Assessment of Inpatient Pharmacists' Clinical Interventions Following Implementation of a Pharmacist Intervention Tracking Tool

by Allison R Behrens, PharmD, Melissa E. Ha, PharmD, BCCCP, Berook Addisu, PharmD, BCPS

Clinical pharmacists practicing in the inpatient setting frequently intervene to optimize patient care. Multiple studies illustrate that clinical pharmacists are integral members of the patient care team by dosing medications, providing pharmacy-pertinent recommendations to the medical team to optimize medication regimens, and closely monitoring the clinical status of patients, among other activities.[1-3] Pharmacist interventions have benefited the healthcare system and improved patient outcomes, including reductions in adverse drug events, length of stay, end organ damage, and mortality.[3-7] A 2018 systematic review, including 28 controlled trials, found that inpatient pharmacist-led interventions improved the quality of medication use, reduced number of hospital visits, and decreased length of stay.[8] Additionally, tasks performed by clinical pharmacists have been shown to lead to cost savings.[6,9] Jourdan et al assigned clinical impact scores to pharmacist interventions and correlated this to the number of prevented hospitalization days and cost savings.[9] This study found that pharmacist interventions prevented 213 potential hospitalization days and a total of $281,981 cost avoidance.[9]

The documentation practices of inpatient pharmacists vary widely across organizations and may depend on the type of clinical intervention being performed.[10] According to the 2016 American Society of Health-System Pharmacists' national survey of pharmacy practice in hospital settings, 56.9% of responding hospitals document clinical services in the patient's permanent medical record.[11] The survey did not specify the types of clinical activities that are documented. Pharmacists frequently intervene to improve patient

Abstract

Objectives: Pharmacists are highly involved in patient care throughout daily practice. The primary objective of this study was to evaluate the most common disease states in which clinical pharmacists intervene using an intervention-tracking tool called the PhARMD template.

Methods: This was a single-site, prospective evaluation assessing inpatient pharmacist interventions. Baseline data was collected for a six-month period prior to implementation of the template and compared to two post-implementation phases. Phase I included voluntary use of the template for activities that pharmacists were already documenting in the electronic medical record, and Phase II included use of the template for all pharmacist interventions.

Results: The number of documented interventions per day increased from baseline 0.67 interventions per day to 32.54 and 46.8 interventions per day in Phase I and Phase II, respectively. During Phase II, the most common categories documented were medication reconciliation, anticoagulation, and inpatient clinical interventions. Of the inpatient clinical interventions, the most common disease states intervened in included antimicrobial stewardship (16.7%) and "additional pharmacotherapy" (19.7%), which includes ordering tests and labs; addressing adherence; and other non-pharmacological interventions. Actions most frequently performed by pharmacists included initiation of medications (28.6%), adjusting dose/frequency (24.2%), and monitoring of medications (19.7%).

Conclusions: Pharmacists impact patients through independent practices and clinical recommendations resulting in changes to patient care plans. Use of the PhARMD template provides quantification of these interventions, including the number of disease states that pharmacists may affect, as well as the quality of these interventions.

care throughout the day-to-day course of business; however, these recommendations are often made verbally and are not documented in the electronic medical records (EMR).[10] Therefore, the discussion and communication are limited to the

provider and pharmacist who were directly involved, and future providers may not be aware of the pharmacists' recommendations previously made and any related changes to the care plan.

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TABLE 1. Pharmacy Services Documented through PhARMD Template Utilization

Intervention	Number of Interventions			Interventions per Day		
	Baseline	Phase I	Phase II	Baseline	Phase I	Phase II
Medication Reconciliation	13	1,695	1,284	0.071	13.78	21.40
Anticoagulation	15	1,212	730	0.082	9.85	12.17
Inpatient Clinical	2	398	427	0.011	3.24	7.12
Pharmacokinetics	11	547	273	0.060	4.45	4.55
Mental Health Education Group	77	38	35	0.421	0.31	0.58
Tube Feeding	4	53	34	0.022	0.43	0.57
Tobacco Treatment	0	59	25	0.000	0.48	0.42
Total	**122**	**4,002**	**2,808**	**0.67**	**32.54**	**46.81**

(VA) Pharmacy Benefits Management Clinical Pharmacy Practice Office (CPPO) created a pharmacist intervention tracking tool called the Pharmacists Achieve Results with Medications Documentation (PhARMD) template to demonstrate the clinical interventions that pharmacists make in daily practice.[12] The PhARMD template is a documentation tool connected to the EMR, which allows pharmacists to track interventions by selecting from a pre-set list of interventions based on relevant disease states and type of intervention made to the particular disease state (e.g., medication initiation, discontinuation, change in dose). In order to use the template, the pharmacist must first enter a note into the EMR containing relevant background information and clinical decision making, and they must link that note with a clinical pharmacist encounter service such as anticoagulation, pharmacokinetics, or medication reconciliation. Then, before completing the note, the pharmacist must use the PhARMD template to briefly characterize the intervention(s) documented in the note. This template then auto-populates at the end of the note. The PhARMD template data can then be reviewed to track and trend interventions.

The decentralized, team-based inpatient pharmacists at the William S. Middleton Memorial Veterans Hospital in Madison, Wis. frequently intervene to increase medication safety and optimize patient care. The pharmacists provide care by monitoring patients' status through the EMR, assessing the patient's therapy, providing clinical recommendations to medical teams they're part of, and performing pharmacist-led activities. Pharmacists are highly involved in transitions of care by performing medication reconciliation and discharge counseling for all admitted patients. Pharmacists intervene both by communicating recommendations to providers and through the use of their scope of practice. A scope of practice within the VA authorizes the pharmacist to independently order medications and laboratory tests as the ordering provider without the need for an accompanying protocol or additional provider signature/review.[13] This method of autonomous practice has been reported in 7.2% of U.S. hospitals[11] and, within the VA, requires accompanying documentation. In addition to scoped activities, pharmacists provide care through recommendations to the medical team. Pharmacist recommendations to the medical team have not historically been documented in the medical record at this site. Prior to formal implementation of the PhARMD template in the inpatient setting, there had been minimal use of the template, with the exception of a psychiatry service that was already using the tool to document education. Therefore, the type and quantity of scoped interventions and recommendations provided to the medical team by the entire inpatient clinical pharmacist staff is unknown.

The primary aim of this evaluation was to identify pharmacy services that were documented through the PhARMD template. Secondary outcomes included determining which disease states clinical pharmacists most commonly intervened in, the most common actions that the pharmacists were performing to optimize patient care, the percentage of time interventions were made within the pharmacists' scope versus recommendations made to and accepted by the treatment team, the percentage of time pharmacists were compliant with use of the template, and describing the end user experience with the template through survey data.

Methods

This single-site, prospective evaluation was performed at the William S. Middleton Memorial Veterans Hospital. This evaluation was determined not to meet the federal definition of research and IRB review was not required per the University of Wisconsin-Madison Health Sciences IRB Not Research Determination Decision Tool.

Baseline use of the PhARMD template was collected for approximately a six-month period (183 days) from May 1, 2018 to

TABLE 2. Quantity of Inpatient Clinical Interventions by Disease State (11/1/18-5/4/19)

Intervention	Number of Interventions	Percent of Total Interventions
Additional Pharmacotherapy	163	19.8%
Antimicrobial Stewardship	138	16.7%
Anticoagulation	73	8.8%
Nutrition Support	69	8.4%
Gastrointestinal	46	5.6%
Arrythmia	42	5.1%
Type II Diabetes	40	4.8%
Pain Management	39	4.7%
Coronary Artery Disease	25	3.0%
Chronic Obstructive Pulmonary Disease	22	2.7%
Hypertension	19	2.3%
Shock	19	2.3%
Sedation	16	1.9%
Transplant	16	1.9%
Gout	12	1.5%
Neurology	11	1.3%
Constipation	10	1.2%
Chronic Heart Failure	9	1.1%
Lipids	9	1.1%
Chronic Kidney Disease	7	0.8%
Alcoholic Liver Disease	6	0.7%
Urology	6	0.7%
Alcohol Withdrawal	5	0.6%
Vascular	4	0.5%
Acute Coronary Syndrome	3	0.4%
Delirium	3	0.4%
Mental Health - Depression	3	0.4%
Coronary artery bypass grafting	2	0.2%
Mental Health - Insomnia	2	0.2%
Oncology	2	0.2%
Alcohol Use	1	0.1%
Anemia	1	0.1%
Rheumatology	1	0.1%
Tobacco Cessation	1	0.1%
Total	**825**	**100.0%**

October 31, 2018 prior to implementation, to identify the quantity of template use without formal implementation. Use of the PhARMD template was then formally implemented in two phases. Phase I was conducted over a four-month period (123 days), between November 1, 2018 and March 4, 2019. During Phase I, use of the PhARMD template was mainly emphasized for activities where the pharmacists were already documenting services within a templated note, including clinical interventions on anticoagulation, pharmacokinetic dosing, tube feeding, and tobacco cessation. Pharmacists then added PhARMD template information to the end of the note for tracking purposes. This phase served as a partial rollout of the template. Inpatient pharmacists were trained prior to the implementation of Phase I at a voluntary inpatient pharmacist meeting. Step-by-step guides were also provided via email. Use of the template was encouraged but not required.

Phase II started on March 5, 2019 and data were gathered for the 60-day period between March 5, 2019 and May 4, 2019. During Phase II, pharmacists expanded use of the template with an emphasis on the documentation of the wide range of daily interventions, whether through the use of their scope or through accepted recommendations to the medical team. During Phase II, all Phase I practices were continued. In addition, a new non-templated pharmacy note was created specifically for pharmacists to document all other daily clinical interventions made, and the PhARMD template was used in a similar manner to that of Phase I. Pharmacists were trained prior to the implementation of Phase II on the necessary components of a complete clinical encounter within the new, non-templated clinical intervention note and appropriate use of the template, via a voluntary training at an inpatient pharmacist meeting and through email communication.

Prior to implementation of Phase II, a small group of pharmacists participated in a Phase II pilot over a one-month period from February 4, 2019 to March 4, 2019. The goal of is this pilot was for the participants to try the Phase II documentation process and provide feedback. Two in-person check-in meetings with this pilot group occurred during the pilot phase. Based on discussions with the pilot group, training materials were created and distributed to the entire pharmacist team prior to full Phase II implementation. The pilot group continued to document all interventions included in Phase I. Due to the pilot period occurring during Phase I and only a limited number of Phase II interventions being documented, data from the pilot period is included with the data for Phase I. The data was analyzed using descriptive statistics for baseline, Phase I, and Phase II periods.

Primary Outcome:

The primary outcome of this evaluation was to identify the pharmacy services that were documented through the PhARMD

TABLE 3. Classification of Interventions by Action Type (11/1/18-5/4/19)

Category of Intervention	Action Type (n= number of interventions)								
	Initiate	Adjust dose/ frequency	Monitor	Change/ discontinue	Non- pharmacologic	Change form	Manage/ prevent ADE	Education	Other
Anticoagulation	309	435	1,084	74	30	1	1	7	1
Inpatient Clinical	190	224	33	252	25	75	15	1	10
Med Reconciliation	1,141	596	13	520	9	12	5	672	11
Mental Health Education Group	0	0	0	0	73	0	0	0	0
Pharmacokinetics	222	386	188	15	1	3	3	0	2
Tobacco Treatment	80	1	0	3	0	0	0	0	0
Tube Feeding	4	7	26	13	0	35	0	0	2
TOTAL	1,946	1,649	1,344	877	138	126	24	680	26

template. These core pharmacy services documented through the template were sorted by the type of service encounter to which the pharmacist linked their note. Encounter selections included medication reconciliation, anticoagulation, pharmacokinetic, mental health education group, tube feeding, tobacco treatment, and inpatient clinical. The "inpatient clinical" category was used for all interventions on disease states that did not appropriately fit into one of the previously listed encounters. The total number of interventions and the average number of interventions per day were sorted by when they occurred: baseline, Phase I, or Phase II.

Secondary Outcomes:

Secondary outcomes include the following items: determine the clinical disease states in which pharmacists were commonly intervening; identify the types of actions being taken with respect to these interventions (e.g., initiate medication, discontinue medication); find the quantity of scoped versus recommended interventions; identify compliance with the PhARMD template; and evaluate the end user experience with the PhARMD template.

The interventions that were included in the "inpatient clinical" category were further quantified for a composite of the

Phase I and Phase II periods to identify the common disease states that pharmacists intervened in. Of note, the term "disease state" in this context refers to the list of predefined options within the PhARMD template, whose names might not accurately describe an actual disease state (e.g., antimicrobial stewardship, urology, pain management) but rather an area of clinical practice.

Additionally, each intervention was assessed for the type of action taken. All interventions in Phase I and Phase II were classified as one of the following: initiate, adjust dose/frequency, monitor, change/discontinue, non-pharmacologic change, change in dosage form, manage/ prevent an adverse effect, education, or other. The category of "other" included all interventions that did not fit into one of the previously defined categories.

Pharmacists at this site manage certain processes, such as anticoagulation and pharmacokinetic dosing. These processes are considered within the pharmacists' scope, and as such, pharmacists are able to make changes to the therapy plan without contacting the medical team. Other changes are made by pharmacists identifying an area of therapy optimization and contacting the medical team, and the medical team accepting and implementing the change. When completing an entry in the PhARMD template, pharmacists select

whether the intervention was within their scope or whether it was a recommendation to the provider. Data were analyzed to identify the percentage of interventions that were made within scope versus a recommendation to the provider.

Pharmacists were encouraged, but not required, to use the template. A report was generated from VA CPPO to analyze compliance with the PhARMD template during Phase II when full use of the template was implemented. Compliance was measured by comparing the number of clinical encounters that had the opportunity for PhARMD template use to the number of encounters in which the PhARMD template was actually used.

The experience pharmacists had using the template was measured at the completion of Phase I. All pharmacists were encouraged to complete a voluntary, online survey, which consisted of Likert scales to measure the pharmacists' confidence, willingness, and satisfaction. The survey included the following three questions: "On a scale of 1 to 5 (1=not at all, 5=the most), what is your confidence in using the PhARMD template?" "On a scale of 1 to 5 (1=not at all, 5=the most), what is your willingness to use the PhARMD template?""On a scale of 1 to 5 (1=not at all, 5=the most), what is your satisfaction in using the PhARMD template?"

TABLE 4. Recommendations within Scope vs. Made to a Provider (11/1/18-5/4/19)

Intervention	Recommendation within Scope	Recommendations Made to Provider	Total Interventions	% of Interventions within Scope
Mental Health Education Group	73	0	73	100.00%
Tobacco Treatment	84	0	84	100.00%
Anticoagulation	1,934	8	1,942	99.59%
Pharmacokinetics	801	19	820	97.68%
Medication Reconciliation	2,628	351	2,979	88.22%
Tube Feeding	74	13	87	85.06%
Inpatient Clinical	382	443	825	46.30%

Results

Thirty-two pharmacist were included and encouraged to use the PhARMD tool in both Phase I and Phase II of implementation; however, the use of the template was voluntary.

Primary Outcome:

The first primary outcome was to determine the pharmacy services that were documented through use of the PhARMD template (Table 1). At baseline, use of the tool was minimal, with a total of 122 interventions logged during the six-month period, for an average of 0.67 interventions logged per day. The majority of the interventions logged at baseline were categorized under "mental health education," as the inpatient mental health pharmacists have historically used the tool to log education that is performed in group classes. Throughout the Phase I period, the average interventions per day increased to 32.54, with the primary interventions being related to medication reconciliation. In Phase II, where all pharmacists were encouraged to use the tool to document all interventions, the average increased to 46.8 interventions logged per day. During Phase II, the most common logged interventions were the medication reconciliation category, followed by anticoagulation, and inpatient clinical interventions that were not classified into one of the previously defined categories.

Secondary Outcomes:

For the interventions that were categorized as general "inpatient clinical" interventions that did not fit within specific pharmacist services, the most common clinical disease states intervened in were antimicrobial stewardship (n=138, 16.7%) and "additional pharmacotherapy" (n=163, 19.7%), which includes interventions such as ordering tests and labs; addressing adherence; and other non-pharmacological interventions (Table 2).

The most common actions performed by pharmacists were initiation of a medication (n=1946, 28.6% of interventions), followed by adjusting dose/frequency (n=1649, 24.2% of interventions), and monitoring of medications (n=1344, 19.7% of interventions). Education, which encompassed discharge counseling, anticoagulation teaching, and other forms of education, was also a common intervention (n=680, 10% of interventions) (Table 3).

The majority of interventions made and recorded were interventions that were within the pharmacists' scope of practice. These intervention often included mental health education group (100%), tobacco treatment (100%), anticoagulation (99.59%), pharmacokinetics (97.69%), medication reconciliation (88.22%), and tube feeding (85.06%). However, interventions that were recorded in the "inpatient clinical" category were only within scope 46.30% of the time (Table 4).

There was an average of 94.74% compliance with PhARMD template use during the Phase II period (Table 5). A total of 16 out of 32 pharmacists completed the End User Experience survey, and responses ranged between 1 and 5 with mean scores of 3.81, 4.38, and 3.94 for confidence, willingness, and satisfaction, respectively.

Discussion

Primary Outcome:

The most commonly documented services were consistent throughout Phase I and Phase II of the PhARMD template implementation. The services in which pharmacists were most commonly intervening were pharmacist-managed processes. The most common interventions in both Phase I and Phase II were through the provision of medication reconciliation. This is likely due to the robust, pharmacist-managed medication reconciliation process at the facility, which pharmacists complete for each patient who is admitted and discharged. The second most common intervention was anticoagulation, which is also a pharmacist-managed process at this facility. In the Phase II period, the "inpatient clinical" interventions were the third most common intervention. This category identifies and quantifies the interventions that pharmacists are making through the day-to-day workflow that previously were not documented, tracked, or trended.

Secondary Outcomes:

As demonstrated in Table 1, pharmacists are intervening on disease states throughout the entire spectrum of patient care. Not only are interventions medication-focused, but pharmacists are also involved in the patient's treatment through laboratory monitoring, non-pharmacological interventions, and education of patients. Most interventions pharmacists made required a change as opposed to monitoring. Almost 1/5 of the interventions made by pharmacists were in the form of education. Transitions of care are a focus at this site, and, therefore,

each patient receives detailed discharge counseling and may receive additional counseling if they are discharging on a high-risk medication such as a new anticoagulant.

The majority of interventions that were made were within the pharmacists' scope with the exception of interventions that fell into the "inpatient clinical" category. This outcome is important because demonstrating the frequency of pharmacist interventions that require authorization from the medical team may guide future expansion of the pharmacists' scope where appropriate.

Overall, the pharmacists' compliance with the template was above 90%. Therefore, this may be an appropriate measurement tool for common pharmacist interventions. Compliance was lower when used for the "medication reconciliation" and "tube feeding" categories. This may be due to confusion about the appropriate times to use the PhARMD template (e.g., whether the template should be used when no medication changes are recommended). Further education regarding appropriate use of the template would likely increase compliance in these categories.

Overall, the pharmacists were satisfied, confident, and willing to use the PhARMD template, which indicates that the template may be beneficial for continued use and tracking/trending of interventions.

Results of this study are similar to results demonstrated at other VA sites that are using the PhARMD template in either the inpatient or outpatient setting. Groppi et al evaluated the use of the PhARMD template at all VA sites where it was in use, in both the inpatient and outpatient settings.[12] Compliance with template use was similar in the Groppi et al study, which found 95% compliance.[12] Additionally, the most common actions taken by the pharmacists were medication monitoring, adjusting dose or frequency of medication; changing or discontinuing a medication; and initiating medication, respectively, which were also the four most common actions demonstrated in our study.[12] Groppi et al found a mean of 6 interventions per patient.[12] Our study was unable to look at patient-specific data but demonstrated a growing number of documented interventions with the

TABLE 5. Compliance with PhARMD Template Use in Phase II (3/5/19-5/4/19)

Row Labels	% PhARMD Encounters
Inpatient Clinical	100.00%
Anticoagulation	94.49%
Pharmacokinetics	94.49%
Tobacco Treatment	92.59%
Mental Health Education Group	92.11%
Medication Reconciliation	84.79%
Tube Feeding	67.74%
Average Compliance	**94.74%**

implementation of each phase.

Limitations:

One limitation of this study was that the use of the PhARMD template was entirely voluntary; therefore, the number of clinical interventions is likely underrepresented, as it is likely that not all interventions were logged with the PhARMD template. Clinical pharmacists were simply encouraged to use the template and multiple email and in-person reminders were delivered to remind pharmacists to use the template. A second limitation was that the template does not include all possible disease states or possible interventions, which, therefore, increases the subjectivity and variability of the template use. To combat this, a small group of pharmacists highly interested in template use participated in the Phase II pilot, and provided feedback on use and suggestions for standardization. Based on feedback from the pilot group, standard work documents were created and emailed to the entire inpatient pharmacy staff prior to full implementation of Phase II. Interventions during the Phase II pilot period were included with Phase I data, given that the timeline overlapped and that the included pharmacists were still actively involved in Phase I interventions. Therefore, the number of interventions during Phase I would have been slightly lower if no pilot group existed, and, thus there would have been a larger difference in the number of interventions between Phase I and Phase II. A final limitation includes the functionality of the PhARMD template for measuring activities that are within the pharmacists' scope of practice. The template may be

used for multiple interventions during a single encounter in the electronic medical record; however, the pharmacist only has the ability to indicate whether the interventions were within scope or were recommendations to the provider. Instruction by CPPO recommends logging all interventions as within scope, even if the interventions were a combination of scoped activities and recommendations to providers. Therefore, the number of scoped interventions versus the recommendations to providers was overstated.

Conclusion

Pharmacists impact patient care on a daily basis by independently intervening and making clinical recommendations that result in changes to patient care plans. Use of a tracking tool, such as the PhARMD template, allows clinical pharmacists to demonstrate the quantity and quality of touchpoints they have within the patient care teams, as well as the variety of disease states in which they are intervening. Overall, pharmacists at this site were satisfied with the template use and willing to track and trend their interventions.

Allison Behrens is a PGY2 Ambulatory Care Pharmacy Resident at UNC Medical Center in Chapel Hill, NC. Melissa Ha is a Clinical Pharmacist at the William S. Middleton Memorial Veterans Hospital in Madison, WI. Berook Addisu is the Associate Chief of Operations at the Washington DC VA Medical Center in Washington, DC.

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