

Project Submission:
2009 Delaware Valley Patient Safety Award

**HOSPITAL OF THE
UNIVERSITY OF PENNSYLVANIA**

*“Aiming for a Therapeutic INR: Success
of a Pharmacy-Assisted Anticoagulation
Inpatient Management (AIM) Team”*

ABSTRACT SUBMISSION FORM

TITLE: Aiming for a Therapeutic INR: Success of a Pharmacy-Assisted Anticoagulation Inpatient Management (AIM) Team

Background: The Joint Commission's National Patient Safety Goals for 2008 and 2009 include numerous anticoagulation elements requiring hospitals to use approved protocols for the initiation and maintenance of anticoagulant therapy. Additionally, at our hospital, patients receiving warfarin on the Cardiac Surgery Service were noted to have an average length of stay (LOS) that was two days longer than patients not receiving warfarin. Previous published literature has demonstrated anticoagulation clinics staffed by pharmacists reduced bleeding episodes, thromboembolic events, hospitalizations and ER visits. Additionally, small studies of pharmacist-guided dosing of warfarin for inpatients have shown a reduction in hospital LOS, supratherapeutic international normalized ratios (INRs), and post-hospitalization bleeds and thromboembolic events. **Methods:** The study was designed as a pre-post intervention trial. Consecutive patients on the hospitalist and cardiac surgery services at a large university teaching hospital who were prescribed warfarin from March 2007 through January 2008 were eligible. The AIM pharmacists collected pre-intervention data on all eligible patients, which served as the control cohort. The pharmacists then initiated written and verbal recommendations of warfarin doses on intervention patients based upon a variety of clinical characteristics and dosing algorithms. Subsequently, they collected post-intervention data on these patients. Outcomes collected included number of patients with INR>4, median number of days on warfarin, median LOS, and 30-day readmissions for reasons related to anticoagulation. A chi-squared test was used for comparisons between groups for categorical variables and a nonparametric rank-sum test was used for median LOS and warfarin days. **Results:** A total of 274 patients (99 Hospitalist) were enrolled before the intervention and 340 patients (253 Hospitalist) were enrolled after the intervention. The unadjusted relative risk of an INR>4 was significantly lower in the total post-intervention cohort at 0.55 (95%CI, 0.33-0.93; p=0.034). The unadjusted relative risk of readmission after intervention was 0.44 (95%CI, 0.15-1.27; p=0.149), which was not statistically lower. The hospitalist subgroup showed similar relative risks for INR>4 (0.59, 95%CI: 0.27-1.36; p=0.255) and readmission (0.39, 95%CI: 0.12-1.32; p=0.229), though these values were not statistically lower than prior to intervention. In the total cohort, the median LOS was reduced from 10 days (interquartile range 6-15) to 7 days (IQR 4-12, p<0.0001) with an identical reduction of 3 days in the median number of warfarin days (p<0.0001). The hospitalist cohort also showed significant reductions in median LOS (2 days, p=0.002) and median warfarin days (1 day, p=0.0003). **Conclusions:** The AIM Team was able to reduce the frequency of supratherapeutic INRs as well as reduce the median LOS through a reduction in the number of days patients spent in the hospital on warfarin.

PROJECT DESCRIPTION: Implementation of a Multi-disciplinary Anticoagulation Management Service**GOALS:**

- 1) To implement a service where Pharmacists will actively manage all patients on warfarin therapy.
- 2) To demonstrate the effect of this service on the number of treatment days needed for warfarin patients
- 3) To show the effect of this team on the numbers of patients with elevated INR's on Warfarin therapy.
- 4) To show an impact if any on Length of stay in selected patient populations relative to warfarin therapy.

The goal of our project was to determine the impact of the Anticoagulation Inpatient Management (AIM) Team on clinical outcomes in inpatients receiving warfarin on the cardiac surgery and hospitalist services.

BASELINE DATA:**Clinical Outcomes All Patients**

Number of Patients Pre AIM	274
% Patients INR > 4	11.68%
Warfarin Days (mean)	7.93
% Patients Readmitted	4.01%

INTERVENTIONS:

In late 2007, the AIM team initiated the service with the Cardiac Surgery team. The pharmacists provided daily consultation (Monday thru Friday) with either nurse practitioners or physician house staff. The AIM team reviewed patient laboratory, clinical, and pharmacy data, and maintained a flow sheet for each patient that contained patient demographics, baseline weight, pertinent medical history, active/past medications, and laboratory results. Initial doses of warfarin were tailored to the patient's age, presence of liver or renal disease, post-operative state if applicable, concomitant medications known to alter the metabolism of warfarin. Dose reductions were recommended for any patient whose INR value increased by more than 0.4 INR units in a 24-hour period.

The Team extended coverage for all in-patients on warfarin therapy as of April of 2009.

Prior to initiation of the service, baseline outcomes were collected on the Hospitalist and Cardiac Surgery Services. After initiation of the service, the same clinical outcomes were collected and compared to the baseline data. The clinical outcomes included % of patients with INRs>4, Average Length of Stay (LOS), Average Number of Warfarin Days, % Readmits. Clinical outcomes were collected from April 2007 thru February 2008.

All of the data were through January 2008 and exclude patients with the following characteristics: INR > 4 upon admission, incomplete data, or undergoing treatment for heparin-induced thrombocytopenia (medications used will confound INR measurements).

We continue to monitor our progress on the clinical outcomes listed above. Since January 2008, we have only preliminary data on some of the outcomes listed above. We reviewed 346 patients that we managed. There was a further reduction in percent of patients with an INR > 4 in the combined cohort to 3.76%. This would correspond to relative risk of 0.32 (95%CI, 0.16-0.62) compared with patients before the start of the AIM Team. At the same time, we've maintained the improvements in the average number of warfarin days and average length of stay over pre-intervention. We are continuing to provide input to the Cardiac Surgery and Hospitalist service and we have hired an additional FTE with the goal of providing service 7 days a week. Additionally, the AIM team will expand to all inpatients requiring therapeutic anticoagulation.

All Patients

CSU,HSP Patients w/o HIT, Patients Admitted with Elevated INR,
Patients Who Expired

	Pre - AIM	Post - AIM	Relative Risk	Feb - Jun 08	Relative Risk	Jul- Dec08
Patients	274	340		344		401
Patients w/ INR>4(%)	11.70%	6.50%	0.55(0.33-0.93)*	4.20%		3.60%
Patients Readmitted(%)	4.00%	1.80%	0.44(0.16-1.17)			
Warfarin Days - Mean	7.93	5.58		6.06		6.55
Warfarin Days - Median	7	4**		5		6
Warfarin Days - Geomean	6.53	4.18		4.62		5.05
Length of Stay - Mean	12.24	9.08		11		10.16
Length of Stay - Median	10	7.0**		9		8
Length of Stay - Geomean	9.71	6.51				

* p-value 0.034

** p-value <0.0001

A. Issues are important to the success of the program

1. Financial support from administration for the hiring of pharmacists.
2. Review of literature and collection of baseline data.
3. Establishing relationships with physicians and nurse practitioners.