Soz.- Präventivmed. 43 (1998) 67–72
0303-8408/98/020067-06 $ 1.50 + 0.20/0

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Teaching physicians about different measures of risk reduction may alter their treatment preference

Summary

We explored during a postgraduate workshop whether basic teaching about absolute and relative effect measures changed physicians' perceptions of the benefit to be derived from modifying particular cardiovascular risk factors. Before and after instruction physicians were asked about the priority they would give to interventions to reduce four risk factors of coronary heart disease in two male patients, aged 35 and 65 years with multiple risk factors. They were given information about the relative risk (RR), absolute risk reduction (ARR) and the number of patients who need to be treated (NNT) to prevent one event associated with the modification of each risk factor. Ratings of 48 of the 67 participating physicians (71.6%) were evaluated. About half did not change their choices regarding the benefit from a particular intervention. Among those who changed, the new choice was in favor of the patient with the higher ARR for three risk factors (hypertension, p=0.01; smoking, p=0.002; non-insulin-dependent diabetes, p=0.05) but not the fourth (left ventricular hypertrophy, p=0.82). Teaching basic principles of clinical epidemiology to physicians can have an impact on their perception of treatment effects. However, this will not suffice in itself to guarantee that this new knowledge will become part of their clinical practice.

The results of a clinical trial may be expressed in various ways. For example, R_1 is the risk for the studied outcome in the treated group and R_0 is the risk in the placebo group, it has been shown that physicians are inclined to interpret the results as being more favorable when they are expressed as relative risk ($RR = R_0 : R_1$) rather than absolute risk difference ($ARR = R_0 - R_1$)[1–7]. The number of patients who need to be treated in order to prevent one event (NNT)[8] is an additional, very intuitive measure of absolute risk reduction ($NNT = 1 : (R_0 - R_1)$) that does not yet belong to the interpretation skills of most clinicians.

Basic principles about how to obtain information on RR, ARR and NNT from clinical trials have been published[9,10] but little is known about whether these principles are used by clinicians. During a postgraduate workshop in continuing medical education we investigated to what extent physicians who have been taught how to compute and interpret RR, ARR and NNT are likely to take these effect measures into account when making treatment decisions.

Methods

A workshop about basic principles of clinical epidemiology was given during a postgraduate course for continuing medical education offered in 1995 by the Swiss Society of Internal Medicine. The majority of the 67 physicians who attended the workshop were general internists (51.8%) and working in private practice (54.7%). Of those working in the hospital (n=28), 67.9% were residents, 14.3% were senior residents and 17.9% were staff members. Mean age was 44.8 (SD = 11.2). Mean time since graduation from medical school was 18.4 years (SD = 11.4). Physicians were divided in three one-hour sessions of equal sizes. The language was German in two sessions and French in the other.

Before the lecture, the participants were given a small questionnaire (See appendix) about two male patients aged 35 and 65 years with identical risk factors for coronary

heart disease: systolic blood pressure of 165 mm Hg, smoking 15 cigarettes per day, non-insulin-dependent diabetes and left ventricular hypertrophy on ECG. Using the Framingham risk profile score for incidence of coronary heart disease[11] we showed for both patients the RR, the corresponding absoute risk reduction and the number needed to treat over 6 years for the following modifications of risk factors: reduction of systolic blood pressure to 120 mm Hg, cessation of smoking, normalization of glucose intolerance, and normalization of left ventricular hypertrophy. Physicians were asked to rate which of the two patients would benefit most from a given risk factor modification.

After having completed the questionnaire physicians were given 30 minutes instruction given by the two authors. The concepts of risk, RR, ARR and NNT were explained and illustrated with two examples[12,13]. Advantages and disadvantages of these effect measures were explained.

This instruction was followed by a second questionaire (See Appendix) with a slightly different example of two male patients aged 35 and 65 with similar multiple risk factors for coronary heart disease. Again physicians were asked to rate which patient would benefit the most from the following risk factor modifications: reduction of systolic blood pressure from 145 mm Hg to normal, smoking cessation in a smoker who consumed 15 cigarettes per day, normalization of blood sugar in non-insulin-dependent diabetes and modification of left ventricular hypertrophy. All three effect measures were similar to those in the first example.

We estimated the impact of our teaching program as follows. For each risk factor modification, the number of physicians who changed their assignment of the higher benefit from intervention in favor of the patient with the higher ARR was compared using the McNemar chi square test with the number of physicians who changed their assignment not in favor of the patient with the higher ARR. Complete questionnaires which allowed paired analysis were obtained from 48 of the physicians. Statistical analysis was done with the SAS package for personal computers[14].

Results

Table 1 shows that, after the short instruction, about half of the physicians did not change their assignment of the patient who would benefit most from a given intervention. However, among those who changed, the new choice was in favor of the patient for whom the ARR was higher for three of the four risk factors. For hypertension 18 physicians changed their assignment in favor of the patient with the higher ARR and 5 in favor of another option (higher RR or similar benefit in both patients) ($p = 0.01$). These numbers were, respectively, 22 and 5 for smoking ($p = 0.002$); 11 and 9 for left ventricular hypertrophy ($p = 0.82$), and 16 and 6 for non-insulin-dependent diabetes ($p = 0.5$).

Discussion

This study suggests that a short period of instruction on basic principles of clinical epidemiology[7,9] may sensitize some physicians about how to interpret different effect measures and how this information can be integrated into clinical decision making. However, changes in decisions occurred in only half of the physicians, and for another 10 to 20% the change in preference was not in favor of the patient with the higher ARR.

Risk factor modified	N	Change in treatment preference after instruction in favor of			No change in treatment preference after instruction in favor of		
		higher ARR	other*	p-value**	higher ARR	other*	% no change
Systolic BP	48	18	5	0.01	17	8	52
Smoking	47	22	11	0.002	9	17	43
LVH	47	11	9	0.82	17	10	57
NIDD	45	16	6	0.05	15	8	51

ARR = absolute risk reduction, BP = blood pressure, LVH = left ventricular hypertrophy, NIDD = non insulin dependent diabetes.
* Either to higher RR or no preference.
** McNemar chi square test for paired observations (before and after instruction) on the same physician.

Table 1. *Physicians' treatment preference for modifying 4 cardiovascular risk factors prior to and after instruction on basic principles for assessing effect measures.*

Before the instruction, roughly one third of the physicians gave their treatment preference to the patient with the higher ARR from cardiovascular risk factor modification. After the instruction, when two patients with similar multiple risk factors for coronary heart disease were presented, the physicians were more inclined to give treatment to the patient with the higher attributable risk reduction from intervention priority in the case of three of the four presented risk factor modifications. No significant change in treatment preference was found for the treatment of left ventricular hypertrophy. A reason for this finding could be that in the presence of organ damage, and in view of the moderate possibility for its modification, physicians had more difficulty in giving treatment priority to either patient.

Future investigations on the impact of teaching clinicians about epidemiological principles of clinical effect measures could benefit from taking into consideration the limitations of the present study. First, the measure of effects given in the questionnaires were computed using the Framingham risk profile. This model may not be the optimal because it gives six-year risks of coronary heart disease and therefore does not reflect the fact that the remaining life span was higher for the younger subject. In addition, the Framingham risk profile is limited to coronary heart disease and does not consider for any other benefit of smoking cessation.

Secondly, the sample comprised motivated physicians, convinced that attending our workshop would be worthwhile and may therefore not have been representative of the majority of Swiss physicians. Finally, a short period of instruction may generate confusion in a minority of participants.

In summary, teaching basic principles of clinical epidemiology and evidence based medicine to physicians can have an impact on physicians' perceptions of treatment effects. However, for most of them, this will not suffice in itself to guarantee that this new knowledge will become part of their clinical practice.

Zusammenfassung

Information über absolute und relative Risikoreduktion kann Therapieentscheide von ÄrztInnen beeinflussen

Wir untersuchten in einem Weiterbildungskurs für praktizierende Ärzte, inwiefern die Vermittlung von Grundkenntnissen von relativen und absoluten Wirkgrössen die Beurteilung der Wirksamkeit kardiovaskulärer Risikofaktorenmodifikation verändert. Ärzte gaben vor und nach einem theoretischen Kurs zu 4 Risikofaktoren ihre Behandlungspräferenzen bei je einem 35- und 65jährigen männlichen Patienten mit multiplen Risikofaktoren an. Für jede Behandlungssituation lagen die Angaben in relativen und absoluten Risiken sowie die Anzahl zu Behandelnder pro verhütetem Krankheitsereignis vor. Fragebogen von 48 (71,6%) Teilnehmern (n=67) waren verwertbar. Rund die Hälfte der Teilnehmer änderten in den Angaben nach Kursinstruktion ihre Behandlungspräferenz nicht. Ärzte, welche ihre Behandlungspräferenz änderten, gaben nach Intervention bei drei Risikofaktoren (Hypertonie, p=0.01; Rauchen, p=0.002; nicht insulinpflichtiger Diabetes mellitus, p=0.005), jedoch nicht bei der Behandlung der linksventrikulären Hypertrophie (p=0.82) ihre Behandlungspräferenz dem Patienten mit der höheren absoluten Risikoreduktion. Die Vermittlung von Prinzipien der klinischen Epidemiologie kann die Beurteilung von Behandlungseffekten ändern. Inwieweit dieses Wissen in die praktische Entscheidungsfindung Eingang findet, muss in weiteren Studien evaluiert werden.

Résumé

L'enseignement des notions de risque relatif et de risque attribuable peut influencer la decision therapeutique

Nous avons déterminé si l'enseignement de principes élémentaires sur les mesures d'effets absolus et relatifs change la perception par les médecins des bénéfices d'une intervention visant à modifier le risque cardio-vasculaire. Le plan de recherche était un échantillon non aléatoire de médecins participants à un atelier post-gradué sur des principes élémentaires de l'épidémiologie clinique. Chaque médecin était son propre témoin. Avant et après la séance d'enseignement, les médecins indiquaient quelle était leur préférence sur une liste d'interventions destinées à reduire 4 facteurs de risque de la maladie coronarienne chez 2 hommes âgés, respectivement, de 35 et 65 ans, ayant de multiples facteurs de risque. Risque relatif, risque évitable et nombre de personnes à traiter pour éviter un cas d'infarctus du myocarde étaient indiqués en regard de chaque modification de facteurs de risque. Les réponses de 48 des 67 participants (71.6%) ont pu être analysées. Environ 50% des médecins n'ont pas changé de préférence après l'instruction. Parmi ceux qui ont changé, le nouveau choix était en faveur du patient qui avait le risque évitable le plus élevé pour 3 facteurs de risque (hypertension, p=0.01; tabagisme, p=0.002; diabète non-insulino-dépendent, p=0.05) mais pas pour le quatrième (hypertrophie ventriculaire gauche, p=0.82). Enseigner les principes de base de l'épidémiologie clinique à des médecin peut avoir un impact sur leur perception des effets d'un traitement. Cependant, ceci ne sera pas suffisant pour garantir qu'ils utilisent ces connaissances dans leur pratique.

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Acknowledgement

The authors would like to thank B. Luong and Ch. Tovena for their assistance during the workshop.

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Appendix

Questionnaire I

We present the examples of two men having similar risk factors for coronary heart disease. The first man is 35 years old. The second man is 65 years old. Both men have the following risk factors for coronary heart disease: Systolic blood pressure 165 mm Hg, both men smoke 15 cigarettes a day, have a non-insulin dependent diabetes and show left ventricular hypertrophy in the ECG.
Using the Framingham risk profile for coronary heart disease we have computed the relative risk, the absolute risk reduction and the number needed to be treated over 6 years associated with modifying each of these risk factors, that is, reduction of systolic blood pressure to 120 mm Hg, smoking cessation, normalisation of glucose intolerance and left ventricular hypertrophy.
For each risk factor indicate in the last column of the table which patient would benefit most from a risk factor modification.

Risk factor	Subject 1 35 years old			Subject 2 65 years old			Treat in priority subject 1 or 2
	relative risk	absolute risk reduction	number needed to treat	relative risk	absolute risk reduction	number needed to treat	
Systolic blood pressure	0.6	−1.0	100	0.6	−4.1	43	
Smoking	0.6	−0.8	125	0.7	−3.4	29	
Left ventricular hypertrophy	0.5	−1.2	83	0.5	−5.1	20	
Non-insulin-dependent diabetes	0.8	−0.5	200	0.8	−2.2	45	

Absolute risk reduction refers to the treatment of 1000 patients for 6 years.

Questionnaire II

We present the examples of two men having similar risk factors for coronary heart disease. The first man is 35 years old. The second man is 65 years old. Both men have the following risk factors for coronary heart disease: Systolic blood pressure 145 mm Hg, both men smoke 15 cigarettes a day, have a non-insulin dependent diabetes and show left ventricular hypertrophy in the ECG.

Using the Framingham risk profile for coronary heart disease we have computed the relative risk, the absolute risk reduction and the number needed to be treated over 6 years associated with modifying each of these risk factors, that is, reduction of systolic blood pressure to 120 mm Hg, smoking cessation, normalisation of glucose intolerance and left ventricular hypertrophy.

For each risk factor indicate in the last column of the table which patient would benefit most from a risk factor modification.

Risk factor	Subject 1 35 years old			Subject 2 65 years old			Treat in priority subject 1 or 2
	relative risk	absolute risk reduction	number needed to treat	relative risk	absolute risk reduction	number needed to treat	
Systolic blood pressure	0.7	–0.7	143	0.8	–1.7	57	
Smoking	07	–0.9	106	0.7	–2.3	15	
Left ventricular hypertrophy	0.5	–1.4	72	0.5	–3.5	29	
Non-insulin-dependent diabetes	0.8	–0.6	164	0.6	–1.5	66	

Absolute risk reduction refers to the treatment of 1000 patients for 6 years.