Risk communication and older people—understanding of probability and risk information by medical inpatients aged 75 years and older

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Abstract

Objective: to determine older people’s understanding of probability and risk information, and the impact of pictorial representation of risk.

Design: a researcher-administered questionnaire.

Subjects: 50 inpatients aged ≥ 75 years on elderly medicine wards at Huddersfield Royal Infirmary, Huddersfield, UK.

Results: older people understand percentage probability better than fractional probability, and a wide range of incorrect responses indicated significant over- and underestimation of probabilities. Visual data about percentages were well received and understood, and were perceived as a good idea by participants.

Conclusions: we have demonstrated a wide variation in understanding of risk and probability information by older people, with over- and underestimations of probability, along with confusion between fractional and percentage probability. Pictorial representation of probability was well understood. It could be developed as a simple, yet powerful communication tool to be used in daily clinical practice to help older people understand information on risks and benefits when making decisions about treatment choices.

Keywords: older people, probability, risk, understanding, visual data

Introduction

Estimations of risk, including probabilities of good and adverse outcomes, are used routinely by doctors as decision-making tools [1]. This information is used in discussion with patients to help them make informed decisions on their treatment options. Such discussions involve doctors helping the decision-making process by giving information about risks and benefits, often in numerical terms [2]. Doctors may often presume that patients understand the probability information contained within their discussions when obtaining consent, but this may not necessarily be true [3, 4].

While patients appreciate the need to take risks in order to cure disease [5], their understanding of risk and probability, especially its expression in basic numerical forms, remains unclear [3]. Patients recall specific aspects of discussions poorly [1, 3]—in a study investigating risk recall in carotid endarterectomy, patients later recalled risks ranging from 0 to 65%, where the risk quoted was 2% [4]. Perceptions of risk can be altered by the way information is presented—the effect of ‘framing’ [7, 8].

Effective communication between doctors and patients is essential, and patients’ participation in decision-making is a key component of the partnership role which doctors are encouraged to develop [9]. Talking about risks and benefits with patients forms the basis of implied and informed consent, so delivery of information and understanding is crucial.

This study’s aims were to assess understanding of probability information, presented in different formats, and to determine whether pictorial representation of probability could aid understanding.
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Subjects

One of the researchers (R.F.) assessed 183 elderly medicine inpatients for entry into the study. An abbreviated mental test score of <7/10, clinically significant speech, sight or hearing impairment or physical illness/coma excluded 83 patients; 34 were discharged before being seen by the researcher.

The study was discussed with 66 eligible patients, and an information leaflet provided; 50 (76%) agreed to participate, and consent was obtained.

Questionnaire

Each patient answered a researcher-administered questionnaire in four sections.

Section 1

Patients were asked the probability of tossing a coin and scoring a head (1 in 2), rolling a die and scoring six (1 in 6), and drawing from a pack of cards one of the heart suit (1 in 4) or the ace of spades (1 in 52). Patients answered in fractions or percentages.

Section 2

The researcher demonstrated an A3-sized chart containing 100 figures (Figure 1) to ensure that each participant appreciated the total number of figures. Six charts were then shown with a varying percentage marked out (75, 50, 20, 10, 5 and 1%) and participants matched each chart with one of 10 cards showing a different percentage probability.

Section 3

To examine understanding of percentages, the researcher asked each participant to mark out a section of the chart with the question “How many of the 100 figures would be affected by a % chance”, using the probabilities in section 2.

Section 4

To examine understanding of fractional probabilities, participants were asked to mark out a proportion of figures using the six probabilities expressed as fractions—e.g. 20% became 1 in 5.

Results

Fifty patients (26 women) participated. Their ages ranged from 75 to 93 years, with a median of 81.5 (78.5 for men, 84.5 for women).

Figure 1. Chart showing 100 figures used to demonstrate percentages and probabilities.

Section 1

Eighty-nine percent of respondents correctly answered the coin-tossing question, but performed less well with the dice and cards questions (47%, 45% and 34% correct responses). Analysis demonstrated that patients underestimated and overestimated these probabilities: incorrect responses to the die rolling question ranged between 5 in 6 to 1 in 100. Similar broad ranges of incorrect answers were also seen for the card-drawing questions.

Comparison of sections 2, 3 and 4 (Table 1)

Section 2 (matching pre-marked charts with cards bearing different probabilities) demonstrated the highest scores, suggesting that pictorial information was better understood. Responses in sections 3 and 4 indicated that there was less understanding of fractional probabilities than of percentage probabilities. Incorrect responses to section 4 (fractional probability) were analysed, showing wide ranges of overestimation and underestimations: when asked to mark out a 1 in 5 probability, responses ranged from 3 in 4 to 1 in 100.
Table 1. Comparison of 50 patients’ understanding of pictorial data (section 2) versus verbal description of percentage and fractional probability (sections 3 and 4)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Pictorial data</th>
<th>Percentages</th>
<th>Fractions</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%/1 in 5</td>
<td>37 (74)</td>
<td>36a (74)</td>
<td>19 (38)</td>
</tr>
<tr>
<td>50%/1 in 2</td>
<td>46 (92)</td>
<td>48a (98)</td>
<td>24a (50)</td>
</tr>
<tr>
<td>75%/3 in 4</td>
<td>45 (90)</td>
<td>31a (63)</td>
<td>23a (48)</td>
</tr>
<tr>
<td>10%/1 in 10</td>
<td>41 (82)</td>
<td>37b (77)</td>
<td>37 (79)</td>
</tr>
<tr>
<td>1%/1 in 100</td>
<td>49 (98)</td>
<td>35b (71)</td>
<td>38 (78)</td>
</tr>
<tr>
<td>5%/1 in 20</td>
<td>35 (70)</td>
<td>25c (51)</td>
<td>19 (39)</td>
</tr>
</tbody>
</table>

Total number of subjects: a49, b48, c47.

Discussion

We chose to examine people aged ≥75 years as they are often asked to consent to treatments or procedures that may involve important risks and limited benefits. In addition, while normally competent, older people may often make less rational decisions when unwell and hospitalized [10].

The visual methods used to communicate probability and risk information in this study were well understood by patients, and pictorial representations of probability were generally better understood than simple verbal statements. Anecdotally, many participants said this aided their understanding and that the use of pictures was a good idea. Certainly, the use of visual data to aid risk communication could easily be introduced into clinical settings with the aid of similar wipe-clean sheets.

The use of visual data in medical practice has been studied in different clinical settings, and patients have found these methods helpful [11–13]. Older people have also been found to understand visual data and scales [14], but caution is needed for patients with hemianopia and neglect [15].

The broad range of responses suggests that many participants both underestimated and overestimated probabilities. One possible explanation is that some respondents were guessing answers to mask their inability to answer correctly. Analysis suggested that participants might have been confused by the change in expression from percentages to fractions between sections 3 and 4. This may explain why scores in the final section (which examined understanding of fractions) were lower, as participants may still have thought they were dealing with percentages. Both of these issues are relevant to everyday clinical situations where probabilities are used in the course of the explanation of risks and benefits.

We acknowledge that this study did not examine the educational levels of participants, particularly with regard to numeracy and literacy, which could have an impact on understanding, and this is an area that needs further study. Additionally, although all our study participants were fluent in English, cultural differences and language may play an important part in understanding risks.

Further studies are required to clarify the effects of age and the environment in which the discussions take place on the understanding of probability information.

Our results have implications for all those who discuss risk with patients. It must not be presumed that patients understand numerical expressions of risk, especially when dealing with older people. In this group, we have shown that expression and communication of numerical risk and probabilities are often misunderstood, and that further difficulties in understanding could occur when percentage and fractional probability are interchanged.

Our findings have important implications for medical practice where discussion of probabilities is involved in obtaining informed consent. The use of visual data to assist older patients’ understanding is supported by our study findings. Such a wipe-clean chart could be developed into a useful communication tool for all who explain risks to older patients.

Key points

- Understanding risk and probability is a cornerstone of informed consent.
- Doctors should not presume that older patients understand risk and probability information.
- Older people often misunderstand numerical expressions of risk and probability, and interchanging percentage and fractional probabilities may lead to increased confusion.
- Visual aids can help people to understand risk and probability information and should be developed for clinical practice.

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References

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