Original Article

Risk Perception is Affected by Modes of Risk Presentation Among Singaporeans

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Abstract

Introduction: Not much is known about how Singaporeans perceive and react to risk presentation. There is no consensus on whether the European Union guidelines for describing the risk of side effects are valid. This study investigated the effect of different modes of risk presentation on how Singaporeans perceive and react to medical risk. Furthermore, we investigated the practical usage of qualitative phrases, the European Union's adjectives in particular, in describing levels of risk. Materials and Methods: A hypothetical situation about the risk of side effects of an influenza vaccine was presented in either a probability format (i.e., 5%; n = 42) or a frequency format (i.e., 1 out of 20; n = 43). The 2 versions of questionnaire were handed out in an alternate order to a convenience sample of 47 healthcare professionals and 38 university students. Results: Respondents presented with a "5% risk" were more likely to describe the risk as "uncommon" or "rare", as compared to respondents presented with a risk of "one out of twenty" (P <0.01). Furthermore, the former showed more willingness to accept the influenza vaccine described in the hypothetical situation than in the latter, but this was not statistically different (67% versus 54%; P >0.1). Conclusions: Modes of risk presentation affect how people perceive risk, even among people who are highly educated.

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Key words: Communication, Risk, Side effect

Introduction

The communication of risk is an important aspect of healthcare and medical research. In 2003, the *British Medical Journal*[1] and the *Journal of the Royal Statistical Society*[2] each published a special issue on this topic, highlighting its relevance to both clinicians and statisticians. There are various ways of presenting the same level of risk. For instance, one may say, "Patients similar to Mr Jones are estimated to have a 10% probability of committing an act of violence to others during the first several months after discharge from a psychiatric facility." But the same risk may also be expressed as "1 out of 10 patients" or "10 out of 100 patients".[3] In the context of describing the side effect of a drug, a 10% risk may be described as "common".[4] In a study of 479 members of the American Psychology-Law Society, almost all of whom had experience in clinical or forensic practice, the respondents were given information presented in different ways about the risk of a mental health patient committing a violent act after being discharged.[1] They were then asked to make judgements about the patient's suitability for discharge from the hospital. About 11% of the respondents who were presented with a "10% probability" did not recommend discharge of the patient. In contrast, 21% of the respondents who were presented with a risk of "10 out of 100" did not recommend discharge of the patient. It has been suggested that when a risk is presented in a probability format (e.g., 5%), people may be unable to appreciate the actual risk and may tend to underestimate it. Hence, presentations using the frequency format (e.g., 1 out of 20) or in terms of words (e.g., probable) are sometimes suggested.[3,5,6]

The European Union (EU) has guidelines for using phrases to describe the risk of the side effects of drugs. For instance, "rare" and "common" are recommended to

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describe a "0.01-0.1%" and "1-10%" risk, respectively.[4] While this approach in communication has an intuitive appeal of easiness for understanding, the meaning of such phrases is far from certain. A series of British studies, whose convenience samples consisted of 200 undergraduate students from the University of Reading and 592 adults recruited from the street, suggested that these phrases are perceived by the public to mean much higher risk levels than intended by the EU guidelines.[4] For example, the students were asked to estimate the probability (as a percentage) of having a side effect as represented by the EU adjectives. On average, "rare" was perceived to connote an 8% risk (in contrast to the intended 0.01% to 0.1% risk in the EU guidelines), and "common" a 45% risk (in contrast to the intended 1% to 10% risk).

There is limited understanding about how Singaporeans perceive and react to the presentation of the risk of a treatment's side effects. We report here a pilot study with dual purposes. We wanted to assess local university students' and healthcare professionals' responses to different ways of presenting the risk of an influenza vaccine in a hypothetical situation. The reason for conducting a pilot study in people who are relatively more educated is that if they were affected by the way risk is communicated, we would expect a stronger relevance of mode of risk communication to the average Singaporean, who is relatively less educated. Secondly, we wanted to assess how people would describe a "5%" or "1 out of 20" risk using the EU adjectives, which include "very rare", "rare", "uncommon", "common" and "very common". There seems to be a big gap between the adjectives "uncommon" and "common", and we experimented with filling it with the word "occasional".

Materials and Methods

Two convenience samples of educated Singaporeans were surveyed in February 2004. One was a class of graduate students (n = 38) from a local university who attended a biostatistics lecture given by the first author. Another was a group of healthcare professionals (n = 47) who attended a workshop given by the second author.

A hypothetical situation about the side effects of an influenza vaccine was presented either in a probability (5%) or a frequency format (1 out of 20). The 2 questionnaires were handed out to the respondents in an alternate order. In the questionnaire set in the probability format, the following was presented: "You are invited to receive an influenza vaccine free-of-charge. There is a 5% probability that the recipients will have a fever and headache within 7 days of vaccination. Would you like to receive this vaccine?" The respondents were requested to answer either yes or no. Furthermore, they were asked, "In your opinion, which of the following phrases best describes a 5% frequency of side effect?" The six phrases were "Very Common", "Common", "Occasional", "Uncommon", "Rare" and "Very Rare". The alternate questionnaire was identical except that the "5% risk" was replaced by a frequency format of "one out of twenty recipients". The main parts of the questionnaires are shown in Appendices A (frequency format) and B (probability format). Chi-square test was used to examine associations between the 2 modes of presentation and the responses to the hypothetical situations, as well as the participants' demographics. ANOVA was used to compare continuous variables. All *P*-values are two-sided.

Results

Table 1 shows the demographics of the respondents by questionnaires presenting risk in the probability (i.e., 5%) and frequency (i.e., 1 out of 20) formats. There were no significant differences in occupation, age and sex between respondents who completed questionnaires using different modes of presentation (each $P > 0.1$).

Table 2 shows the responses to the hypothetical situation. Among respondents who presented with a "5% risk", 33.3% of them were not willing to accept the free vaccine. This is in contrast to the 45.2% of respondents who were presented with a risk of "1 out of 20". The difference (95% confidence interval) was 11.9% (-8.8% to 32.6%). However, the difference was not statistically significant ($P > 0.1$). Interestingly, although not reaching statistical significance, the difference in proportion of respondents willing to accept the vaccine between the 2 modes of risk presentation were approximately the same – about 11% – in both the student and healthcare professional samples.

Respondents on the 2 modes of risk presentation differed significantly in the phrases they considered best to describe the risk presented to them (Table 3; $P < 0.01$). Those shown a "5% risk" were most likely (28.6%) to endorse the phrase "uncommon", closely followed by "occasional" (26.2%). On the other hand, respondents shown a "1 out of 20" risk mostly (53.5%) endorsed the phrase "common". Roughly the same pattern was seen in both the student and healthcare professional samples.

Discussion

Risk communication is a matter of public and clinical concern. It may affect a patient's decision to undergo a treatment and, consequently, affect the patient's health status. As Singapore strives to become a biomedical hub, this issue becomes even more important, for example, in the context of patient recruitment for clinical trials or other studies.[7,8]

It has been suggested that presenting risk in a probability format may lead to a lower perceived risk in contrast to a presentation using a frequency format. Findings from our

Table 1. Characteristics of Respondents by Modes of Risk Presentation

Variable	Probability format No. (%)	Frequency format No. (%)	*P* value
Occupation			
Students	19 (45.2)	19 (44.2)	0.546
Physicians	12 (28.6)	15 (34.9)	
Nurses	9 (21.4)	5 (11.6)	
Other healthcare workers	2 (4.8)	4 (9.3)	
Age (y)	33.8	34.2	0.531
Sex			
Male	26 (61.9)	21 (48.8)	0.226
Female	16 (38.1)	22 (51.2)	

Table 2. Willingness to Receive a Free Influenza Vaccine in a Hypothetical Situation, by Modes of Risk Presentation*

Variable	Probability format No. (%)	Frequency format No. (%)	*P* value
All subjects			
No	14 (33.3)	19 (45.2)	0.263
Yes	28 (66.7)	23 (54.8)	
Students			
No	8 (42.1)	10 (52.6)	0.515
Yes	11 (57.9)	9 (47.4)	
Healthcare professionals			
No	6 (26.1)	9 (39.1)	0.345
Yes	17 (73.9)	14 (60.9)	

* One healthcare professional in the frequency format group was excluded due to a missing value.

Table 3. Best Phrases to Describe the Given Risk, by Mode of Risk Presentation

Variable	Probability format No. (%)	Frequency format No. (%)	*P* value
All subjects			
Very common	3 (7.1)	1 (2.3)	0.005
Common	9 (21.4)	23 (53.5)	
Occasional	11 (26.2)	13 (30.2)	
Uncommon	12 (28.6)	3 (7.0)	
Rare	7 (16.7)	3 (7.0)	
Students			
Very common	3 (15.8)	0 (0.0)	0.020
Common	3 (15.8)	11 (57.9)	
Occasional	5 (26.3)	5 (26.3)	
Uncommon	4 (21.1)	2 (10.5)	
Rare	4 (21.1)	1 (5.3)	
Healthcare professionals			
Very common	0 (0.0)	1 (4.2)	0.039
Common	6 (26.1)	12 (50.0)	
Occasional	6 (26.1)	8 (33.3)	
Uncommon	8 (34.8)	1 (4.2)	
Rare	3(13.0)	2 (8.3)	

study are consistent with this observation. Respondents who were presented with risk information in the 2 formats differed in the suggested direction in terms of their willingness to accept a vaccine free-of-charge and of phrases they considered appropriate for describing the risk.[1,3] That the latter was statistically significant, but the former was not, suggested to us that risk perception does not solely determine decisions. Although people may consider a "1 out of 20" risk "common", they may take the potential benefits (which we did not state in the scenarios) and relative mildness of the side effects in the hypothetical situations into account in their decision-making. That might explain why the 2 samples did not differ significantly in willingness to accept the free treatment. Furthermore, the sample size may not have been large enough to reveal a true difference.

We expect graduate students and healthcare professionals to be more knowledgeable in understanding quantitative information and information about side effects as compared to the general public and patients. That even in such educated people the mode of information presentation may affect risk perception raised our concern that the general public and patients are potentially more subject to the influence of different ways of risk communication. This is an important area for future research.

According to the EU guidelines, a 0.1% to 1% risk should be described as "uncommon" and a 1% to 10% risk as "common". British studies presenting risk as a percentage showed, however, that undergraduate students and convenience samples of adults tended to see the 2 phrases as representing about 18%, and 45% to 50%, respectively.[2] The British authors argued that while it is right for the medical profession to use a strict standard to assess the risk of drug side effects, the public did not share the same terminology with the medical profession. The use of the EU terms may, therefore, lead to substantial misunderstanding. Our findings are closer to the EU recommendations, but there is still some disagreement. The respondents tended to consider that the term "uncommon" best described a "5%" risk and that "common" best described a "1 out of 20" risk. Interestingly, even in our sample of healthcare professionals, which mainly consisted of physicians, the EU use of adjectives seemed to be quite stringent.

Our intention to use the term "occasional" to fill the gap between the EU descriptors "common" and "uncommon" was based on our understanding of the terms. There was discussion, among team members of this study, on whether the word "occasional" should be placed between "rare" and "uncommon", or between "uncommon" and "common",

in the range of risk-describing terms. A consultation of dictionaries, such as the Oxford English Dictionary, Random House Webster's College Dictionary and Merriam Webster's Dictionary of Synonyms, revealed that, in terms of frequency, "uncommon" is close to "rare" – they are, in fact, often used to define each other – while "occasional" more or less means "not common". It was, therefore, appropriate to put "occasional" between "uncommon" and "common". Furthermore, this was supported by the distribution of data from the respondents presented with a risk in frequency format. The distribution suggested that "occasional" should stand between "uncommon" and "common". Nevertheless, we could not exclude the possibility of the influence of the way we presented the categories in an ordinal-like format in the questionnaires. The distribution from the probability format sample was quite flat and did not suggest any clear solution.

Our study did not formally randomise the 2 ways of risk presentation. Instead, we handed out the questionnaires in alternate order, assuming that it could offer some degree of randomness. This may not have excluded all potential bias in the comparisons. Furthermore, this is a pilot study based on a convenience, rather than representative, sample. The present findings are valid in this sample, which may or may not represent the target population well. Due to a paucity of similar data, there is no way to assess whether the findings here could be extrapolated to other groups or populations. Further studies of people randomly selected from predefined sampling frame may be useful and may offer a comparison with the present results. In order to minimise non-response, we consciously made the questionnaire very short (only 1 page). In the future, randomised studies using representative samples of the population, and which collect more lifestyle and health information, would be ideal.

To sum up, our findings suggest that presenting risk in a probability format may lead to a lower perceived risk than in a frequency format even among highly educated people. However, the impact of the presentation format on treatment intention was not statistically significant in this study. Secondly, our findings suggest that the EU use of qualitative descriptors of risk may not agree with common language usage, even among medical personnel. The disagreement may not be as great as that reported by British studies. Third the phrase "occasional" may be able to fill the gap between the phrases "common" and "uncommon". Risk communication, risk perception and informed choice are important and complex topics. Further work to assess how risk is being communicated and how people react to risk information in Singapore are warranted, as are studies on assessing what a preferred mode of risk communication is and what informed choices are.[4,9]

Appendix A. Main part of the questionnaire that used a frequency format.

Question 1.

Please read the following description of a **hypothetical** situation about a vaccine and its side effects.

You are invited to receive an influenza vaccine free-of-charge. One out of twenty recipients will have a fever and headache within 7 days of vaccination.

Would you like to receive this vaccine? (please check one box)

☐ Yes ☐ No

Question 2.

In your opinion, which of the following phrases best describe the frequency of **one out of twenty** recipients suffering a side effect? (please check one box)

☐ Very common ☐ Uncommon
☐ Common ☐ Rare
☐ Occasional ☐ Very rare

Appendix B. Main part of the questionnaire that used a probability format.

Question 1.

Please read the following description of a **hypothetical** situation about a vaccine and its side effects.

You are invited to receive an influenza vaccine free-of-charge. There is a 5% probability that the recipients will have a fever and headache within 7 days of vaccination.

Would you like to receive this vaccine? (please check one box)

☐ Yes ☐ No

Question 2.

In your opinion, which of the following phrases best describes a **5%** frequency of side effect? (please check one box)

☐ Very common ☐ Uncommon
☐ Common ☐ Rare
☐ Occasional ☐ Very rare

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