

## HOME PROPHYLACTIC WARFARIN ANTICOAGULATION PROGRAM AFTER HIP AND KNEE ARTHROPLASTY

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**OBJECTIVE:** To determine the efficiency of a program designed to maintain prophylactic oral anticoagulation within a target range for 6 weeks after hip and knee arthroplasty.

**DESIGN:** A prospective continuous quality improvement indicator.

**SETTING:** A tertiary care university hospital.

**PATIENTS:** Patients who underwent hip and knee arthroplasty and had no indications for routine anticoagulation other than postoperative thromboembolism prophylaxis.

**INTERVENTION:** An outpatient warfarin prophylaxis program, which included an information letter given to the patient, Home Care coordinated community laboratory services, communication with and anticoagulant dosage adjustment by the patient's personal family physician.

**OUTCOME MEASURES:** The proportion of international normalized ratio (INR) values within, below and above the target range of 2.0 to 3.0.

**RESULTS:** Sixty-two patients were enrolled over a 3-month period. On the day of hospital discharge, 64% of patients had INR values that were within the target range, 31% were below and 5% were above. After hospital discharge, 42% of the INR values were within the target range, 48% were below and 10% were above.

**CONCLUSION:** Despite a program designed to address patient information, physician communication and laboratory testing, tight control of home INR values could not be achieved with the existing resources of Home Care and family physicians.

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**OBJECTIF :** Déterminer l'efficacité d'un programme conçu pour maintenir une anticoagulation orale prophylactique à l'intérieur d'une plage cible pendant six semaines après une arthroplastie de la hanche et du genou.

**CONCEPTION :** Indicateur prospectif d'amélioration continue de la qualité.

**CONTEXTE :** Hôpital universitaire de soins tertiaires.

**PATIENTS :** Patients qui ont subi une arthroplastie de la hanche et du genou et ne présentaient aucune indication pour une anticoagulation de routine autre qu'une prophylaxie contre la thrombo-embolie postopératoire.

**INTERVENTION :** Programme de prophylaxie à la warfarine en service externe, qui comportait une lettre d'information remise au patient, des services coordonnés de laboratoire communautaire en soins à domicile, la communication avec le médecin de famille personnel du patient et l'ajustement de la dose anticoagulante par le médecin.

**MESURES DE RÉSULTATS :** Proportion des valeurs du rapport international normalisé (RIN) à l'intérieur, au-dessous et au-dessus de la plage cible de 2,0 à 3,0.

**RÉSULTATS :** Soixante-deux patients ont été inscrits au programme sur une période de trois mois. Le jour du congé de l'hôpital, les valeurs RIN se situaient à l'intérieur de la plage cible chez 64 % des patients, au-dessous de la plage dans 31 % des cas et au-dessus de celle-ci dans 5 % des cas. Après le congé, 42 % des valeurs RIN se situaient à l'intérieur de la plage cible, 48 % au-dessous et 10 % au-dessus.

**CONCLUSION :** En dépit d'un programme conçu pour tenir compte de l'information des patients, de la communication avec le médecin et des tests de laboratoire, on n'a pu contrôler rigoureusement les valeurs RIN à domicile au moyen des ressources existantes de soins à domicile et de médecins de famille.

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Patients who undergo hip and knee replacement are at high risk for postoperative thromboembolic complications.<sup>1-5</sup> Warfarin is a commonly used method of anticoagulation prophylaxis for these patients.<sup>1-6</sup> The duration of treatment is controversial, with recommendations ranging from 1 to 12 weeks postoperatively.<sup>1-3,5,6</sup> International normalized ratios (INRs) in the range of 2.0 to 3.0<sup>1,3-5</sup> have been recommended as targets for prophylaxis with warfarin.

Warfarin treatment is resource intensive and may give rise to complications.<sup>1,2,4-6</sup> A study using a single spot check of prothrombin time on patients receiving warfarin at home under the supervision of their family physician has shown difficulties in maintaining a therapeutic range.<sup>7</sup> However, when an anticoagulation clinic was used to provide treatment, comparable rates (maintaining a therapeutic range) between inpatient and post-discharge patients have been reported.<sup>2</sup>

This study was undertaken to determine the ability of a home program to provide thromboprophylaxis throughout a 6-week postoperative treatment period. Serial INR measurements were used to monitor the status of anticoagulation. The program involved providing the patient with an information letter, arranging for community laboratory services to be coordinated through Home Care, and communication with and anticoagulation dosage adjustment by the patients' personal family physicians.

## METHODS

A protocol of warfarin for prophylaxis of thromboembolism in patients who undergo hip and knee arthroplasty has been in effect at our hospital since 1994. One component of the protocol is a referral to Home Care to arrange, through a community laboratory, the testing of INR 3 times a week for 6 weeks postoperatively. An-

other component is notification of patient discharge and enrolment in the program through a telephone call to the patient's personal family physician or physician covering the practice if the family physician is away, followed by a letter detailing the patient's course of in-hospital anticoagulation with the recommendation to maintain home INR levels between 2.0 and 2.5 for 6 weeks postoperatively. The housestaff and the patients' personal family physicians were allowed to use their own medical judgement in adjusting the warfarin dosages while the patient was in hospital and after discharge respectively. The last component of the protocol is a letter outlining the program and reasons for prophylactic anticoagulation, which is given to the patient at the time of discharge along with a prescription for warfarin. No dietary instructions are given to the patients. They are advised not to take anti-inflammatory drugs and to check with their family physician before starting new medications while taking warfarin.

All patients who underwent hip and knee replacement were considered for entry into the study. The patients were prospectively recruited from a single institution over a 3-month period. The exclusion criteria were an ongoing indication for anticoagulation other than for thromboprophylaxis after the joint replacement surgery or a contraindication to warfarin.

A copy of all INR results after discharge was obtained, but there was no interference with the family physician's management of the prophylaxis. All patients were seen in follow-up by their surgeon 6 weeks postoperatively, and any thromboembolic or bleeding complications after hospital discharge noted.

As a hospital continuous quality improvement indicator, we undertook this study to determine the ability of this specialized protocol to provide thromboprophylaxis throughout a 6-week postoperative treatment period.

Our Hospital Research Ethics Board does not require review of quality assurance studies related directly to performance assessment of programs within the organization.

## RESULTS

Sixty-two patients were enrolled in the study between January and March 1996. In total, 653 post-discharge INR values were obtained. An INR value was available for each of the 62 patients for the day of discharge. On average there were 10.5 post-discharge values per patient (range from 4 to 18). The maximum home INR was 8.2 and the minimum 1.0.

The last in-hospital INR was within the 2.0 to 3.0 target range in 64% of patients, 31% were below and 5% above. Only 42% of the home INR values were in target range, 48% were below and 10% above. Eleven INR values (10 patients) were greater than 4.0. In 9 patients, more than 50% of their INR values were less than 1.7.

From the time of discharge to discontinuation of warfarin 6 weeks postoperatively, no patients enrolled in the study were identified as having thromboembolism or bleeding complications.

## DISCUSSION

The variable INR values per patient indicate that patients had difficulty following our protocol. Our program causes inconvenience to the patient and extra work for the family physician and Home Care. However, we did not study whether the difficulty with compliance is related to the patient, Home Care or physician.

Tight control of INR levels with warfarin is difficult even in an inpatient setting. Paiement and colleagues<sup>2</sup> reported that 48% of their in-hospital patients' INR values were within their target range, and Lieberman and associates<sup>6</sup> found that 67.5% of their patients' INR values were within their

target range at the time of discharge. Consistent with these authors, we were able to get the last inpatient INR value within our target range in 64% of our patients.

After hospital discharge, only 42% of our INR values were within the target range during the 6-week study period. This compares with 33% reported by Oh and colleagues<sup>7</sup> who used a single spot check in patients on warfarin anticoagulation therapy in the community who were supervised by their family physicians. Therefore, in a longitudinal study, despite a home prophylaxis program that provided patients with information, physician communication and facilitated laboratory testing, we could not achieve tightly controlled INR levels within the limits of 2.0 and 3.0. Indeed, 58% of our home INR values were outside the target range. The INR values at the upper and lower extremes were consistently in the same small segment of the study population.

The maximum and minimum values were significantly outside the target range. We identified no thromboembolic or bleeding complications in our study patients. However, our

study size is too small to draw any conclusions concerning the appropriate INR value for prophylaxis or the safety of our protocol.

Paiement and colleagues<sup>2</sup> reported that through a specialized anticoagulation clinic, comparable rates within their target range were maintained between in-hospital and post-discharge patients (48% versus 49%). Incorporation into our program of such a clinic, whose sole function would be to maintain patient INR values within a target range, following a set testing and dosage protocol, may deal with physician and Home Care issues that may negatively influence the number of INR values within the target range. The expansion of patient information from a letter to more formal education, including teaching about dietary and drug interactions with warfarin, may improve patient-related effects on INR values.

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