Expressing medicine side effects: Assessing the effectiveness of absolute risk, relative risk, and number needed to harm, and the provision of baseline risk information

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Abstract

Objective: To assess the effectiveness of absolute risk, relative risk, and number needed to harm formats for medicine side effects, with and without the provision of baseline risk information.

Methods: A two factor, risk increase format (relative, absolute and NNH) × baseline (present/absent) between participants design was used. A sample of 268 women was given a scenario about increase in side effect risk with third generation oral contraceptives, and were required to answer written questions to assess their understanding, satisfaction, and likelihood of continuing to take the drug.

Results: Provision of baseline information significantly improved risk estimates and increased satisfaction, although the estimates were still considerably higher than the actual risk. No differences between presentation formats were observed when baseline information was presented. Without baseline information, absolute risk led to the most accurate performance.

Conclusion: The findings support the importance of informing people about baseline level of risk when describing risk increases. In contrast, they offer no support for using number needed to harm.

Practice implications: Health professionals should provide baseline risk information when presenting information about risk increases or decreases. More research is needed before numbers needed to harm (or treat) should be given to members of the general populations.

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1. Introduction

Over the past two decades there has been increasing recognition that patients both want and need to be given information about their illnesses and treatments, in a form that they can readily understand and apply to their own circumstances (e.g. [1,2]). The provision of such information enables patients to become active partners in decisions about their healthcare [3]. However, it is not the case that presentation of any information, in any format, will necessarily bring about beneficial effects. One type of information that has been noted to cause particular difficulties in terms of patient (and health professional)

understanding is the presentation of risk information (e.g. [4]).

It is now widely accepted that particular presentation formats can have significant effects on the way in which risk information is interpreted, and can influence intended and actual health behaviours. The two most commonly used methods for conveying comparative risk information are absolute and relative risk reductions (or increases). Absolute risk reduction can be thought of as the difference between risk of an event in a control group and risk of an event in a treatment group. In contrast, relative risk reduction is the ratio of risks of the treatment and control group. Thus, a risk reduction from 6 to 3%, for example, can be expressed as an absolute risk reduction of 3%, or as a relative risk reduction of 50%. A less commonly used method is the 'number needed to treat' (NNT), which is simply the reciprocal of

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absolute risk reduction. In practice, the measure describes the number of patients that need to be given a particular treatment to get the desired effect in one patient [5]. Several researchers have advocated that this format is a particularly effective way of communicating treatment benefits (e.g. [6,7]).

To date, relative formats have been much more commonly used in risk communications (e.g. [6,8]). Indeed a number of studies have shown what are reported to be 'significant advantages' of using such formats. Thus, it has been found that physicians are more likely to prescribe, and patients more willing to choose, medical treatments if risk reductions are expressed in relative terms (e.g. [9–12]). However, the 'biasing' effects of relative risk presentations are not always beneficial for health. The most classic demonstration of this is the 1995 'pill scare', in which the Committee on Safety of Medicines (CSM) issued a warning that third generation oral contraceptives were associated with "around twice the risk" compared with second generation preparations. This relatively simple risk communication was taken up by the media and resulted in a dramatic decrease in use of the pill and a steep rise in pregnancies and terminations [13]. However, what was not stated was that the starting level of risk was actually very low (rising from around 15 cases per year per 100,000 users to around 25 cases) and that the risk in pregnancy was actually several times higher.

This failure to communicate the starting or baseline level of risk is also apparent in virtually all of the empirical studies to date that have reported beneficial effects of relative risk communications (see Sheridan et al. [14] for a recent exception), despite the fact that some researchers and practitioners have started to express concern about the use of such formats (e.g. [15–17]). Gigerenzer and Edwards [15], for example, argue that the confusion caused by relative risk presentations can be avoided by using absolute risk formats or NNT. Surprisingly, however, very few researchers to date have commented on the missing baseline information (see Leung [18] for an exception), despite evidence from cognitive psychology showing that people can take account of baseline information when it is presented in an understandable way (e.g. [19]).

Only one empirical study to date has examined the effects of providing (as opposed to not providing) people with information about the baseline level of risk on interpretation of relative and absolute risk communications [20]. In this study, people were told that Britain was to be hit by an influenza epidemic, and they were advised that they should be vaccinated, as this reduces the risk of flu, (expressed in either relative or absolute terms). Natter and Berry [20] found that presentation of baseline information resulted in more accurate estimates of risk of flu, and also led to higher ratings of satisfaction with the information, perceived effectiveness of vaccination, and likelihood of being vaccinated.

Although these findings are important, the Natter and Berry [20] study had several limitations. First, as with nearly all other empirical studies in the area that have compared absolute and relative risk presentations, it involved presenting information about risk reductions. However, in many real world situations (such as the pill scare) it is necessary to inform people about risk increases. It is also interesting to note that virtually all empirical evaluations of NNT have also involved situations depicting risk reductions. It is an open question whether any differences between the different presentation formats are the same when they are applied to risk increases as opposed to reductions. Second, the Natter and Berry [20] study used relatively high baseline levels (10 and 20%), whereas many real world health risks involve much smaller baselines. Third, the study used an analogue sample, with a scenario that did not apply to them at the time of testing. Finally, Natter and Berry only compared relative and absolute risk presentation formats.

The main purpose of the present study is therefore to build on the Natter and Berry [20] study to examine the effects of presentation of baseline information on three different risk presentation formats; relative risk, absolute risk, and number needed to harm, NNH (i.e. the number of patients that need to be given the treatment to result in a harmful outcome in one patient). The latter measure is the equivalent to NNT, for a situation that involves a risk increase rather than reduction. The study uses a real world situation, involving a risk increase, with a small baseline level (risk of venous thrombosis with second (0.02%) and third (0.04%) generation oral contraceptives). The participant population comprised female volunteers, who were either currently taking the pill, were ex-users, or had never taken it.

Participants were provided with a written scenario that asked them to imagine that they were taking the third generation oral contraceptive pill, and that they read an article in the newspaper that provided information about the risk of thrombosis. The latter information was presented in one of relative risk, absolute risk, or NNH formats, and patients either received information about the baseline level of risk or not. Participants were then asked to answer a number of questions, including providing numerical estimates of risk of thrombosis with the second and third generation pill, as well as their satisfaction, ease of judging risk, and likelihood of continuing to take the pill. On the basis of earlier findings in the literature (e.g. [9–11]) and the recent Natter and Berry study [20], we predicted that, in the absence of baseline information, participants receiving the relative risk format would provide the highest risk estimates and lowest ratings of continuing to take the pill. The difference would disappear, however, once baseline information was included. Provision of baseline information should result in significantly lower risk estimates in all conditions and also increase estimates of satisfaction and ease of judging risk.