



# The understanding of terms in evidence-based medicine: a pilot study

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## Introduction

Evidence-based medicine (EBM) has dominated therapy and prescribing in diabetes for the last 10–20 years. The biomedical targets generated by EBM have set the standards for quality of care, for example in the NHS Quality Outcomes Framework (QOF) in the UK.<sup>1</sup> EBM forms the backbone of guidelines used in clinical practice,<sup>2</sup> and a number of pieces of evidence are quoted frequently in major guidelines.<sup>3</sup>

Most relevant to this pilot study, EBM has introduced both health care professionals and people with diabetes to a new vocabulary, or new usage of an established and sometimes colloquial vocabulary, much of it associated with the term 'risk'.

Most powerful among the tools of EBM is the randomised controlled trial (RCT), which ranks highest in the five-tier hierarchy of EBM behind the meta-analysis.<sup>4,5</sup> In diabetes care and type 2 diabetes in particular, foremost in RCTs are studies in glycaemic control and

## Abstract

**Background:** A questionnaire was developed to investigate the differences in frequency of usage and the understood meaning of 10 terms used in evidence-based medicine.

**Method:** The questionnaire was administered to a group of healthcare professionals (64), medical students (71) and patients with diabetes (69). The frequency of use on a yes/no basis and a profile of usage by participants choosing alternatives a–d were recorded.

**Results:** The findings showed that significant differences in the frequency of usage of terms such as 'risk factor' and 'relative risk' and the concept of 'number needed to treat' occurred between the three participant groups ( $p < 0.001$ ). The findings also showed that the considered meaning out of the four options offered for some of these 'terms' differed significantly between the three participant groups, eg 'probable' and 'risk factor' ( $p < 0.001$ ).

**Conclusion:** We should be aware of the frequency with which we use these words and the meanings attached to them, both from our own and our patients' perspectives, and clarify this. We propose that further investigation is warranted.

## Key words

Evidence-based medicine; risk; healthcare professionals; patients; diabetes; language

blood pressure management. One such study is the United Kingdom Prospective Diabetes Study, which expressed its results in its two most cited clinical references<sup>6,7</sup> as relative risk for which 95% confidence intervals were given. Such relative risk could be expressed as decimals (eg 0.25 for myocardial infarction in the treated group) or percentages (in this example 25%).

Results were also expressed as absolute risks per 1000 patient years. Oft-quoted studies on cholesterol and diabetes, both in RCTs<sup>8</sup> and meta-analysis,<sup>9</sup> have used these terms. In addition, studies of multiple risk factors expressing their observations with these terms have led to type 2 diabetes being described as a 'cardiovascular' disease.

Linguistic studies especially those linked to the use of words in medical communication<sup>10,11,12</sup> suggest that there is no consensus as to the general usage of the word 'risk'. Specifically it is suggested that

different groups in society use 'risk' in their own ways, and that, since 'risk' means different things to different people, 'lay people' (such as people with diabetes or patients) may not understand 'experts' such as clinicians or those in training, like medical students when they discuss 'risk'. Add to this adjectives such as 'relative', 'absolute' and 'high', and the potential for differences in frequency of usage and interpretation of meaning of words and terms centred on risk are likely.

These considerations have great potential bearing on communication and understanding between a healthcare professional to patient, healthcare professional to colleague, and trainer to trainee, with regards to treatment options and/or behaviour change. It was this that led us to begin investigations into the use of words on a linguistic basis in the vocabulary of evidence-based medicine.

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## Method

A questionnaire was developed containing nine terms and one concept, related to the word 'risk' as used in EBM. The nine words were: chance, risk, probable or probability, possible or possibility, high risk, risk factor, absolute risk, relative risk and confidence limits. These words were taken from publications forming the basis of EBM, and being used most frequently to describe risk. The concept was of number needed to treat,<sup>13</sup> which is used commonly to express the results of RCTs.

The participants to whom the questionnaire was administered were opportunistic samples taken during attendance at clinical study days for healthcare professionals (64) and medical students (71), and patients (69) attending a UK diabetes outpatient clinic. The only demographic information requested was age and gender which were not used in this investigation.

The questionnaire was designed to first ask if the participant used the term by answering yes or no. Next, participants were offered four possible meanings of the term listed a–d and were asked to choose the one they felt was closest to its meaning for them, whether they used the term or not. The meanings were chosen by the author 'AB' from the Collins English dictionary definition, his professional use of the word and two colloquial alternatives. For the concept of number needed to treat, a short description of the concept was given (Table 1). Again participants were asked to answer 'yes' or 'no' to whether they used the term, and again were offered four possible meanings of the concept, listed a–d and were asked to indicate which was the closest to the meaning for them, again whether they used the term or not.

Data analysis was undertaken

### Number needed to treat – the concept

Your doctor or nurse has suggested to you that you should take a medicine to change the risk that you may develop a complication of diabetes. They are convinced that the benefit from treatment is more likely than harm using the 'number needed to treat' concept. This is a measure of how many people prescribed and taking a medicine are required in order to show that one extra patient has benefited compared to patients not treated. The doctor or nurse tells you that the NNT number is 15.

	Healthcare professionals n=64	Medical students n=71	Diabetic patients n=69	p-value $\chi^2$ test
Every patient treated will get some benefit if 15 are treated	22%	10%	61%	–
None of 15 patients treated may benefit	34%	62%	23%	–
The first of 15 patients treated will benefit	2%	6%	6%	p<0.001
The last of 15 patients treated will benefit	20%	13%	3%	–
No meaning chosen	22%	9%	7%	–

**Table 1:** The concept of 'number needed to treat' with the meanings offered and the percentage of each group's chosen meaning with  $\chi^2$  p-values.

using Microsoft Excel and the Statistical Package for Social Sciences (SPSS).

The data were first input into Excel to give overall percentages for the frequency of use of the 'terms' and the chosen meanings. These data were analysed further by inputting the data into SPSS and performing Chi-Square analysis to investigate for any significant difference between the three groups of participants, in the use of the 'term' and their choice of meaning for each term and the concept of number needed to treat.

## Results

The results of those who replied 'yes' to using the term, the nine terms used and the concept of number needed to treat for all three groups are presented in Figure 1.

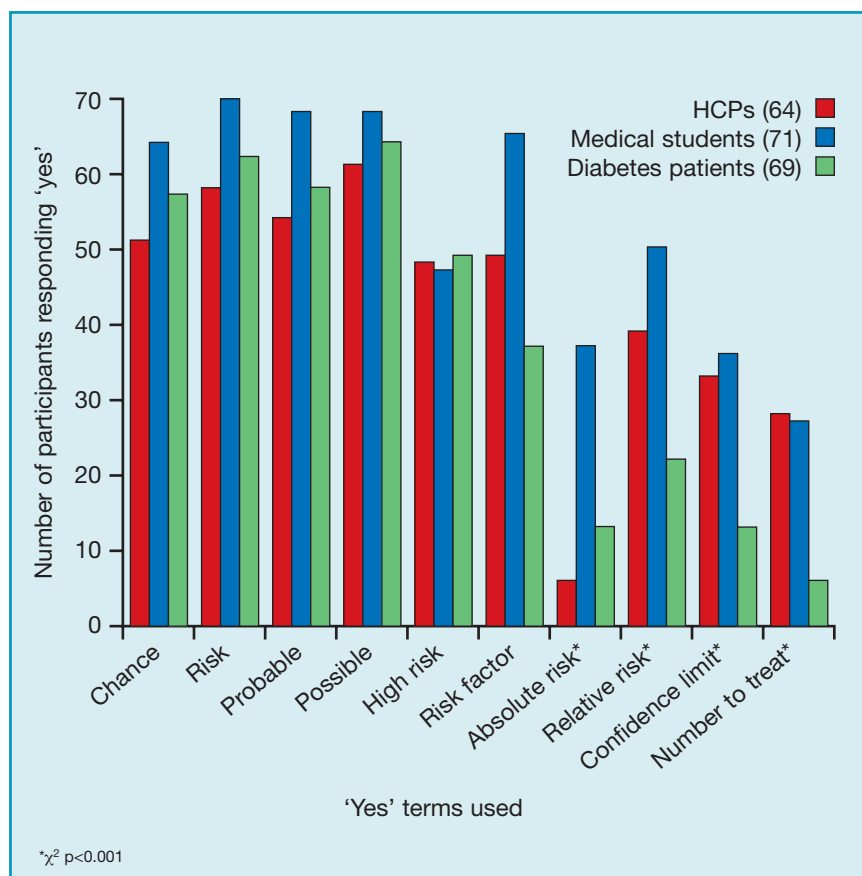
Table 2 shows the results in percentages and the Chi-Square analysis for the terms and their

offered meanings, and for the concept of number needed to treat and the offered meanings.

The  $\chi^2$  findings indicate that there were significant differences between the three groups in terms of whether participants used the term yes/no; risk factor, absolute risk, relative risk, confidence limits and the concept of number need to treat (p<0.001).

The  $\chi^2$  findings also indicated that there were significant differences between the meanings participants chose in a–d for the terms: probable/probability, risk factor, absolute risk, relative risk, confidence limits and number needed to treat (p<0.001).

It was also found that between and within the three groups, the chosen meanings would vary. For example, for the term 'risk factor', the meaning 'a risk factor is something that changes the probability of an event happening' was



**Figure 1:** The frequency of usage ('Yes') for all nine words/terms and the concept of NNT for all healthcare professionals (HCPs), medical students and diabetes patients

chosen the most by all the groups; however, a number of healthcare professionals (11%) and the patients (16%) also chose the meaning 'risk factors can only make something worse'.

For the term 'absolute risk', the patient group was divided on the meaning, with 36% choosing 'a statistical way of measuring risk', and 32% choosing 'any risk is dangerous'.

It needs to be noted here that not all the participants chose a meaning in some cases. This occurred mainly in the concept of 'number needed to treat'.

The findings showed that not only was there a difference between the groups in the terms of their main chosen meaning, but there were also differences within the groups, particularly within the

healthcare professional group with the meaning chosen measured as 22%, 34% and 20%, respectively; it was also found that 22% of the healthcare professionals did not choose any meaning.

### Discussion

Looking at the terms chosen to include in this questionnaire, readers will already have formed some opinion of the frequency with which the three groups of participants may be expected to use them. It is not surprising that the simple words 'risk' and 'possible/possibility' were used equally frequently by all three groups (90–98%). Equally, it may not be surprising that a more technical term as used in the context of EBM such as 'confidence limits' was used equally frequently

by diabetes healthcare providers (50%) and medical students (50%), but twice as often as by diabetes patients (22% of usage,  $p < 0.001$ ). Similarly the use of the concept 'number needed to treat' and 'relative risk' differed significantly ( $p < 0.001$ ). What, however, is of more interest is the relatively low frequency with which healthcare professionals and medical students used these terms overall (40–50%), or perhaps felt comfortable with their use. This is highlighted by 22% of the healthcare professionals not choosing any of the meanings offered. Considering our introductory statements about the influence of EBM, and its vocabulary and concepts on modern clinical practice and in diabetes care and education, it is also a lesson for education and training of healthcare professionals and medical students.<sup>14</sup>

Further analysis of the popular choice of meaning for these words shows some differences which also reached statistical significance (Table 2). It is not surprising that there was a common meaning for the simple words 'chance', 'risk', and 'possible' between the three groups, since they are all in widespread and frequent use. However, the pattern of inferred meaning differed for the words 'probable/probability' between the three groups, which is in itself an interesting consideration. A more probing questionnaire may have highlighted differences in the inferred and understood meaning of the word 'probable', but the one that we used did not. The common understanding and use of the word 'high risk' confirms that healthcare providers and patients do acknowledge that some diseases, in this case diabetes and its consequences, has measurable and considerable risks to health. However, it underlines the need to ensure a common understanding of the concepts that



	Healthcare professionals n=64	Medical students n=71	Diabetes patients n=69	p-value $\chi^2$ test
<b>Chance</b> Chance means the same as risk A chance is always a good opportunity I have no influence over chance A chance is always a gamble	33% 31% 14% 16%	45% 14% 14% 25%	25% 39% 9% 25%	p>0.05
<b>Risk</b> Risk means the same as chance A risk is always a hazardous thing Risk can be measured I can do nothing to change a risk	11% 38% 50% 5%	17% 32% 49% 0%	14% 42% 36% 7%	p>0.05
<b>Probable/probability</b> Something that is probable is less likely than something that is possible Probability and possibility mean the same thing Something that is probable is very likely to happen The probability of something happening can be measured	9% 9% 53% 25%	4% 3% 45% 45%	17% 7% 61% 13%	p<0.001
<b>Possible/possibility</b> Possibility and probability mean the same Something that is possible is more likely than something that is probable Something that is possible is unlikely, but may happen Whether something is possible is all down to luck	6% 27% 63% 5%	10% 10% 73% 3%	14% 23% 51% 6%	p>0.05
<b>High risk</b> Something is almost certain to happen The risk is about 1 chance in 10 The risk is about 1 chance in 100 The risk is about 1 chance in 1000	30% 38% 16% 2%	32% 42% 17% 1%	41% 43% 9% 4%	p>0.05
<b>Risk factor</b> A risk factor is something that changes the probability of an event happening Risk factors only affect men Risk factors can only make something worse Risk factors do not change with time	73% 2% 11% 3%	93% 0% 6% 0%	65% 0% 16% 19%	p<0.001
<b>Absolute risk</b> Something that is risky is certain to happen A statistical way of measuring risk Any risk is dangerous There is absolutely no risk of something happening	9% 75% 5% 0%	6% 86% 1% 0%	26% 36% 32% 3%	p<0.001
<b>Relative risk</b> Any risk is likely to happen The chances of the same thing happening to another family member Taking any risk is relatively dangerous A statistical way of comparing the probabilities of two things happening	2% 8% 5% 83%	4% 1% 0% 92%	14% 6% 30% 49%	p<0.001
<b>Confidence limits</b> How confident I am doing something new is limited I have little confidence in my doctor We cannot always keep things secret A way of expressing how accurate something may be	9% 2% 8% 73%	1% 1% 0% 92%	25% 3% 20% 51%	p<0.001

**Table 2:** The terms used, the meanings offered and the percentage of each group's chosen meaning with  $\chi^2$  p-values



underpin prescribing and clinical management in trying to modify 'high risk'.

The words 'absolute risk', 'relative risk' and 'confidence limits' are some of the key terms used to express the results of RCTs, and again they very much influence the clinical advice we give to patients. The differences in inferred meaning are wide between clinicians and patients with respect to these words, indicating either a technical issue in the use of these terms, or also a limitation of the meanings within the questionnaire.

This may be expected to be true for the one concept tested of number needed to treat, which is fundamental in applying the findings of RCTs to clinical practice. We have commented on its low frequency of use among the health care professionals and medical students in our study and expected particularly low use in the diabetes patients (9%).

The pattern of choice of meaning differed widely, with 22% healthcare providers 10% medical students and 61% diabetes patients choosing the first meaning offered, and 34% of the healthcare providers and 62% of the medical students choosing the second.

Clearly, if two out of three patients believe that every patient will derive some benefit from treatment, but only one out of four healthcare providers and one in 10 medical trainees do, then there is a big communication gap to bridge. We could start to bridge that gap by saying that this verbal example of interpretation of the concept NNT may itself be criticised, and that a more visual way of expressing the idea such as that put forward by Cates<sup>13</sup> may turn out to be more meaningful.

Limitations on the significance of these findings may be due to the word 'usage' in the questionnaire

and, therefore, we are designing a more linguistically and scientifically supported version to enable investigation into these ideas.

In conclusion, this simple questionnaire has highlighted differences in the frequency of use and inferred meanings of some words and concepts commonly used in clinical practice in diabetes care, and education between clinicians and patients. It suggests that we need to develop a glossary, first of all to ensure that all professionals in the multidisciplinary team have a common understanding and usage of the words.

This pilot study has suggested that there is a gap between different professional groups (healthcare providers versus medical students), as well as between professionals such as clinicians and patients, which may relate to training and experience. With respect to the concept of number needed to treat, for which we looked at understanding and usage, it may well be that words alone are not sufficient for professionals to understand the concept, and then to pass that understanding on in a meaningful way to patients.

#### Conflict of interest statement:

None

#### References

1. Department of Health (UK) Quality and Outcomes Framework Guidance. 2004. Available at: [www.dh.gov.uk/en/Healthcare/Primarycare/Primarycarecontracting/QOF/index.htm](http://www.dh.gov.uk/en/Healthcare/Primarycare/Primarycarecontracting/QOF/index.htm) [Accessed 3.9.09].
2. National Institute for Health and Clinical Excellence. Type 2 diabetes: The management of Type 2 diabetes. 2008 NICE Guideline (CG 66). Available at: [www.nice.org.uk/nicemedia/pdf/CG66FullGuideline0509.pdf](http://www.nice.org.uk/nicemedia/pdf/CG66FullGuideline0509.pdf) [Accessed 3.9.09].
3. Home PD, Review article – Impact of the UKPDS – an overview. *Diabetic Medicine* 2008; 25(Suppl 2): 2–8.
4. Jhawar S. Practical steps to evidence based medicine (EBM). *Ind J Practising Doctor* 2006; 3(1). [www.indmedica.com/journals.php?journalid=3&issueid=74&articleid=956&action=article](http://www.indmedica.com/journals.php?journalid=3&issueid=74&articleid=956&action=article)
5. Sackett DL, Rosenberg WMC, Muir Gray JA et al. evidence based medicine: what it is and what it isn't. *BMJ* 1996; 312: 71–72.
6. United Kingdom Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and macrovascular complications in type 2 diabetes. UKPDS 38. *BMJ* 1998; 317: 703–712.
7. United Kingdom Prospective Diabetes Study Group. Effect of intensive blood glucose control with metformin on complications in overweight patients with type 2 diabetes. UKPDS 34. *Lancet* 1998; 352: 854–865.
8. Collins R, Armitage J, Parish S et al. MRC/BHF Heart Protection Study of cholesterol-lowering with simvastatin in 5963 people with diabetes: a randomized placebo controlled trial. *Lancet* 2003; 361: 2005–2016.
9. Costa J, Borges M, David C, Vaz Carnerio A. Efficacy of lipid lowering drug treatment for diabetic and non-diabetic patients: meta-analysis of randomised controlled trials. *BMJ* 2006; 332: 1115–1124.
10. Hamilton C, Adolphs S, Nerlich B. The meanings of 'risk': a view from corpus linguistics. *Discourse Society* 2007; 18: 163–168.
11. Malmfors T, Rosing H. Introduction- risk from a philosophy of science point of view. *Toxicology* 2002; 181–182: 109–113.
12. Calman KC. Cancer: Science and society and the communication of risk. *BMJ* 1996; 131: 799–802.
13. Cates C. No need to be confused. Update 2005; 15 September: 89. Available at: [www.nntonline.net/ebm/newsletter/2005/September/No\\_Need\\_To\\_Be\\_Confused.pdf](http://www.nntonline.net/ebm/newsletter/2005/September/No_Need_To_Be_Confused.pdf) [Accessed 3.9.09].
14. Sedwick P, Hall A. Teaching medical students and doctors how to communicate risk (Editorial). *BMJ* 2003; 327: 694–695.