 2000 indicated that outpatient pharmacists were devoting only 28% of their time to patient-directed interactions, with 56% of their time devoted to dispensing tasks.[8] Redirecting pharmacists to use more of their time for patient interaction requires modifications of pharmacy workflow that facilitate a redistribution of dispensing activities.

A growing body of evidence indicates that workflow enhancements that shift technical dispensing activities away from the pharmacist (i.e., the use of automation and increased technician-focused dispensing responsibilities) could be used as effective tools to increase pharmacist–patient interactions.[9-11] While the benefits of enhanced workflow patterns have been demonstrated in the literature, there is little information that delineates a process for conducting a comprehensive evaluation of the use of pharmacist time during medication dispensation.

One way to perform a detailed characterization of pharmacist time is to identify the "value-added" time (i.e., time that is used to add value for the patient) in the dispensing process. That can be achieved by applying the concepts of "value stream mapping"—an offshoot of "lean manufacturing" practices pioneered by car makers and now widely used in health care and other fields—to analyze the workflow involved in bringing a product to the customer or patient.[12-16]

The value that pharmacists provide to patients is derived from the use of their expertise to promote safe medication use through patient interactions. This article describes a workflow analysis and a proposed methodology for conducting a robust workflow evaluation with the ultimate goal of allowing pharmacists more time for direct patient interactions.

Background

The University of North Carolina Hospitals and Clinics (UNCH) central outpatient pharmacy is designed to provide a high degree of pharmacist–patient interaction, but the allocation of pharmacists' time has not been optimized for patient care due to pharmacists' involvement in technical dispensing tasks. The outpatient pharmacy, which dispenses approximately 240 prescriptions daily, is staffed by up to six pharmacists and six pharmacy technicians at any given time. The unusually high number of staff relative to the prescription volume is intended to make pharmacists available for direct patient interactions such as patient profile review, medication reconciliation, and patient counseling. The outpatient pharmacy is also equipped with a queuing system (Q-Matic, Qmatic United States, Fletcher, NC) and an automated dispensing system (PharmASSIST, Innovation, Johnson City, NY) to streamline medication dispensation. However, despite having a staffing model and automated solutions to facilitate a high level of pharmacist–patient interaction, patients still wait to be seen because pharmacists are slowed by the dispensing functions that technicians could be performing.

Performing a detailed evaluation of the UNCH central outpatient pharmacy's workflow was critical to identifying opportunities for optimizing the application of pharmacists' skills in order to reduce patient wait times and improve the overall quality of patient care.

The management of workflow in the UNCH central outpatient pharmacy was analyzed by evaluating the use of pharmacist time during medication dispensation; as a result, opportunities for improvement that could be used to develop future plans for workflow enhancement were identified.

Evaluation of existing workflow

This prospective, observational workflow analysis was conducted over an eight-week period (March–May 2010) in the UNCH central outpatient pharmacy. All information was collected by direct observation and elicitation of staff feedback in order to accurately evaluate the unique workflow of the outpatient pharmacy. Observations were conducted on weekdays from 8 a.m. to 5 p.m. by the study investigators and two research assistants.

Pharmacist activities. For the first seven weeks of the analysis, qualitative observations were collected periodically by one investigator (approximately 15 hours per week spent in the pharmacy) in order to describe and differentiate the pharmacist activities that characterized the outpatient pharmacy workflow. Examples of qualitative observations included determining the level of pharmacist involvement in a certain activity and deciding whether or not that involvement ultimately added value to the patient. During the final week of the analysis, workflow measurements for a time–motion analysis were collected by research assistants (a total of approximately 40 hours spent in the pharmacy). Because staff feedback was a vital component of this project, the pharmacists and other pharmacy staff were apprised of the study objectives. The research was approved by the University of North Carolina institutional review board.

Workflow analysis. The outpatient pharmacy workflow was analyzed in order to measure pharmacist workload by describing the fundamental "activity sets" involved in medication dispensing and then examining the amount of pharmacist time dedicated to each activity set throughout the dispensing process (Table 1). For the purposes of this analysis, an activity set was defined as a distinct activity or group of activities in the dispensing process that had defined start and end times. The degree of pharmacist involvement in each activity set was determined by observing whether activities were performed only by pharmacists, only by technicians, or by both; when there was a mixed contribution, pharmacist involvement was approximated based on documented trends (i.e., how often pharmacists performed activities relative to the total number of opportunities to perform those activities).

Concepts of lean health care were used to classify each activity set that entailed pharmacist involvement according to whether or not it ultimately added value to patient care. Using techniques similar to value stream mapping of industrial processes, the current state of the outpatient pharmacy workflow was mapped out so that the value-added pharmacist activities in the dispensing process could be identified. Value-added pharmacist activity sets were identified as those that included direct pharmacist–patient interaction: patient counseling, medication reconciliation, drug therapy review, pharmacotherapy recommendations, and any other component of medication therapy management (MTM). Pharmacist verification of medications to be dispensed was also considered a value-added activity because it helped ensure that the right drug was dispensed to the right patient (as legally required). Value-added pharmacist activities were those that in some way used the unique expertise of pharmacists to contribute to safe and appropriate medication use.

Following the lean health care philosophy of maximizing value-added activities, the non-value-added pharmacist activities were also identified as opportunities for streamlining workflow. Because the analysis was focused on pharmacist work loads, non-value-added activity sets were defined as any activities that could have been performed by nonpharmacist staff. Examples of non-value-added activities included the entry of prescription information into the pharmacy information system, stock-bottle retrieval, medication counting, and preparation of will-call orders.

The workflow observations were subjective, and the collected information was used to characterize the dispensing process as follows:

- Activity set name—Designation based on associated activities
- Activity set description—Brief description based on associated activities
- Pharmacist involvement—Percentage of pharmacist time spent on a given activity set, approximated by direct observation
- Value determination—Classification of activity sets as value-added, non-value-added, or partially value-added (a mix of value-added and non-value-added activities)

The workflow observations in the UNCH central outpatient pharmacy indicated that of the nine activity sets identified (Table 1), four were performed only by pharmacists (pharmacist engagement, pharmacist verification, will-call preparation, and counseling–checkout); three activity sets had 50% pharmacist involvement (prescription preparation, stock retrieval, and prescription processing), and one activity set had no pharmacist involvement (return to stock). Pharmacist engagement, pharmacist verification, and patient counseling were the only value-added pharmacist activities identified.

Time–motion analysis. Once the basic activity sets that constitute the dispensing process were identified, the average time dedicated to each activity set was measured. Patient queue times before the initial engagement by pharmacy staff were excluded from the analysis, but this information was obtained from the Q-Matic system in order to establish a total process time beginning from

Table 1.
Results of Workflow Analysis at UNCH Central Outpatient Pharmacy[a]

Activity Set	Description	Pharmacist Involvement	Service Type
Queue time	Wait time before pharmacist engagement	NA	NA
Pharmacist engagement	Profile review, medication reconciliation, prescription entry and adjudication	Yes	Value-added
Prescription preparation	Retrieval of prescription labels	50%	Non-value-added
Stock retrieval	Retrieval of medication stock containers	50%	Non-value-added
Prescription processing	Scanning, counting, pouring, labeling	50%	Non-value-added
Pharmacist verification	Product verification	Yes	Value-added
Will-call preparation	Collation and preparation for will call or patient counseling	Yes	Non-value-added
Return to stock	Stock-container return	No	NA
Counseling–checkout	Patient counseling and checkout	Yes	Partial value-added[b]

[a]UNCH = University of North Carolina Hospitals and Clinics, NA = not applicable.
[b]Patient counseling.

the time patients entered the outpatient pharmacy.

All data in this assessment were collected using handheld devices equipped with UMT Plus software (Laubrass, Inc., Montreal, Canada), which is designed to capture data for work measurement studies. Data collection was based on repeated observations of the performance of each activity set. Because some activity sets involved multiple prescriptions and significant variability was anticipated between time measurements, all measurements were standardized by prescription volume (i.e., the process time for each measured activity set was divided by the corresponding prescription volume). The calculated standardized times were then represented as the average pharmacist-dedicated time per prescription.

The mean dedicated pharmacist time for each activity set was determined by multiplying the average dedicated time per prescription by the percentage of pharmacist involvement. Calculated figures for dedicated pharmacist time were then used to define a baseline model of how pharmacist time was used during medication dispensation in the outpatient pharmacy.

During the data collection period, the overall dispensing process time was 40.74 minutes per prescription (that included a queue time of 21.9 minutes before pharmacist engagement), and the mean total measured time was 18.84 minutes per prescription (Table 2). Because pharmacists were highly involved with dispensing activities, pharmacist time represented a significant portion (14.73 minutes per prescription) of the total measured time, and pharmacy technician work accounted for just 4.11 minutes per prescription. Furthermore, approximately 43% of pharmacist time (6.32 minutes per prescription) dedicated to dispensing was determined to be non-value-added time.

Theoretical modeling. Using the calculated baseline figures, theoretical models were developed to demonstrate opportunities for improved use of pharmacist time by showing that the application of different workflow enhancements could minimize pharmacist involvement in non-value-added activities, thereby facilitating increased pharmacist–patient interactions. Two models were developed:

- Theoretical model A—Expansion of pharmacy technicians' defined responsibilities to include three technical dispensing activities (prescription preparation, stock-bottle retrieval, and prescription processing)
- Theoretical model B—Technician performance of checkout procedures (after patient counseling by a pharmacist) in addition to the above-listed expanded standard duties

Calculations resulting from the theoretical application of models A and B indicated that the proposed workflow enhancements would greatly reduce the amount of non-value-added pharmacist time dedicated to the processing of dispensed prescriptions. With models A and B, the total value-added pharmacist time would remain the same as at baseline (8.41 minutes per prescription), but non-value-added pharmacist time would be reduced to 2.83 and 1.66 minutes per prescription, respectively (Table 2); as a result, the total pharmacist process time per prescription dispensed would be reduced by 24% under model A and 32% under model B.

Discussion

At baseline, the workflow in the UNCH central outpatient pharmacy was characterized by significant pharmacist involvement in technical aspects of the medication dispensing process. Of the nine activity sets identified in the workflow analysis, seven entailed pharmacist involvement of at least 50%, but only three entailed value-added work. Because the initial patient engagement was always performed by a pharmacist, the same pharmacist often performed all subsequent activity sets in the dispensing process (except return to stock). This resulted in pharmacists using approximately 43% of their time for non-value-added work instead of directing more attention toward expediting queue times by initiating engagement with patients earlier.

Because pharmacist–patient interactions were strongly emphasized in the baseline dispensing process, a significant amount of value-added pharmacist work was involved, but there were still opportunities to improve the use of pharmacist time.

Theoretical modeling demonstrated how non-value-added pharmacist work could be reduced by applying technician-driven workflow enhancements: an expansion of technicians' defined responsibilities (model A) and technician performance of checkout activities in addition to an expansion of defined responsibilities (model B). The theoretical application of these workflow enhancements showed that non-value-added pharmacist time could be reduced, thereby reducing the pharmacists' share of the total process time, by shifting technical dispensing activities from pharmacists to pharmacy technicians.

If broadly implemented, measures to reduce the amount of pharmacist time dedicated to technical dispensing activities would facilitate a reallocation of the pharmacist's work load to enable an increased focus on direct patient interactions in any outpatient or community pharmacy setting. The potential benefits of optimizing pharmacist–patient interactions include improved workflow efficiency, increased opportunities for MTM, a reduced salary cost per dispensed prescription, an enhanced ability to handle a larger prescription volume, a reduced risk of medication errors

Table 2.
Results of Time–Motion Analysis of Dispensing Process at UNCH Central Outpatient Pharmacy[a]

Variable	Mean ± S.D. Total Time per Prescription (min)	Mean ± S.D. Pharmacist Time per Prescription (min)		
		Baseline	Model A[b]	Model B[c]
Activity sets				
Pharmacist engagement	5.08 ± 4.72	5.08 ± 4.72	5.08 ± 4.72	5.08 ± 4.72
Prescription preparation	1.42[e]	0.71[e]	. . .[d]	. . .
Stock retrieval	1.10 ± 1.56	0.55 ± 0.78	. . .	. . .
Prescription processing	4.45 ± 4.44	2.23 ± 2.22	. . .	. . .
Pharmacist verification	2.15 ± 1.71	2.15 ± 1.71	2.15 ± 1.71	2.15 ± 1.71
Will-call preparation	1.66 ± 0.74	1.66 ± 0.74	1.66 ± 0.74	1.66 ± 0.74
Return to stock	0.63 ± 1.45	. . .	. . .	. . .
Counseling–checkout	2.35 ± 2.99	2.35 ± 2.99	2.35 ± 2.99	1.18 ± 1.50
Time calculations				
Total prescription process time	18.84 ± 17.61	14.73	11.24	10.07 ± 8.67
Value-added pharmacist time	. . .	8.41	8.41	8.41 ± 7.93
Non-value-added pharmacist time	. . .	6.32	2.83	1.66 ± 0.74

[a]UNCH = University of North Carolina Hospitals and Clinics.
[b]Expansion of pharmacy technicians' defined responsibilities to include prescription preparation, stock retrieval, and prescription processing.
[c]Pharmacy technician performance of checkout activities in addition to expanded defined responsibilities per model A.
[d]Not evaluated.
[e]S.D. not calculable.

due to process standardization, and, ultimately, improved quality of patient care.

The workflow analysis and theoretical modeling exercise had several notable limitations. First, the patient care model at the UNCH central outpatient pharmacy is atypical in that the number of pharmacists on staff is high relative to the prescription volume; while most outpatient pharmacies that dispense around 250 prescriptions per day are likely not staffed by more than two pharmacists at any given time, the UNCH outpatient pharmacy is simultaneously staffed by up to six pharmacists in order to emphasize direct patient interactions. Second, throughout the workflow evaluation, there was significant variability in the observed pharmacist and technician activities (i.e., rather than completing each activity set without interruption, they often stopped performing one activity set to perform other, unrelated activities); because of that measurement variability, almost 50% of the initially collected data were excluded from the workflow analysis. In addition, the results of the observational analysis described here would have had greater external validity if the theoretical workflow enhancements had been implemented during the study period; if that had been the case, preimplementation and postimplementation data collection might have allowed a stronger demonstration of the potential benefits of adopting workflow modifications designed to optimize pharmacist–patient interactions.

Despite those limitations, combining time–motion studies with concepts of lean health care provided a robust understanding of how pharmacist time could be used more effectively in the UNCH central outpatient pharmacy. Regardless of the outpatient pharmacy's atypical staffing model, the basic elements of the pharmacist workflow evaluation can be applied to any outpatient or community pharmacy setting. Identifying opportunities for improved workflow may also be useful in analyzing strategies to reduce medication errors by introducing standardized processes. Similar time–motion and workflow evaluations at other outpatient pharmacy practice sites are warranted.

Conclusion

Through analysis of existing workflow in an outpatient pharmacy, opportunities to optimize the use of value-added pharmacist time in the dispensing process were identified.

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