Original Work

Impact of a Direct Oral Anticoagulant Population Management Tool in a Pharmacist-Led Outpatient Anticoagulation Service

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Abstract

Background: Clinical guidelines indicate that direct oral anticoagulants (DOACs) require periodic monitoring but do not define the optimal workflow for this required monitoring.

Objectives: To evaluate the impact of a population management tool (PMT) on pharmacist interventions compared to traditional management of DOACs in an outpatient pharmacist-led anticoagulation (AC) service. Pharmacist time spent and occurrence of bleeding and thromboembolism were reviewed as secondary objectives.

Methods: A retrospective analysis was conducted of patients on DOAC therapy managed by a pharmacist-led AC clinic. A query of the health-system pharmacy database was performed to identify all patients initially prescribed a DOAC from April 2016 to April 2017, to represent pharmacist monitoring using a traditional model, and from April 2018 to April 2019, to represent monitoring with a PMT. Patients were randomly selected from each respective monitoring model for chart review. Pharmacist interventions, including lab ordering, were tracked as the primary outcome. Pharmacist time invested per patient encounter and safety outcomes were assessed as a secondary outcomes.

Results: A total of 150 patient charts (n=75 for each model) were reviewed. The traditional model yielded more overall interventions than the PMT model (249 vs. 127, respectively). However, if routine lab ordering was excluded, the PMT model yielded a higher number of clinical interventions (66 vs. 82, respectively). Besides lab monitoring, there were statistically significant differences in DOAC discontinuation, DOAC dose change, and changes to GI prophylaxis captured between models.

Conclusions: DOAC monitoring using the PMT approach may offer an effective alternative to traditional monitoring to reduce the need for unnecessary lab ordering while still capturing necessary clinical interventions.

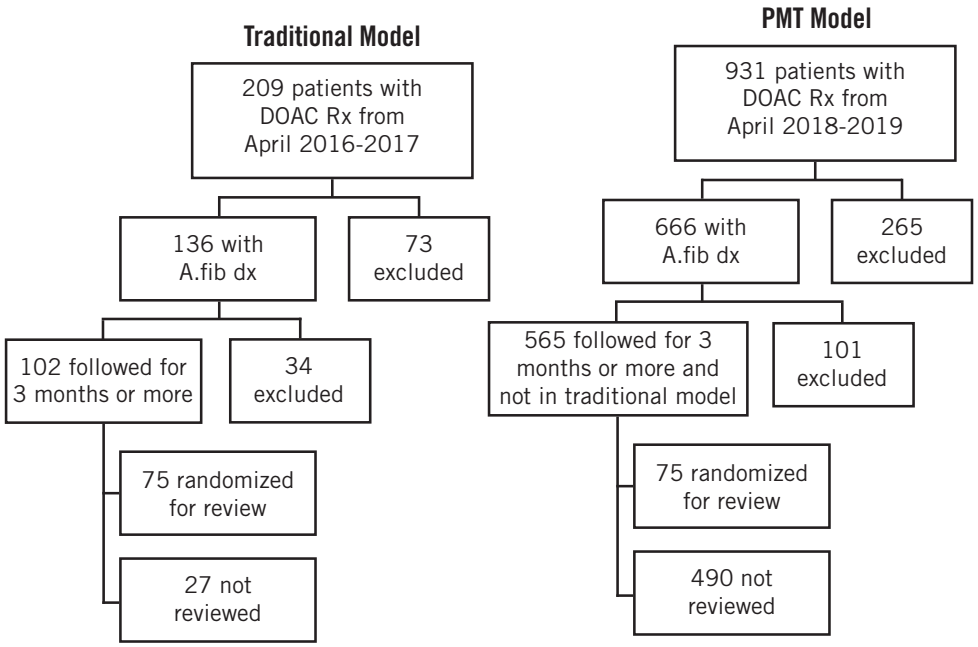
Direct oral anticoagulant (DOAC) therapies were first approved by the U.S. FDA in 2010.[1] Since their introduction, multiple societies have worked to provide guidance on appropriate monitoring of DOAC therapies. The Canadian Cardiovascular Society created a monitoring checklist to ensure topics such as adherence, bleeding risk, renal function, and drug interactions are being assessed during follow-up visits.[2] The American Heart Association and European Heart Rhythm Association published practice guidelines recommending routine monitoring for DOACs at least every six months.[3,4] Even with these practice recommendations available, the ideal management strategy for DOACs has yet to be determined.

Given this gap in knowledge regarding optimal DOAC management, monitoring of these therapies has become very site specific. At the William S. Middleton Memorial Veterans Hospital, the outpatient anticoagulation clinic (AC) is primarily managed by clinical pharmacy specialists (CPS). A CPS operates as an advanced practice provider within a defined scope of practice to manage anticoagulant medications and order necessary labs. Direct oral anticoagulants are among the medications managed by the AC clinic, and their use increased more than 200% at this site from May 2017 to May 2018.

Historically, the traditional method of DOAC monitoring in the AC clinic included an initial, educational visit followed by a phone call at two weeks to assess medication tolerability. Within three months of DOAC initiation, a complete blood count and serum creatinine labs were drawn to monitor therapy safety. These labs were repeated six months after initiation and every six months thereafter, or more frequently if determined clinically necessary. Not every patient contacted via phone by a CPS needed a clinical intervention. It remained unclear if this resource-intensive method for DOAC management was ideal, because there were no clear guidelines for the optimal frequency of clinician follow-up.

Evidence regarding the use of clinical dashboards, such as a population management tool (PMT), in health care environments has demonstrated better

FIGURE 1. Participant Flow



Direct Oral Anticoagulant (DOAC), Prescription (Rx), Atrial Fibrillation (A.fib), Diagnosis (dx)

immediate access to patient information, in addition to improving care processes and patient outcomes.[5] Population management tools have been found useful in the management of chronic disease states such as diabetes.[6] Two Veterans Affairs (VA) hospitals collaboratively developed a PMT for DOACs that electronically tracked data and determined when a clinical intervention was needed based on predefined clinical parameters.[7] The PMT tracked critical labs, drug-drug interactions, appropriateness of therapy dose and duration based on indication, and overdue refills and labs. A prospective study comparing routine, scheduled DOAC monitoring versus use of the PMT showed the PMT reduced the amount of pharmacist time required to perform a clinical intervention by 48 minutes.

The William S. Middleton Memorial Veterans Hospital AC implemented the VA DOAC PMT in July 2018 to streamline management of patients receiving DOACs by electronically tracking and flagging when a potential intervention was needed. The PMT monitoring diverges from the traditional monitoring model after the third month, where, instead of scheduled labs every six months, unscheduled patient encounters occur when the PMT alerts the CPS to a necessary intervention. The purpose of this evaluation was to determine the impact of a population management tool (PMT) compared to traditional follow-up for management of direct oral anticoagulants (DOACs) in a pharmacist-led anticoagulation (AC) service, with a primary focus on number of pharmacist interventions.

Methods

This single-center retrospective evaluation reviewed patients managed by a pharmacist-led AC clinic. A query of the health-system pharmacy database was performed to identify all patients initially prescribed a DOAC from April 2016 to April 2017 (traditional model) and from April 2018 to April 2019 (PMT model). Patients were eligible for review if they had a DOAC prescription managed by the William S. Middleton Memorial Hospital VA outpatient AC clinic. Patients were excluded from the evaluation if they had a DOAC indication other than atrial fibrillation or atrial flutter, due to variable durations of therapy and transition periods to the DOAC PMT for long-term management. Patients were also excluded if DOAC therapy was managed for less than 3 months.

In both the traditional and PMT model, a convenience sample of 75 patients was randomly selected for review from a total of 209 patients in the traditional model and 931 patients in the PMT. The convenience sample was performed due to time constraints of the reviewers, and randomization was performed using a random number generator. Chart reviews of AC clinical notes were performed by two investigators. Inter-rater reliability was completed every 5 patients. AC clinical notes for each patient were reviewed for a one-year period beginning three months after initiation of therapy. A start date of three months after DOAC initiation was selected to capture the differences between the traditional and PMT models, as this was when the monitoring strategies diverged. Charts were reviewed to collect the following demographics: age, gender, indication for DOAC, CHA2DS2-VASc score, DOAC used, history of major bleed, previous oral anticoagulant use, and concurrent antiplatelet therapy.[8] Interventions tracked included identification of drug interactions, DOAC dose adjustments, change in DOAC therapy or discontinuation, ordering of necessary labs, referral for additional care, adherence issues, peri-procedural management, discontinuation of antiplatelets, and addition or removal of gastrointestinal (GI) prophylaxis such as proton-pump inhibitors or histamine-2 receptor antagonists.

The total number of interventions captured in each model were reviewed with and without ordering labs included. Lab ordering in the PMT model was not performed on a scheduled basis. Any labs ordered by a VA provider (including annual labs ordered by a primary care provider) were automatically tracked by the tool, therefore reducing the lab ordering burden from the AC pharmacist. Since lab ordering was a routine part of the traditional model, total interventions captured in each model excluding labs might be a more accurate assessment of clinically needed interventions being made.

Major bleeding and thromboembolic episodes during the chart review period were assessed as secondary safety outcomes. Definition of major bleeding was defined as fatal or symptomatic bleed into brain, spine, eye, retroperitoneal, or intramuscular with compartment syndrome, or bleed leading to hospitalization or transfusion of two or more units of packed red blood cells.[9] An additional secondary outcome was pharmacist time spent per patient.

TABLE 1. Baseline Demographics / Safety Outcomes

	Traditional (n=75)	*PMT (n=75)*	*P-value*
Mean Age (SD)	73 (9.6)	75 (7.6)	0.31
Gender - Male (%)	72 (96)	72 (96)	1.00
Medication (%) Dabigatran Rivaroxaban Apixaban	 30 (40) 36 (48) 9 (12)	 4 (5) 32 (43) 39 (52)	 <0.001 0.62 <0.001
Previous OAC (%) Warfarin DOAC	 45 (60) 22 (29)	 30 (40) 21 (28)	 0.02 1.00
History of major bleed (%)	6 (8)	6 (8)	1.00
History of VTE (%)	5 (7)	6 (8)	1.00
Antiplatelet (%) Aspirin Clopidogrel	 31 (41) 4 (5)	 29 (39) 7 (9)	 0.87 0.53
GI prophylaxis (%)	35 (47)	30 (40)	0.51
Mean CHA2DS2-VASc (SD)	3.3 (1.8)	3.7 (1.5)	0.09
Major Bleeding n, (%)	7 (9%)	2 (3%)	0.19
Thromboembolism n, (%)	0	0	1.00

Footnote: Oral Anticoagulant (OAC), Direct Oral Anticoagulant (DOAC), Venous Thromboembolism (VTE), Gastrointestinal (GI), Population Management Tool (PMT)

TABLE 2. Counts of Interventions Captured

	Traditional (n=75)	*PMT (n=75)*	*P-value*
Ordering of labs	183	45	<0.001
Periprocedural Management	26	30	0.38
Referrals	10	15	0.45
Adherence	7	12	0.96
DOAC discontinuation	7	1	0.03
Drug Interaction	6	2	0.15
Antiplatelet discontinuation	4	2	0.63
Switch DOAC agent	4	5	0.73
Addition or removal of GI prophylactic agent	2	9	0.03
DOAC dose change	0	6	0.01

Footnote: Population Management Tool (PMT), Direct Oral Anticoagulant (DOAC), Gastrointestinal (GI)

The William S. Middleton Memorial Veterans Hospital AC clinic previously performed a time and motion analysis in December 2018 to determine pharmacist time spent for various anticoagulation clinic DOAC activities including scheduled and unscheduled patient encounters. The unpublished results from that time study were used to determine CPS time spent for each patient encounter. No additional time was designated for specific interventions. Assumptions from the time study included the following: unscheduled follow-ups where patient was not reached (5 minutes), unscheduled follow-up where patient was reached (20 minutes), scheduled follow-up where patient was not reached (7 min), scheduled follow-up where patient was reached (21 minutes).

Baseline demographics were determined using descriptive statistics. Comparison of the traditional and PMT models used Students T-test and Fisher's Exact Test for continuous and binominal results, respectively. A linear regression analysis was performed for CPS time spent to account for any differences in baseline statistics. Statistical analysis was conducted using STATA version 14.1. P-values <0.05 were considered statistically significant and there were no adjustments made for repeated analysis. This project was determined not to meet the federal definition of research and full institutional review board review was not required.

Results

Patient charts (n=75 for each model) were reviewed for a median of 10 months (Figure 1). Baseline demographics demonstrated a primarily older adult male population (Table 1). Dabigatran use was higher in the traditional mode, whereas apixaban use increased in the PMT model. Prior warfarin use was also statistically significantly different between the traditional and PMT models. Other demographic characteristics were similar between the two groups.

The traditional model yielded more overall interventions than the PMT model (249 vs. 127, respectively). However, if routine lab ordering was excluded, the traditional model yielded 66 interventions compared to 82 in the PMT model. Besides lab monitoring, there were statistically significant differences in DOAC

discontinuation, DOAC dose change, and changes to GI prophylaxis captured between models (Table 2). In terms of the secondary outcome of pharmacist time invested, the total time spent per patient was 15 minutes shorter in the PMT model. This was consistent with the regression analysis; the PMT model still showed a similar time savings of 18 minutes (p=0.006).

The secondary safety outcome of major bleeding episodes revealed more bleeding episodes in the traditional model; however, this was not statistically significant (Table 1). No thromboembolic episodes were noted in either model during the time period review.

Discussion

In general, use of the PMT model maintains the number of clinical interventions detected while saving pharmacists' time. More widespread use of PMTs for DOAC monitoring may lead to clarification of the best DOAC monitoring strategy to adopt.

Based on a time savings of about 18 minutes per patient during the evaluation period, a facility could determine how much annual CPS time could be saved. For example, at the Madison VA, there are about 1900 patients on DOAC therapies. Therefore, by switching to the PMT model, the AC clinic could save around 570 hours per year. From an impact standpoint, this has system-wide implications from a cost-savings perspective. The William S. Middleton Memorial Veterans Hospital AC implemented a pharmacy technician in the AC clinic to assist with more administrative tasks between the two time periods reviewed, which could have improved CPS efficiency and be a confounding variable in the time savings. Of note, the prospective study performed at another VA looked at the amount of pharmacist time required to perform a clinical intervention (48 minutes) whereas this evaluation looked at the time savings between the two different models of monitoring.[7]

There were some differences in baseline characteristics between the traditional and PMT models. The decrease in prior warfarin use during the PMT model could be attributed to increased provider comfort with DOAC prescribing as time progressed as well as changes in the local prior authorization process for DOACs. During the time of the traditional model, dabigatran was used more frequently and this shifted to apixaban at the time of the PMT model. We suspect this also influenced the type of interventions made. For instance, there is more flexibility in apixaban dosing and dabigatran has the potential for GI side effects which could have swayed the likelihood for DOAC discontinuation versus dose changes.

Strengths of this evaluation include the random selection of patients, inclusion of inter-rater reliability, and use of regression analysis to account for differences in baseline characteristics. One limitation of retrospective chart reviews is that quantifying interventions and time requirements is based on documentation. If an intervention was performed but not documented, or if a patient's chart was reviewed to determine appropriateness of an intervention but no note was placed, then this could be an underestimation of the true results in either model. Other limitations include a relatively small sample size and the use of time estimates from a previous study.

Conclusion

Use of the DOAC PMT resulted in similar non-laboratory monitoring interventions captured and less time spent monitoring per patient compared to the traditional model of scheduled encounters with a CPS. While this model could improve pharmacist monitoring efficiency for DOACs, institutions need to consider safety and feasibility prior to implementation.

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