

RESEARCH LETTER

Feasibility of pre-discharge training in the self-management of oral anticoagulation

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To the editor

Self-management training improves the efficacy and safety of oral anticoagulation by teaching patients how to monitor their own therapy and has been rated a high priority by the Agency for Healthcare Research and Quality [1]. We tested the feasibility of this recommendation in routine practice on hospitalized patients prior to discharge.

The study was conducted between March 2004 and March 2005 at The Hadassah-Hebrew University Medical Center, a 1000-bed academic general hospital in Jerusalem, Israel. The intervention, carried out in the department of cardiac surgery, was partly motivated by the tragic death of a patient from cerebral haemorrhage, because of excessive anticoagulation, several months following successful aortic valve replacement.

Methods

Hospitalized adults beginning long-term warfarin oral anticoagulation were included in the study. Control patients received standard explanations on oral anticoagulation by the ward staff. This control group was comprised of two subgroups of patients discharged on oral anticoagulants: (1) historical controls ($n = 32$), treated in the cardiac surgery ward over the past 2 years before the current intervention; and (2) contemporary controls ($n = 30$), hospitalized in other wards (vascular surgery, emergency room and internal medicine) during the current intervention.

The intervention group was comprised of 30 consecutive cardiac surgery patients, trained in self-management of anticoagu-

lant therapy prior to discharge. Several pre-discharge training sessions were conducted by a designated nurse, using materials described below. Staff doctors and a medical student were available for further explanations and question answering. In addition, 15 patients (50%) were randomly selected to receive a self-monitoring home device and given instruction on its operation. Randomization was done using PEPI Version 4.0 (Salt Lake City, UT, USA; Sagebrush Press, 2001).

All patients in the intervention group received a training kit, which included an explanation booklet on oral anticoagulation (principles of action, side effects, interactions, importance of monitoring, how to change dosage, when to seek emergent care and a log sheet for recording international normalized ratio (INR) values and warfarin dosage). Simple, understandable wording was used, employing principles of social marketing. After several revisions, the final version was published in four languages (Hebrew, English, Russian and Arabic) and incorporated input from patients, doctors and other professionals. The kit contained the booklet, a dosage calculator in the form of a slide rule (shown in Fig. 1), instructions for operating the dosage calculator and a simple software program to help calculate the warfarin dosage, based on a published algorithm [2].

Two kits were designed: one for target INR 2.0–3.0 and the other for target INR 2.5–3.5. All materials can be viewed on our web site [3]. In addition, each patient in the intervention group received a folder for his primary care doctor, containing identical material, plus select medical articles and a personal letter explaining the benefits of self-management and requesting doctor cooperation.

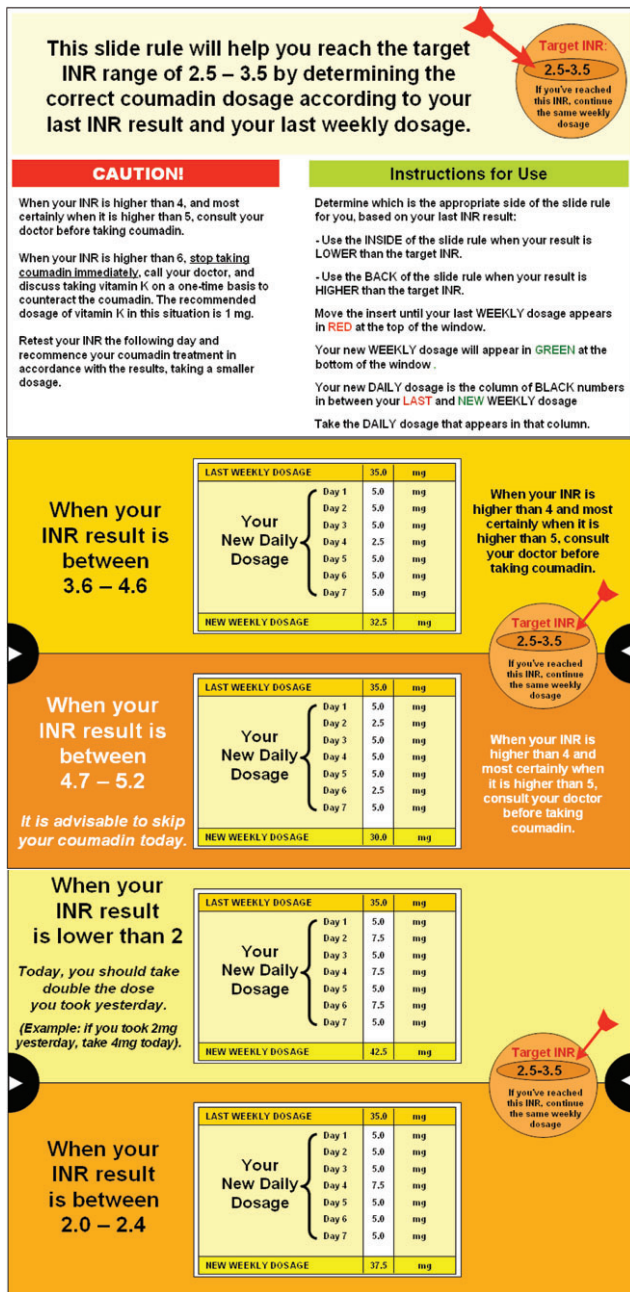


Figure 1 Dosage calculator slide rule [target international normalized ratio (INR) 2.5–3.5].

Outcome measures

Data on INR testing were collected for all patients from their health care provider or from a home device (if applicable), 3 months post discharge. A phone survey was used to collect information on patients’ attitudes and knowledge of oral anticoagulation and included an open question both to patients and their primary care doctors on the perceived value of the training kit.

Statistical analysis

Data are presented as the mean with 95% confidence intervals, and *P*-values <0.05 were considered statistically significant. χ^2 and ANOVA were used to compare groups (with Scheffe post hoc test) and ANCOVA to control for confounders (age, education, sex, family status, nationality, indication for oral anticoagulation and patient’s ward). The Kruskal Wallis test was applied for non-parametric variables.

Results

Patients’ baseline data are shown in Table 1. As the intervention targeted cardiac surgery, the indication for anticoagulation in this group was most often valve replacement. There were differences in several socio-demographic variables between groups (Table 1). The target INR for both the control and intervention groups was 2.0–3.0 in 55% of the patients, 2.5–3.5 in 40% and 3.0–4.0 in 5%. Data on the INR test results (3 months post discharge) are presented in Table 2. The rate of INR results within target was nearly 60% in the intervention group, with or without a self-monitoring device, compared with 40% or less in the control group, with less deviation from the target. Availability of a self-

Table 1 Patient baseline data in the control and intervention groups

Characteristic	Control group	Intervention group
Number of patients at the beginning (at the end of study [†])	62 (58)	30 (27)
Sex		
Male (%)	26 (45)	17 (63)
Mean age in years (95% CI)	61 (58–65)	56 (52–60)
Family status		
Married (%)	41 (71)	24 (89)
Widow/widower (%)	7 (12)	0
Divorced (%)	5 (9)	2 (7)
Single (%)	4 (7)	1 (4)
Nationality		
Jewish (%)	40 (69)	26 (96)*
Arabic (%)	18 (31)	1 (4)
Mean education in years (95% CI)	9 (8–10)	13 (12–15)*
Discharging ward		
Cardiothoracic surgery (%)	26 (45)	27 (100)
Vascular surgery (%)	11 (19)	0
Medicine (%)	13 (22)	0
Emergency room (%)	8 (14)	0
Indication for warfarin		
Valve replacement (%)	25 (43) [‡]	27 (100)*
Atrial fibrillation (%)	14 (24)	0
Pulmonary embolus (%)	5 (9)	0
Deep vein thrombosis (%)	12 (21)	0
Hypercoagulable state (%)	2 (3)	0

[†]A total of seven patients (8%) were lost to follow-up for all outcome measures.

[‡]Historical controls.

CI, confidence interval.

**P* < 0.001 vs. control group.

Table 2 Outcome measures of anticoagulation in the control and intervention groups. Data are expressed as the mean and 95% confidence intervals

	Control group		Intervention group	
	Historical (<i>n</i> = 32)	Contemporary (<i>n</i> = 26)	With self-monitoring device (<i>n</i> = 13)	Without self-monitoring device (<i>n</i> = 13)
Rate at which INR within target range (%)	40 (33–47)	36 (28–44)	61 (48–73)*	58 (43–72)*
Distance of INR from mid-range of target (mean)	0.8 (0.7–0.9)	0.9 (0.8–1)	0.5 (0.4–0.7)*	0.5 (0.4–0.7)*
Rate at which INR was >4.0 (%)	10 (5–14)	14 (9–20)	5 (0.7–10)	8 (3–14)
Number of times INR was checked (mean)	16 (14–18)	14 (12–16)	23 (18–28) [†]	14 (11–17)

**P* < 0.001 vs. control groups (*P* < 0.01 with ANCOVA controlling for education/nationality).

[†]*P* < 0.001 vs. any other group.

INR, international normalized ratio.

monitoring device was associated with a higher number of tests and a tendency for a lower number of INR results above 4.0 (*P* = 0.08).

The intervention improved patients' attitude and knowledge about anticoagulant therapy. Agreement with the sentence 'I always know my last INR' on a scale of 1 (fully disagree) to 5 (fully agree) increased from a mean of 2.8 in the control group to 4.3 and 4.0 in the intervention groups, with and without a self-monitoring device respectively (*P* < 0.05). Agreement with the sentence 'I prefer that I decide on the dosage of warfarin I should take rather than my physician' increased from a mean of 2.1 in the control group to 4.3 in the intervention group with a self-monitoring device (*P* < 0.001) but remained unchanged at 2.1 in those without a self-monitoring device. The percentage of patients who correctly answered questions about warfarin increased from 60% in the contemporary control group to 87% and 83% in the intervention groups, with or without a self-monitoring device respectively (*P* < 0.001). Patients reported satisfaction with the kit. Most patients reported using the slide rule and a few reported having used the software. Primary care doctors reported satisfaction with the kit, slide rule and software.

During the 3-month follow-up, only one re-admission occurred (in the control group, because of a transient ischemic attack that occurred 1 month after starting anticoagulant therapy). No other significant bleeding or clotting events were reported in either group.

Discussion

Our observations are consistent with the literature. Less than 50% of patients on oral anticoagulation are within their target INR putting them at risk for excess bleeding or thromboembolism [4–6]. A systematic review recently showed that self-monitoring and self-management improve anticoagulant therapy and decrease the rate of haemorrhage, thromboembolism and death [7]. Our study shows that training in self-management prior to hospital discharge is feasible and improves the accuracy of anticoagulation therapy. The INR was found to be closer to the target range in the intervention group than in the control group. In addition, the intervention improved attitude and knowledge of patients, possibly helping them to maintain target range INR more efficiently [8,9]. Most of the improvement was observed regardless of the availability of a self-monitoring home device. Both patients and doctors commented positively on the user-friendly aspects of the kit, specifically mentioning the simplicity of the slide rule.

Our study has some significant limitations. The study design was before–after with contemporary controls (randomization was done only within the intervention group for the self-monitoring device and was not blinded). Furthermore, our observations were limited by the small sample size and short follow-up period to show any impact on complication rates. Finally, we cannot determine what exactly worked in the intervention, and the redundancy of support options (brochure, slide rule and software) might in itself have contributed to the usefulness of the kit to patients.

In conclusion, initiating anticoagulant self-management before hospital discharge appears feasible and efficacious.

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