Measuring the Effectiveness of an In-patient, Pharmacist-Managed Anticoagulation Service

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Introduction:
Warfarin and heparins are anticoagulant medications that require individualized dosing and intensive laboratory monitoring to avoid both serious bleeding and blood clots. Warfarin is the most commonly used oral anticoagulant in North America. Heparins are intravenously or subcutaneously administered anticoagulants. They are most commonly used in the prevention and treatment of blood clots. Anticoagulants have narrow therapeutic ranges, so dosing and monitoring can be very challenging, particularly with warfarin. If the level of anticoagulation is too low, subtherapeutic, the patient may develop a serious blood clot such as a deep vein thrombosis, pulmonary embolism, myocardial infarction, or embolic stroke. If the level of anticoagulation is too high, supratherapeutic, the patient is at risk for mild or life-threatening bleeding complications such as nose bleeds, easy bruising, gastrointestinal bleeding, genitourinary bleeding, and hemorrhagic stroke. Warfarin therapy must also be closely monitored for drug-drug, drug-disease, and drug-food interactions to maintain a steady level of anticoagulation.[1]

The American College of Chest Physicians (ACCP) has developed national consensus evidence-based guidelines that provide clinicians with recommendations for appropriate use and monitoring of warfarin and heparins.[1] Several comparative trials have shown pharmacist-managed anticoagulation to be equal or superior to individual prescriber-managed therapy in achieving compliance with the ACCP guidelines and other quality indicators.[2-7] These individual prescribers are defined as physicians, physician assistants, and nurse practitioners.

In 2004, Wesley Medical Center initiated a pharmacist-managed warfarin clinical service. This management service is provided during hospitalization at the request of the attending physician. This continuous quality improvement study provides descriptive information regarding the effectiveness of an in-patient, pharmacist-managed anticoagulation (PMA) service in meeting national consensus treatment guidelines, including: 1) heparin pretreatment, 2) warfarin dosing and monitoring, 3) vitamin K and/or blood product usage, and 4) adverse drug reactions and patient outcomes. 1) The ACCP recommends that appropriate heparin pretreatment should include baseline laboratory monitoring prior to starting therapy and an appropriate overlap of warfarin with heparin before discontinuing the heparin. It is recommended that heparin be discontinued only after the warfarin is within the effective anticoagulation range for two to three days. 2) The ACCP recommends that the starting warfarin dose should not exceed 5mg daily. Lower doses are preferred in the elderly or those with a history of liver disease. 3) The ACCP recommends that in instances requiring administration of the warfarin antidote, vitamin K, the oral route is preferred if there is no significant bleeding and in most instances doses should exceed 5mg.[1]

Methodology:
Setting / Study Population: This was a non-randomized, retrospective, descriptive continuous quality improvement study, conducted at Wesley Medical Center, a 760-bed teaching hospital that serves as a tertiary referral center for Kansas and north-central Oklahoma. The studied group consisted of 28 hospitalized patients enrolled in the PMA clinical service from September 1, 2004 to March 30, 2005. The matched control group consisted of 27 hospitalized patients receiving anticoagulation therapy, as managed by their individual prescribers, during this same time period. The controls were matched according to their diagnosis and reason for warfarin therapy. The case-matched control group provides descriptive data only. Statistical analysis was not performed due to small sample size; therefore, direct comparisons cannot be made.

Measurements: A majority of the data was manually collected from the hospital’s computerized medical records. Additional data was collected directly from patient charts. In measuring the effectiveness of the PMA
service, the following was evaluated: 1) appropriate heparin pretreatment, 2) appropriate warfarin dosing and monitoring, 3) vitamin K and/or blood product usage, 4) adverse drug reactions and patient outcomes.

**Results:**

Of the 28 PMA patients evaluated, 17 were taking warfarin prior to admission and 11 were started during hospitalization. Only 36% of patients received a warfarin/heparin overlap in full accordance with guidelines (desired 100%) and 46% were discharged before warfarin became effective. None of the patients exceeded the recommended warfarin starting dose of 5mg daily (desired 0%). The majority of patients, 91%, did have baseline laboratory, hematocrit, hemoglobin, and platelets obtained prior to beginning anticoagulation, but 64% (7/11) beginning warfarin did not have a baseline prothrombin time conducted. Three patients required vitamin K or a blood product and all doses were within recommended guidelines. Two patients received oral doses and a third received intravenous vitamin K for serious bleeding. Four patients were readmitted within 6 months of discharge for excessive anticoagulation, and no patients were readmitted with blood clots. Both the PMA and prescriber-managed groups showed similar results.

**Discussion:**

One limitation with this study was that the PMA service is provided only at the request of the attending physician. Primarily two physicians currently utilized this clinical service, a geriatric specialist and a geriatric psychiatric physician. Therefore, these results are not generalizable hospital-wide, but are fairly specific to a geriatric general medical and geriatric psychiatric patient population.

The PMA service was generally not requested immediately upon patient admission. Therefore, the patient’s individual prescriber was often responsible for initial anticoagulation treatment until the pharmacy was officially requested to intervene. This accounted for all instances where baseline labs were not ordered prior to initiation of anticoagulation. In many cases, the PMA service was not contacted until the patient had already received heparin pretreatment and the prescriber was ready to initiate warfarin therapy. This partially accounts for the low, 36% compliance rate with the recommended warfarin/heparin overlap. Had the PMA service been requested earlier in therapy, it is likely that compliance with these indicators would have been higher.

Physicians are under increasingly high pressure to dismiss patients from the hospital as soon as feasible. Many of these patients are then followed up closely at home or may spend a short stay in a rehabilitation facility or skilled nursing unit. Forty-six percent of patients were dismissed prior to warfarin becoming effective. The PMA service has no control over patient dismissal and does not follow the patients after they leave the hospital. Therefore, this study only provided a “snap-shot” in time of these patients’ total anticoagulation therapy. It is unknown how closely these patients were monitored after leaving the hospital.

Four patients were either readmitted to the hospital or evaluated and treated in the emergency department within 6 months of after discharge for excessive anticoagulation. It is desirable to have the rate of adverse reactions to be as small as possible, but this was not large enough study to compare these outcomes to the literature. Also, this studied population was likely older and more ill than seen in a typical anticoagulant services.

For this hospital’s PMA clinical service to be successful, it would likely require earlier initiation and an outpatient branch to provide continuity of care. If a repeated continuous quality improvement study is conducted, it should contain a larger number of subjects and a larger control group so that statistical analysis can be conducted.

**Conclusions:**

This pharmacist-managed anticoagulation service did not entirely meet the desired ACCP consensus treatment goals. Possible improvements to the service and delivery of the service need to be explored.

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**References:**


