Are family physicians using the $CHADS_2$ score?

Is it useful for assessing risk of stroke in patients with atrial fibrillation?

Douglas Klein MD CCFP **Max Levine**

Abstract

Objective To assess whether family physicians are using the $CHADS_2$ (congestive heart failure, hypertension, age ≥ 75, diabetes mellitus, and stroke or transient ischemic attack) score in the decision to initiate warfarin therapy to prevent stroke in patients with atrial fibrillation.

Design Retrospective analysis of the medical records of patients with atrial fibrillation.

Setting Data were gathered from records at 3 clinics in a primary care network in Edmonton, Alta.

Participants The medical records of patients with atrial fibrillation who were currently taking warfarin therapy.

Main outcome measures Percentage of patients whose $CHADS_2$ scores indicated warfarin therapy for stroke prophylaxis compared with the actual percentage of patients taking warfarin therapy. Data on patients' age, number of medications, and number of comorbid conditions were also recorded.

Results Among these patients, 7% had a $CHADS_2$ score of 0, for which no warfarin therapy was indicated; 21% had a score of 1, for which either acetylsalicylic acid or warfarin was indicated; and 72% had a score of 2 or greater, for which warfarin therapy was indicated. About 80% of patients were taking medication to control their heart rate.

Conclusion The $CHADS_2$ score is not being used in all cases to assess the need for warfarin therapy for preventing stroke in patients with atrial fibrillation. The $CHADS_2$ score might be of limited use because it is not sensitive enough to stratify patients clearly into high-, intermediate-, and low-risk groups. Although guidelines for stroke prevention should be followed, the $CHADS_2$ portion of the guidelines might not be the most effective way to assess patients' risk of stroke.

EDITOR'S KEY POINTS

- The $CHADS_2$ (congestive heart failure, hypertension, age ≥ 75, diabetes mellitus, and stroke or transient ischemic attack) score is a common, easy-to-use, evidence-based tool available to clinicians. Since its creation in 2001, $CHADS_2$ has been shown to be superior to the other stroke-risk prediction tools previously available.
- The goal of this study was to assess physicians' level of adherence to clinical practice guidelines for preventing stroke among patients with atrial fibrillation.
- This study found that 28% of the patients, all of whom were taking warfarin therapy, fell outside a category that clearly indicated warfarin as appropriate therapy (such patients were in low- and intermediate-risk groups), and that 7% of patients fell into the low-risk group, for which warfarin was not indicated.
- The study revealed that physicians were not prescribing warfarin therapy for stroke prophylaxis to patients with atrial fibrillation in accordance with Canadian clinical practice guidelines and questioned the usefulness of the $CHADS_2$ score.

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Les médecins de famille utilisent-ils le score de $CHADS_2$?

Peut-il servir à évaluer le risque d'accident vasculaire cérébral chez les patients souffrant de fibrillation auriculaire?

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Résumé

Objectif Déterminer si les médecins de famille utilisent le score de $CHADS_2$ (insuffisance cardiaque congestive, hypertension, âge ≥ 75 ans, diabète, et accident vasculaire cérébral ou ischémie cérébrale transitoire) pour décider s'il faut commencer un traitement de warfarine en prévention des accidents vasculaires cérébraux chez les patients souffrant de fibrillation auriculaire.

Type d'étude Analyse rétrospective de dossiers médicaux de patients souffrant de fibrillation auriculaire.

Contexte Les données provenaient des dossiers de 3 cliniques d'un réseau de soins primaires d'Edmonton, Alberta.

Participants Les dossiers médicaux des patients souffrant de fibrillation auriculaire et qui était traités par la warfarine.

Principaux paramètres à l'étude Pourcentage des patients qui, selon leur score de $CHADS_2$, devaient être traités à la warfarine en prévention des accidents vasculaires cérébraux, par rapport au pourcentage de ceux qui en prenaient effectivement. On a également noté les données sur l'âge des patients, le nombre de médicaments et le nombre des affections coexistantes.

Résultats Parmi les patients, 7% avaient des scores de 0, la warfarine n'étant donc pas indiquée pour eux; 21% avaient un score de 1, correspondant à une indication d'acide acétylsalicylique ou de warfarine; et 72% avaient un score de 2 ou plus, soit une indication de warfarine. Environ 80% des patients prenaient un médicament pour contrôler leur rythme cardiaque.

Conclusion Le score de $CHADS_2$ n'est pas utilisé dans tous les cas pour évaluer le besoin d'un traitement par la warfarine pour prévenir les accidents vasculaires cérébraux chez les patients souffrant de fibrillation auriculaire. Ce score pourrait avoir une utilité limitée parce qu'il n'est pas suffisamment sensible pour bien distinguer les patients qui présentent un risque élevé, intermédiaire et bas. Même s'il est important de suivre les directives concernant la prévention des accidents vasculaires cérébraux, la portion $CHADS_2$ des directives pourrait ne pas être la façon la plus efficace d'évaluer le risque d'accident vasculaire cérébral des patients.

POINTS DE REPÈRE DU RÉDACTEUR

- Le score de $CHADS_2$ (insuffisance cardiaque congestive, hypertension, âge ≥ 75 ans, diabète, et accident vasculaire cérébral ou ischémie cérébrale transitoire) est un outil d'utilisation facile, fondé sur des données probantes, qui est disponible aux cliniciens. Depuis sa création en 2001, on a démontré que le $CHADS_2$ est supérieur aux prédicteurs du risque d'accident vasculaire cérébral existant auparavant.
- Cette étude avait pour but d'évaluer le degré de conformité aux directives de pratique clinique pour la prévention des accidents vasculaires chez les patients souffrant de fibrillation auriculaire.
- L'étude a trouvé que 28% des patients, lesquels recevaient tous de la warfarine, n'appartenaient pas à la catégorie pour laquelle la warfarine était clairement considérée appropriée (ces patients étaient dans les groupes à risque faible ou intermédiaire), et que 7% d'entre eux étaient dans le groupe à faible risque, pour lequel la warfarine n'était pas indiquée.
- Les auteurs ont observé que les médecins ne suivaient pas les directives canadiennes de pratique clinique lorsqu'ils prescrivaient la warfarine en prophylaxie des accidents vasculaires cérébraux chez les patients souffrant de fibrillation auriculaire et ils ont remis en question l'utilité du score de $CHADS_2$.

Cet article a fait l'objet d'une révision par des pairs.
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Atrial fibrillation is a commonly encountered condition in family practice and a risk factor for thromboembolic stroke. Patients with atrial fibrillation can benefit from anticoagulation therapy to reduce their risk of stroke. The decision to initiate anticoagulation therapy is made by weighing pertinent risk factors with potential benefit. Warfarin, a vitamin K antagonist, is often used for anticoagulation and has been shown to be superior to acetylsalicylic acid (ASA)[1] for preventing stroke. However, warfarin has a narrow therapeutic range, and the decision to initiate warfarin therapy needs to be made with great care, as complications can include intracranial hemorrhage.

The decision to initiate warfarin therapy for patients with atrial fibrillation is dictated by patients' cumulative risk factors and consideration of the contraindications to warfarin therapy. The $CHADS_2$ (congestive heart failure, hypertension, age ≥75, diabetes mellitus, and stroke or transient ischemic attack) score, a stroke-risk stratification schema, is a common, easy-to-use, evidence-based tool available to clinicians.[2-5] Briefly, $CHADS_2$ scores are calculated by allocating points to patients based on their past and current medical conditions as criteria for risk of future stroke.[1]

The $CHADS_2$ score was first used and validated in 2001[6] and since then has been shown to be superior to the stroke-risk prediction tools[4,6] previously available. The $CHADS_2$ score categorizes patients' risk of stroke: a score of 0 equals low risk, 1 equals moderate risk, and 2 or greater equals high risk.[1] According to current guidelines, warfarin is indicated for patients at high risk (ie, $CHADS_2$ score ≥2).[4,5]

This study examines physicians' level of adherence to clinical practice guidelines for managing patients with atrial fibrillation. The results could aid in assessing whether physicians are following guidelines, specifically with regard to recommendations based on the $CHADS_2$ score.

METHODS

The electronic medical records of 3 clinics in the Edmonton-Oliver Primary Care Network in Alberta were searched to identify retrospectively patients who were diagnosed with atrial fibrillation and also prescribed warfarin. A follow-up search identified patients with atrial fibrillation who were not prescribed warfarin for comparison. The study received ethics approval from the Human Research Ethics Board at the University of Alberta in Edmonton, and consent to view the records was obtained from physicians in the network before the search.

Both chronic and paroxysmal atrial fibrillation were considered because anticoagulation therapy is beneficial for both conditions.[7] Records were excluded if patients were deceased or warfarin therapy was not ongoing at the time of the search. Patients' age, medications, and comorbid conditions were abstracted into a database for statistical analysis. Number of medications, number of patients taking specific medications, number of comorbid conditions, and patients' age were recorded. The $CHADS_2$ scores were derived from the data collected.

The $CHADS_2$ score categorizes patients into 3 risk groups.[5] For each group, we determined the number and proportion of men and women, the average number of medications they were taking, and the average number of comorbid conditions they had. We then determined the percentage of patients in each risk group and documented how many patients were using medications to control their heart rate (pharmacologic control of heart rate is another component of atrial fibrillation treatment guidelines[7] and was used as an independent measure of adherence to guidelines). To identify differences among risk groups, these factors were compared across groups using one-way ANOVA (analysis of variance) for continuous factors (ie, age, number of medications, number of comorbid conditions) followed by Tukey post-hoc analysis when significance was found, and χ^2 tests of association for categorical factors (ie, sex, prescriptions for drugs to control heart rate).

Owing to software limitations in the electronic medical records, only 1 clinic was able to generate the number of patients with atrial fibrillation who were not prescribed warfarin. Comparison of patients taking warfarin and not taking warfarin was done within this clinic, rather than across all 3 clinics. Because of the small sample size, nonparametric analyses were used to compare these 2 groups: a Fisher exact test for dichotomous outcomes (ie, sex) and a Mann-Whitney test for continuous outcomes (ie, age, medications, comorbid conditions).

RESULTS

The search found the records of 415 patients with atrial fibrillation who were taking warfarin for prophylaxis of stroke. To ensure that pooling patient data from 3 different clinics would not skew our results significantly, we compared our main outcome variables among the 3 clinics and found no statistically or clinically significant differences (data not published). Thus, we could justify combining results from the clinics into a single analysis. Demographic data on patients in each group, as well as on the collective population sample, are shown in **Table 1**. Increases in mean patient age, number of medications, and number of comorbid conditions correlated with progression from low- to intermediate- to high-risk groups. Of particular interest was the finding that 28% of patients were not in a category that clearly indicated warfarin as appropriate therapy, and 7% of

Table 1. Patient demographics in low-, intermediate-, and high-risk groups

CHARACTERISTICS	LOW RISK	INTERMEDIATE RISK	HIGH RISK	OVERALL
N (%)	31 (7)	86 (21)	298 (72)	415 (100)
No. of men (%)	19 (9)	46 (21)	149 (70)	214 (100)
No. of women (%)	12 (6)	40 (20)	149 (74)	201 (100)
Mean (SD) age, y	62 (9)*	73 (9)*	81 (7)*	78 (9)
Mean (SD) no. of medications	6.0 (3.5)*	7.9 (3.9)*	9.6 (3.7)*	9.0 (3.9)
Mean (SD) no. of comorbid conditions	4.0 (2.0)*	5.4 (2.2)*	6.5 (2.3)*	6.1 (2.4)

*ANOVA with Tukey post-hoc test $P<.05$ compared with all other risk groups.

patients were in the low-risk group, for which warfarin was not indicated at all.

Table 2 shows the frequency with which drugs commonly used to control heart rate (β-blockers, digoxin, or nondihydropyridine calcium channel blockers) were prescribed.[7] Overall, 80% of patients were taking at least 1 type of drug to control heart rate. A χ^2 value of 2.65 was calculated, so we were unable to identify any significant differences across risk groups with respect to prescriptions for heart rate control medications.

Only 1 clinic's records indicated which patients were diagnosed with atrial fibrillation but were not taking warfarin. **Table 3** shows the results of comparing patients taking and not taking warfarin. No significant differences were found in age, number of medications, or number of comorbid conditions; the only significant difference was found in the number of men and women in the 2 groups ($P=.03$).

DISCUSSION

To our knowledge, this is the first study that assesses physicians' adherence to using the $CHADS_2$ score in a Canadian community-based setting. Our results show that a significant increase in age, number of medications, and number of comorbid conditions parallels an increase in risk of stroke ($P<.05$). It seems that increases in these factors correlate with stroke-risk group categorization using the $CHADS_2$ score. There was no significant difference in the number of men and women in the 3 risk groups.

A substantial proportion (28%) of the patients sampled were taking warfarin for stroke prophylaxis despite having $CHADS_2$ scores that put them in low- or intermediate-risk categories for which warfarin was not indicated (ie, low risk) or not unequivocally recommended (ie, intermediate risk).[5,7] Approximately 21% of patients were in the intermediate-risk group, for which there was no clearly defined treatment protocol. Canadian guidelines[5] and other literature[7] suggest that patients at intermediate risk be prescribed either ASA or warfarin, which leaves them in a sort of gray zone. Their physicians are left to make a decision about anticoagulation therapy that might not be supported by evidence.

Because as many as 7% of patients with atrial fibrillation were taking warfarin when it was not indicated, we could conclude that physicians were not aware of or not using the guidelines around the $CHADS_2$ score. **Table 2** shows that approximately 80% of patients with atrial fibrillation were taking at least 1 type of drug for heart rate control, which is an important component

Table 2. Distribution of prescriptions for heart rate control drugs to patients in low-, intermediate-, and high-risk groups: $\chi^2=2.65$; $P=.266$.

GROUPS	NO. OF PATIENTS PRESCRIBED HEART RATE CONTROL DRUGS (%)	NO. OF PATIENTS NOT PRESCRIBED HEART RATE CONTROL DRUGS (%)
Low risk	26 (8)	5 (6)
Intermediate risk	74 (22)	12 (15)
High risk	234 (70)	64 (79)
Total	334 (100)	81 (100)

Table 3. Comparison of patients taking and not taking warfarin therapy

CHARACTERISTICS	TAKING WARFARIN THERAPY	NOT TAKING WARFARIN
No. of patients (%)	57 (76)	18 (24)
No. of men (%)	27 (66)	14 (34)
No. of women (%)	30 (88)	4 (12)*
Mean (SD) age, y	76 (9)	73 (14)
Mean (SD) no. of medications	8.1 (4.1)	8.3 (4.1)
Mean (SD) no. of comorbid conditions	6.1 (2.4)	5.7 (2.2)

*Fisher exact test $P<.05$ compared with the warfarin group.

of therapy for atrial fibrillation.[7] When we analyzed the rates of prescriptions for heart rate control drugs in each risk group, we found them to be no different from expected frequencies ($\chi^2 = 2.65$; $P = .266$). While heart rate control is another component of atrial fibrillation treatment guidelines (yet is independent of the $CHADS_2$ score), it seems that physicians are aware of treatment guidelines[4] but perhaps are not following all aspects of them. The specific recommendations regarding warfarin therapy for patients with $CHADS_2$ scores of 2 or less are not being considered or followed.

The usefulness of the $CHADS_2$ score could be called into question. It seems that physicians are prescribing warfarin to patients with atrial fibrillation in spite of a stroke-risk calculation that does not support such treatment. Of course, the decision to initiate warfarin for these patients must be made on an individual basis,[8] and several factors other than those considered in the $CHADS_2$ schema need to be assessed. The simplicity of the $CHADS_2$ score, as well as its validated superiority over other risk-stratification schemas,[1,4] make it a favourable tool for guidelines.

The findings of our study reflect criticisms of the $CHADS_2$ score found in other studies.[1,3] Karthikeyan and Eikelboom[3] noted that the $CHADS_2$ score categorizes a substantial number of patients into the intermediate-risk group, and that further risk-factor considerations for this group have therefore been suggested.[7] Karthikeyan and Eikelboom also argued that some patients in the intermediate-risk group are at the threshold for benefit from anticoagulation therapy and that such patients should not necessarily be prescribed warfarin. On the other hand, Lip[1] discusses evidence that up to a third of patients in a given population of patients with atrial fibrillation have been categorized as intermediate risk and might be taking ASA therapy when anticoagulation with warfarin could be more appropriate. The ambiguity surrounding treatment of the intermediate-risk group further challenges the usefulness of the $CHADS_2$ score.

Limitations

This study has limitations. First, many patients are started on warfarin in hospital and, once out in the community, continue treatment without further consideration of risk of stroke. Also, hospital discharge with ASA therapy might then prompt physicians to calculate risk using the $CHADS_2$ score. Our study is not sensitive enough to assess whether the $CHADS_2$ score is being used in the community as an initial and routine part of the approach to managing atrial fibrillation. We were unable to collect sufficient data to make an adequate comparison of patients with atrial fibrillation who were and were not prescribed warfarin across all 3 clinics. However, a general comparison of the patients in all 3 clinics suggests that those patients not taking warfarin did not have obviously different characteristics from those taking warfarin.

Conclusion

Our findings indicate that patients with atrial fibrillation are not being prescribed warfarin for stroke prophylaxis in accordance with Canadian clinical practice guidelines. The $CHADS_2$ score is not being used or not being followed; however, the prevalence of prescriptions for drugs used to control heart rate suggests that physicians are at least considering the guidelines. The large proportion of patients at intermediate risk of stroke and the unclear guideline for the treatment of these patients might suggest that the $CHADS_2$ score is not the best tool for assessing risk of stroke in patients with atrial fibrillation. Newly developed risk-stratification schemas[1,3] should be evaluated with a view to improving clinical practice guidelines.

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Contributors

Dr Klein initiated the project by developing the research question and hypothesis, oversaw data collection, directed the analysis, and edited versions of the manuscript. **Mr Levine** collected and analyzed data, contributed to interpretation of the data, and wrote the initial drafts of the manuscript.

Competing interests

None declared

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