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Physicians' estimates of the 10-year cardiovascular risk in hypertensive patients

An evaluation in primary care physicians in training

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Summary

Objective: To evaluate how young physicians in training perceive their patients' cardiovascular risk based on the medical charts and their clinical judgment.

Design: Cross sectional observational study.

Setting: University outpatient clinic, Lausanne, Switzerland.

Subjects: Two hundred hypertensive patients and 50 non-hypertensive patients with at least one cardiovascular risk factor.

Main outcome measure: Comparison of the absolute 10-year cardiovascular risk calculated by a computer program based on the Framingham score and adapted for physicians by the WHO/ISH with the perceived risk as assessed clinically by the physicians.

Results: Physicians underestimated the 10-year cardiovascular risk of their patients compared to that calculated with the Framingham score. Concordance between methods was 39% for hypertensive patients and 30% for non-hypertensive patients. Underestimation of cardiovascular risks for hypertensive patients was related to the fact they had a stabilized systolic blood pressure under 140 mm Hg (OR = 2.1 [1.1; 4.1]).

Conclusions: These data show that young physicians in training often have an incorrect perception of the cardiovascular risk of their patients with a tendency to underestimate the risk. However, the calculated risk could also be slightly overestimated when applying the Framingham Heart Study model to a Swiss population. To implement a systematic evaluation of risk factors in primary care a greater emphasis should be placed on the teaching of cardiovascular risk evaluation and on the implementation of quality improvement programs.

Key words: hypertension; cardiovascular risk

Introduction

Blood pressure levels, both systolic and diastolic, have been shown to be positively and linearly related to the risks of stroke, coronary heart disease, heart failure and renal disease [1]. According to several national and international guidelines, the management of patients with hypertension should be based on the absolute cardiovascular risk of patients rather than on the level of blood pressure alone [2–5]. An estimation of the individual cardiovascular risk should take into account several risk factors such as age, gender, smoking, diabetes, cholesterol, family history of premature cardiovascular disease, the presence of target organ damage and history of cardiovascular and renal diseases [2].

Previous studies demonstrated that risk assessment performed by a small group of senior hypertension specialists as well as general practitioners is poor, has a bad concordance with the calculated risk and is poorly reproducible [6, 7]. To improve physicians' ability to accurately predict cardiovascular risk in their patients, appropriate tables and computer programs have been developed [3, 8–11]. Nevertheless, these tools are generally underused in clinical settings because they are either not available or difficult to use and time-consuming in a consultation. Hence, the assessment of cardiovascular risk remains a difficult task for most doctors, who generally rely on their own intuitive appreciation of the risk. A large German survey (11,547 physicians contacted) has recently suggested that hypertension guideline awareness is better among newly qualified physicians [12]. Thus, young doctors in a teaching environment may be more aware of the present recommendations and might be more accurate in predicting the cardiovascular risk of their patients. Yet, to our knowledge, the ability of young physicians in training to judge the 10-year cardiovascular risk of their hypertensive patients, as recommended in most hypertension management guidelines, has never been assessed.

Therefore, the goal of this study was to evaluate how young doctors in training perceive the 10-year cardiovascular risk of their patients and to compare their assessment with the absolute risk calculated by a computer program using the Framingham score adapted by the WHO-ISH guidelines for physicians. Thereafter, we have examined potential determinants of a discrepancy between the calculated risk and the physician's perception in hypertensive patients.

Methods and subjects

Patients

Two hundred hypertensive patients followed during the investigation period (from June 2001 to August 2001) by the clinical residents of the University Outpatient Clinic in Lausanne were included in this study. Subjects were selected by viewing all the files in each physician's office (all patients under treatment). All patients were included until the predetermined sample size was achieved. The sole inclusion criteria were that patients had to be hypertensive, to receive an antihypertensive therapy and that the medical charts were complete. To estimate the capacity of physicians to evaluate the cardiovascular risk of patients with known risk factors other than high blood pressure (BP), the same recruiting method was used to select fifty non-hypertensive patients with at least one cardiovascular risk factor such as smoking, dyslipidaemia or diabetes.

Physicians

Seventeen physicians (8 men and 9 women), all working at the university medical outpatient department in Lausanne, participated in this study with their given consent. Their mean age was 32 years (range: 26–43 years). Their mean duration of post-graduate training was about 5 years (range 1 to 9) with a mean of 2.5 years in internal medicine (range 1–5). When evaluating the risk of their patients, physicians had access to their patient's records but they had no access to computer programs or tables enabling to calculate the risk. Moreover, no particular training on risk estimation was provided before starting the study.

Methods

All medical charts were reviewed by a single investigator (MS) to verify that the key elements necessary to calculate the cardiovascular risk according to the Framingham equation were present in the charts. These included blood pressure (mean of the last 3 measurements), gender, age, total cholesterol, blood glucose, body weight and height, smoking habits and a complete personal and familial cardiovascular history. The data of each patient were reported on a questionnaire and included in a database in order to calculate the individual cardiovascular risk as reported in the 1999 WHO-ISH guidelines [13] and discussed in European guidelines [2]. Thereafter, the cardiovascular risk was calculated for each individual according to the Framingham score developed in 1998 in the Framingham Heart Study. The heterogeneity of patients followed in the outpatient clinic (more than 50% were non-Swiss patients) justified the use of the Framingham score rather than Swiss scores to calculate the risk of this group of patients. Each doctor was interviewed personally and was asked to attribute a 10-year cardiovascular risk to their patients using one of the four categories described in the WHO-ISH guidelines i.e.: low risk <15%, medium risk 15–20%, high risk 20–30% and very high risk >30%.

Statistical analysis

We adopted a descriptive approach without any statistical inference to describe case and control groups as different sampling fractions were used. Results where considered concordant when both computer and physician assign the same risk category.

For hypertensive patients, predictors for underestimation of risk versus correct or overestimation were analyzed by a random effects logistic regression model. A multivariable model was constructed using clinically logical grounds based on known predictors of cardiovascular risks. These were: having a systolic blood pressure below 140 mm Hg, being a woman, being under 50 years old, being treated for dyslipidaemia or having high LDL blood level, having diabetes, being a non-smoker, having a personal history of coronary heart disease and having a positive family history of cardio-vascular diseases. We also included the physician as a random effect in the model to take account of any clustering effect. This random effect logistic regression model was fit in Stata 8.2 (using the xtlogit function) and adjusted odds ratios (OR) are given with a 95% confidence interval (CI).

Results

Two hundreds patients with hypertension followed by 15 physicians were included in the analysis. Number of patients per physician ranged from 1 to 23 with a median of 13. The 50 files from patients without hypertension were reviewed by 8 physicians (range 1 to 9; median 7). Table 1 shows the characteristics of both groups of patients included in the study. In the treated hypertensive population (n = 200), 57% had a diastolic BP <90 mm Hg (mean of the 3 last measurements at different terms), 49% had a systolic BP <140 mm Hg and 38% had a BP below 140/90 mm Hg.

There was a clear underestimation by physicians of the 10 year cardiovascular risk of their patients for both groups (figure 1). 78/200 (39%) of patients were assigned in the same risk category with both methods. Physicians underestimated risk category for 48% of hypertensive patients compared to the Framingham score, and overestimated it for 13% (table 2).

Where risk was underestimated in known hypertensive patients (n = 96), the underestimation was of one category in two thirds of the patients and of two categories or more in one third of the cases. Of patients with an actual measured BP >140/90 mm Hg (n = 104), the physician underestimated risk, correctly assessed risk and overestimated risk in 39%, 44% and 17% of patients respectively.

Logistic regression analysis with physicians as a random effect, showed no evidence of between-physician variability. Multivariate model (table 3) reveals that underestimation of risk is related to having a normalized systolic BP (OR = 2.1 [1.1; 4.1]). In non-hypertensive subjects, 30% of the assessments were concordant between methods, 54% were underestimated by physicians and 16% overestimated.

Table 1

Characteristics of included hypertensive (n = 200) and non-hypertensive patients (n = 50).

	Hypertensive (n = 200)	Non-hypertensive (n = 50)
Men: N (%)	121 (60%)	30 (60%)
Dyslipidaemia: N (%)	138 (68%)	27 (54%)
Diabetes: N (%)	69 (34%)	4 (8%)
Smoker: N (%)	54 (27%)	29 (58%)
Family history of coronary heart disease: N (%)	27 (13%)	4 (8%)
Age (years): mean (SD)	63 (14)	47 (16)
BMI (kg/m^2): mean (SD)	28 (5)	27 (6)
Systolic BP (mm Hg): mean (SD)	141 (19)	128 (13)
Diastolic BP (mm Hg): mean (SD)	86 (11)	81 (7)

BP: blood pressure, BMI: body mass index

Table 2

Concordance between physicians' and Framingham estimation of risk category for both hypertensive (n = 200) and non-hypertensive patients (n = 50).

	Framingham' score			
	Low (<15%)	Moderate (15–20%)	High (21–30%)	Very high (>30%)
Physicians' estimation				
Low (<15%) Hypertensive (n = 200) / non-hypertensive (n = 50)	4 / 0	12 / 19	13 / 3	5 / 0
Moderate (15–20%) Hypertensive (n = 200) / non-hypertensive (n = 50)	5 / 0	11 / 6	24 / 2	14 / 0
High (21–30%) Hypertensive (n = 200) / non-hypertensive (n = 50)	0 / 0	11 / 4	29 / 7	28 / 5
Very high (>30%) Hypertensive (n = 200) / non-hypertensive (n = 50)	0 / 0	1 / 0	9 / 2	34 / 2

Figure 1

Distribution of the physician-perceived and computer-calculated cardiovascular risk in 200 hypertensive and 50 non-hypertensive patients.

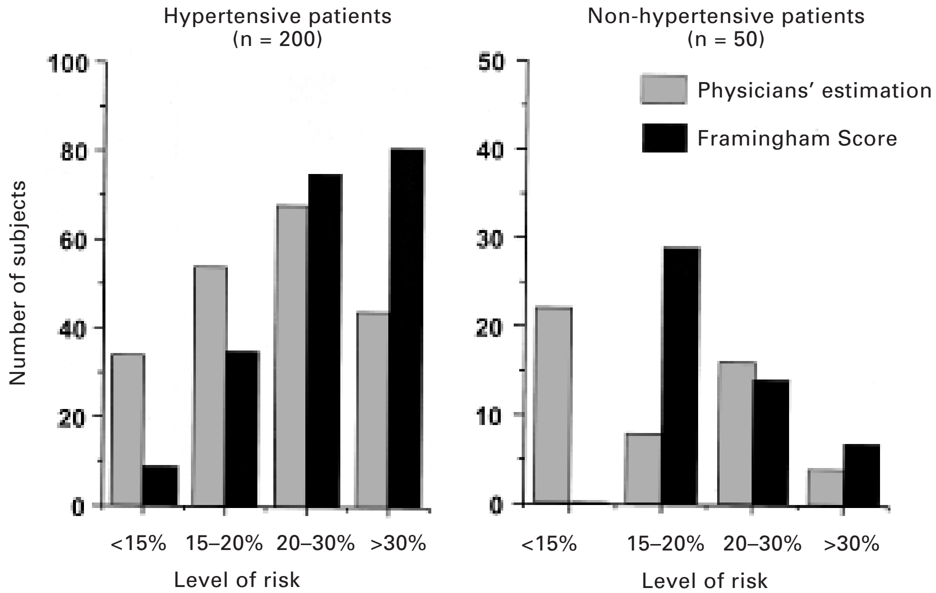

Table 3

Odds ratios of underestimating cardiovascular risks versus not underestimating them on usual predictors for hypertensive patients. Logistic regression model was clustered for physicians (n = 200).

	N (%) with underestimated risk	Adjusted OR [95% CI]
Gender (Women versus men)	43 (54%) vs. 53 (44%)	1.8 [0.9; 3.5]
Age (≤50 y versus >50 y)	18 (56.3%) vs. 77 (48.4%)	1.2 [0.5; 3.0]
Controlled Blood Pressure (Systolic BP <140 versus ≥140 mm Hg)	58 (56%) vs. 38 (39%)	2.1 [1.1; 4.1]*
Smoking habits (Non-smoker versus smoker)	78 (52%) vs. 18 (36%)	2.0 [0.9; 4.4]
Dyslipidaemia (LDL >6.5 mmol or treated versus other)	66 (48%) vs. 30 (47%)	0.9 [0.4; 1.9]
Diabetes (diabetes versus no diabetes)	33 (49%) vs. 63 (47%)	0.7 [0.3; 1.5]
Personal history of coronary heart disease (With versus none)	24 (48%) vs. 72 (49%)	1.3 [0.6; 3.0]
Family history of coronary heart disease (With versus none)	15 (62%) vs. 81 (46%)	2.0 [0.7; 5.9]

* Adjusted OR significantly different from 1 with CI 95%

Discussion

In recent years, several national and international guidelines have proposed to assess the global risk of hypertensive patients in order to take therapeutic decisions [2–4, 13]. The results of the present study show that the judgment of young physicians of the 10-year cardiovascular risk of their patients is relatively poor when compared to a computer-calculated risk. Indeed, almost 50% of the assessments were underestimated and close to 15% were overestimated. Multivariate analysis showed that hypertensive patients with an underestimated risk were more likely to have a lower blood pressure.

So far, very few studies have examined the ability of physicians to predict accurately the cardiovascular risk of their hypertensive patients. In one study, the ability of six senior hypertensive specialists was investigated and the results of this study showed that only three of these specialists were in keeping with Framingham predictions [6]. In a larger French study, 953 general physicians estimated the absolute risk of 1243 hypertensive patients. Their estimation was then compared to a calculated risk. The concordance between the estimated and the calculated risk was 35% with 50% underestimation [7]. Our finding agrees with this observation with 48.5% underestimation in the hypertensive group and 54% underestimation in the non-hypertensive control group. Yet, our results differ from those reported previously by Grower et al. in which doctors tended to systematically overestimate the absolute risk of coronary heart disease in individual patients [14]. However, in this latter study, hypothetical patients were presented and physicians attended several meetings before participating in the study [14]. In contrast, in the present study, physicians were younger and were asked to assess the risk of their own patients.

Hanon et al, who studied only patients with a BP greater than 140/90 mm Hg found that correct estimation of the risk was predicted by being a man, being a smoker and having a low HDL cholesterol [7]. In their hands blood pressure per se had no impact on the prediction. In contrast our study shows that blood pressure has an impact on the physician's perception of the cardiovascular risk. Thus we found that treated hypertensive patients with a low systolic blood pressure are 2.5 times more likely to have their cardiovascular risk underestimated compared to the computer calculated risk. The observed trend concerning different risk assessments between smokers and nonsmokers may be due to the fact that smokers' risks are better evaluated [7]. In this respect, training of residents in tobacco prevention programs could explain their capacity to assess more accurately the cardiovascular risk of smoking patients [15].

In this study, the computer-calculated risk was taken as the reference system. The computer calculation was based on the WHO-ISH guidelines [13] which provide a simple method to calculate the combined effect of several risk factors and conditions on the future absolute risk of major cardiovascular events. These calculations are based on data from the Framingham study [16]. When used in our population, it is possible that the computer calculation overestimates the risk. Thus, for example, in our control group, young smoking males (below age 30) were often attributed a 15–20% risk of cardiovascular complications over 10 years by the computer whereas physicians tended to give a lower estimate. In this situation, physicians may be closer to the truth because the computer assessment does not take into account other variables such as the number of cigarettes smoked each day [15]. One may also argue that the Framingham risk function is not appropriate for a central European population and that it overestimates the risk of our patients. Nevertheless, recent studies have suggested that Framingham data are accurate for northern European populations [17] but this may not be true for all European populations [18]. Laurier et al. have demonstrated that the Framingham data overestimate the coronary heart disease risk in the French population [19], Thomsen et al. have drawn the same conclusion in the Danish population [20] and Menotti et al. for the Italian population [21]. A prospective cohort study showed that overestimation of Framingham functions concerns mainly patients in the highest risk quintile and that it ranged from 2% in UK to 7% in France [22]. However, our results showed that patients with lower risk factors were those whose cardiovascular risks tended to be most underestimated. Achieving proper assessment without computed database can be difficult especially for heterogeneous populations. For this reason, alternative databases are accessible where the risk of other populations can be calculated, for example based on the data obtained in European population (www.scopri.ch/MONICA-PROCAM3_RA3.html). One other limitation of our study is that our hypertensive patients were treated and whether risk assessment is still valid in treated hypertensive patients has been discussed earlier [22]. However, if lowering blood pressure with a therapy in order to reduce the patient's cardiovascular risk, had no impact on the estimation of the total cardiovascular risk, the entire validity of the risk calculation should be questioned. Moreover, the Framingham risk function uses a model which takes into consideration the fact that patients are treated.

In conclusions, our data confirm that even though guidelines exist for targeting patients at high risk of cardiovascular diseases, an accurate assessment of coronary risk in hypertensive patients remains a difficult task for doctors. This is true even in a teaching hospital where doctors have free access to computers and to the latest medical information and have direct contacts with specialists. However, one has to emphasize that in many teaching hospitals young physicians are not readily trained to improve their ability to assess the risk of their patients because educational interventions are lacking. Consequently, doctors tend to overestimate their own capacity to assess cardiovascular disease risk factors [23]. The use of tables and computer-based programs should enhance their abilities to assess the cardiovascular risk. Several studies have indeed suggested that a computer-based evaluation of the risk has a favourable impact on physicians [8–11] but it appears to have only a minor impact on patient management and its effect on the quality of blood pressure control is still questioned [24]. If one wishes to implement a systematic evaluation of risk factors in primary care a greater emphasis should be placed on the teaching of cardiovascular risk evaluation and on the implementation of quality improvement programs.

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