

Thoughts on risk communication¹

by Felix Redmill

The analysis of risk provides jobs in many fields, but it isn't an end in itself. At least, it shouldn't be. Its purpose is to inform decision-making. More often than not the risk analyst is not the decision maker, so the results of risk analyses – the risk information – must be communicated, and it is the risk analyst who, at least in the first instance, must communicate them.

Communication is crucial in all endeavours involving more than one person. An important component of every professional's competence – alas, an often overlooked and underdeveloped component – is the ability to communicate clearly and fully. For safety professionals, the requirement extends to the communication of risk information, which, for many reasons, can be problematic. A generally poor understanding of the subject of risk is one reason, and the paucity of our risk vocabulary is another.

Guidance given from the earliest stages of education is to design and package information with the intended recipients in mind. School pupils are taught to tailor the style, length, tone, and format of documents to suit their intended readerships, and not to write an essay on the life of a dollar bill in the same way as a report on a laboratory experiment. There are many ways of designing and packaging risk information. There are also many potential recipients, each of whom may require the information for a different purpose. For example, engineering managers must decide if systems are adequately safe for deployment, and politicians must consider risks when defining policies. Then there is the public, each individual of which must make decisions based on risk information. Should we use mobile telephones, vaccinate our children, buy a house on a flood plane, or evacuate that house at the threat of a storm?

Risk communication is therefore important. We need to choose what information to communicate and how to communicate it. In doing so, we should ask ourselves what assumptions we can reasonably make about the intended recipients before we base our communication on them. A scientist may flippantly say that a certain carcinogen in a food or drink, taken each day in moderation, increases the average person's risk of cancer over their lifetime by one in a million. A member of the public may reply, 'Yes, but is it safe?'

Communication is two-way, and recipients also bear responsibilities. However 'good' or 'correct' the communicated information, it is subject to interpretation by the person receiving it. Recipients should be conscious of their own requirements and capable of determining whether or not the received information satisfies them. What decision do I need to make? What information do I require in order to be sufficiently informed? Then, when information is received: What does it mean? Is it what I need?

This article is intended to remind safety professionals of the importance of risk communication, and to illustrate how difficult it is to get it right and how easy it is to get it wrong. The appropriateness of safety-critical (and other) decisions depends on how successfully we achieve it. The article identifies a number of factors that influence communication and shows why we should take account of them.

Appropriateness of Information

Risk information may be inappropriate to the decision that needs to be made because it is wrong. Why it is wrong is another issue; it may be known to be wrong and intended to mislead, or it may have been determined wrongly. At the UK's Bristol Royal Infirmary,

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between April 1990 and August 1993, a surgeon carried out heart operations on thirteen infants to correct Atrioventricular Septal Defects (AVSD). Seven died (GMC 1998a, 1998b). Yet the surgeon told the parents of the next patient that the risk of mortality as a result of the operation was 20 - 25%. Where could such a figure have come from? At the time, not only was the death rate of the surgeon's AVSD-operation patients greater than 53%, but also the trend was not encouraging: the last 3 patients had died, as had 5 of the last 6 and 7 of the last 9. The parents approved the operation and the baby died. Yet the surgeon told the parents of the next patient that the chance of success of the operation by him was 80%.

It is likely that the surgeon was not intentionally dishonest, but gave a figure based on overconfidence in his own capability. As a professional, he should have derived the figure from an assessment of his past performance, but it appears that his culture did not include such analysis. Certainly, however, the communicated information did not represent the facts and was inappropriate to the parents' decisions on whether or not to allow their infants to be operated on by the surgeon.

Timing

A friend of mine was suspected of having a liver problem, and his consultant physician recommended a biopsy. My friend agreed and a hospital appointment was made for the procedure. On the appointed day he reported to the hospital and underwent preparation. The doctor arrived, made ready to perform the biopsy, and then, at the last minute, requested my friend to sign a permission form. Then, as he was about to do so, she added that there was certain information that she should impart to him. In the procedure, she said, there was a one-in-a-hundred chance of some internal bleeding, a one-in-a-thousand chance that the bleeding would require intervention, and a one-in-a-million chance that it would be fatal. My friend noted this, signed the permission form, and the biopsy was carried out.

There are reasons to doubt the figures given, but the issue here is timing. The information was provided too late to be of help in making the decision to undergo the biopsy, for my friend had made that decision long before, when discussing the matter with the consultant physician. For risk information to be relevant, it must be timely. Its dispatcher should be working to a predetermined decision-making schedule – which should have been set by the decision-maker.

Late information is a problem in all management situations. It introduces an extra stage of decision-making, for it places managers in the position of having to judge whether to make the required decision in the absence of necessary information or to delay it until the information is available. This extra stage can introduce significant risks, for both uninformed and delayed decisions carry potentially calamitous consequences. Frequently, managers in such situations merely curse their luck, but they could do more than that. The added risk can, in many circumstances, be obviated by the decision-maker planning in advance for the necessary information to be available on time.

We need not only to carry out risk analysis, but also to do so in the knowledge of its purpose and its proper schedule.

To Inform Or To Reassure?

The purpose of a medical practitioner providing risk information to a patient is, surely, to inform the patient's decision-making. It was with this in mind that I engaged in discussion with a medical acquaintance. Referring to the cases of the Bristol Royal Infirmary and my friend's liver biopsy, I asked how medical professionals could justify such substandard risk communication when potential life-and-death decisions depended on it. 'You don't believe that that's what the information is for, do you?' asked my acquaintance. "Of course," I said. "What else?" "It's not to inform," she said, "it's to reassure."

I don't believe that the biopsy information given to my friend was to reassure him. Rather it was provided to satisfy a legal requirement for patients to make 'informed decisions'. But the AVSD-operation information certainly gives the impression of being

intended for reassurance. And that's how it seems to be in many industry sectors. The use of misleading information in the selling (or mis-selling) of financial products, such as insurance policies, pensions and loans, shows that the problem is not confined to medicine. Yet, the dependence of the public on "professionals" is near absolute. The alternative to accepting the information provided as true is for every member of the public to seek a second opinion every time professional advice is required. It is important for us to strive to be both objective and honest in providing risk information.

Misleading Information

It is also important to be honest, for risk information can be communicated to give a false impression. Huff (1965) retells a story of statistical "proof" provided by the US Air Force that jet flying was safer than flying in conventional aircraft. The proof consisted of figures showing that the death rate, in fatalities per 100,000 flying hours, was higher in ordinary planes than in "jets". As the air-force jets in question carried only one or two persons, while the conventional aircraft carried many passengers, more were at risk per flying hour in the latter. Huff points out that if genuine information had been the aim, deaths would have been presented per man-hour or man-mile rather than per plane-hour.

Averages

Risk figures are often given in averages, particularly to the public. Yet, average figures can be misleading. The physician who considers the average patient rather than the one before him is likely to be far off the mark in both diagnosis and treatment.

In civil aviation it is reported that there is about one fatal crash per million flying hours. This may be useful as a reference point against which to monitor the air-worthiness of new aircraft prior to licensing them, but it does not help the public to decide which planes, routes, or airlines to use or avoid. As crashes occur more frequently at takeoff and landing than during cruising, numbers of crashes per flight would make it apparent that someone who makes a few long flights is exposed to a smaller risk than someone who travels a shorter total distance on many flights.

Road-transport risk is often presented in terms of an average mortality rate per year, but this fails to inform decisions that ordinary people may wish to make. It does not distinguish between a driver's chance of being killed, killing another road user, and being in an accident in which a passenger is killed. It does not facilitate a decision on what time of the day or night it is safest or least safe to venture out as a driver or pedestrian. It does not inform on what type of person is most likely to have an accident or which types of roads have the highest and lowest accident rates. To propose an average risk figure is to suggest that there is a common risk to all drivers regardless of their gender or age, the time of day, or their geographical location. This is not the case.

Risk Versus Risk

Public panic has on several occasions been created by media stories of risks posed by contraceptive pills. On one occasion, when it was announced that a particular pill posed a greater risk than others, many women spontaneously ceased to take it. It later became apparent that in doing so their overall risk was now greater because the difference between the risk posed by the pill in question and others was smaller than the risk of fatality in childbirth.

On another occasion, the reopening of schools after the summer break was to be delayed because of a central agency's backlog in vetting new teachers and other staff for histories of paedophilia. The government advocated that the schools remain closed in the interest of protecting the children. Then a head teacher intervened, pointing out that the risk posed to pupils in classrooms during the next few weeks by unidentified paedophiles was tiny

compared to those posed to them on the streets by traffic, miscreants, drug dealers, and their own instincts. Calm was restored and the schools reopened.

The public in general is not practised in handling risk information. When the risk is not stated in absolute terms, but as an increase over some other risk level, or when it is one that needs to be traded off against some other risk, the full story needs to be told. Even professional decision-makers, such as safety managers and politicians, whose duty it is to treat risk as only one of many information sources, and who should be versed in weighing it against the other factors in the decision-making process, are likely to forget context and accord excessive importance to one or other type of information.

Context and Meaning

A frequent assertion, often made by politicians, is that “the risk is one in a million”. Such a statement is almost always intended to reassure rather than to inform, and any meaning that it might contain depends on its context and requires interpretation. It answers no questions and raises some. One question is, what risk? In the context of the risk posed by a carcinogen in food, does the statement refer to the probability of contracting cancer or of dying of it? In the context of road traffic, does the statement refer to the probability of an accident, being injured in an accident, or being killed? The statement alone is incomplete.

Another question is, one in a million what? Is the statement intended to mean that one in every million people in the country, or the world, will die of the cause in question? Or, are we to understand that, of every million people who come into contact with the source, one will die? Or is another probabilistic implication intended?

Glib statements may roll off the tongue easily, and they may give confidence to large numbers of the public that “the risk” is small, but if the intention of communication is honestly to provide a basis for decision-making, they are inadequate, almost certainly not accurate, and likely to be misleading.

Time Units

As just mentioned, risk statements require units, and it must be made clear what the risk is and who or what is at risk. In addition, it is essential for the relevant time factor to be defined. Does the risk affect the given population per year, or per day, or for the lifetime of the persons involved? Or might the risk apply per hour of exposure to the risk?

Risk is stated per hour or per year of operation if it is posed by continuously operating equipment. It may be stated per unit of time of presence in a hazardous area in the case of someone – for example a maintenance technician – who must enter that area for only a proportion of the day. The risk associated with the failure to operate of protection equipment, such as a fire extinguisher, is stated per demand.

Failure to define the appropriate time units can lead to incorrect decisions and, in many cases, over-engineering of plant, which may then be uncompetitively expensive.

Framing

It is now well established that the response to communicated information depends strongly on how the information is framed, or packaged. For example, information couched in terms of the number of survivors of an accident creates a significantly different impression on the recipient, and elicits a very different response, from the same information framed in terms of deaths.

In one experiment, Shah, Domke and Wackman (1996) tested two groups of subjects for how their decision-making was affected by the framing of information. The groups, of evangelical Christians and university undergraduates, were expected to hold different views. The decisions to be made concerned voting for one or other of electoral candidates. The information presented to the groups consisted of simulated news stories about the

candidates' views, using "ethical" and "material" frames. It was found that the two frames had a pronounced influence on the interpretation of the issue in hand and on how the voters perceived other issues within the same environment – referred to as "the priming effect". If ethical framing was activated, it helped to foster an ethical interpretation of other issues – for both groups of subjects. The material frame had a corresponding effect. Further, voters were likely to put the frame at the centre of their evaluation for decision-making. Thus, the frame was not only influential on the subject's interpretation of the particular issue, but also on subsequent decision-making – in the form of voting. An individual's judgement became biased by the framing of the information.

As communicators, we influence the recipients of our information by the way in which we frame it, whether or not we are conscious of doing so. Marketing and sales people understand this and use framing to influence others to their way of thinking. As safety professionals, it is proper for us to be aware of framing. There is no wholly objective transmission of information, for our own biases influence our framing, and it is useful for us to recognise this. Neither is there any wholly objective receipt, for the recipient's biases cannot be put aside. Thus, our awareness of the phenomenon of framing should be used in an attempt to make communication as objective as possible.

Presentation of Numeric Information

Framing includes the way in which numeric information is presented. The message that, on average, one in a million of the population will die of cause A each year could be presented in a number of forms, for example: 1 per 1,000,000 per year, 1/1000000 per year, 10^{-6} per year, 1 person in a city the size of 'Metropolis' per year. Which is used should be determined from knowledge of the intended recipients of the information, whom it is desired to communicate the information to. We should be aware of any assumptions made about the ability of recipients to understand the communicated information.

Risk of Rejection of the Message

Although Huff's story shows that risk communication can mislead, it is also the case that when recipients detect bias or an ulterior motive they are likely to reject the message. Providing risk information in terms of a comparison – e.g. 'the risk is about the same as that of eating a hundred grams of chocolate per day' – may be enlightening if the recipients understand the risk being referred to. Yet it has been established that if the recipients believe that the intention is to persuade them of the tolerability of the risk in question, the result is likely to be that they understand the communication but reject the message because they distrust the messenger. Thus, not only must risk information be appropriate to its context and purpose, but its framing must not be patronising.

Trust

A key factor in the acceptance of risk information is trust in the communicator. Polls have shown that the public's trust in government and "big business" is low. The public places high trust in scientists working in academic establishments, but low trust in scientists employed by organisations with interests in getting the public to believe their messages. A perception that the message is intended to convince rather than to inform is almost certain to lead to rejection. As safety professionals, we need to be perceived as independent of vested interests, honest, and having the purpose of informing rather than persuading.

Taking the other point of view, as recipients of risk information, we should question its origin, its accuracy, the perspective from which it was derived, and whether the person communicating it believes it. We need to ask how appropriate it is for our purposes. I wonder what the answer would have been if my friend of the liver biopsy had asked the doctor what confidence she had in the bleeding, intervention and fatality figures that she

gave him.

Risk information is unlikely to be wholly accurate, but it needs to be sufficiently accurate for its purpose. The person communicating it needs to know the limits of its accuracy and to communicate them to the recipient in a way that the recipient understands.

Uncertainty

Understanding and communicating the limits of accuracy has never been insignificant, but its importance is increasing. A great deal of risk discussion, and indeed controversy, falls within areas of uncertainty – scientific and otherwise. Funtowicz and Ravetz (1992) say that when both the stakes and the uncertainty of facts are high, scientists need to use a language in which the uncertainty and quality of information are made explicit. Yet organisations communicating risk information to the public are seldom open about the scientific uncertainty involved. Rather, they tend to play it down while emphasising the lack of evidence of risk. However, such communication is now frequently found to lack credibility by the public, who, as a result, lose trust in the organisation.

Risk analysts do not often include confidence statements in their communications, and decision-makers do not often ask for them, but it is time for safety professionalism to require them as a matter of course.

Summary

The way in which we communicate risk information is crucial to how it is received and to the decision-making that depends on it. The purpose of this article is to offer reasons for why we should be more aware of our risk communication and more conscientious in accomplishing it.

There is no single correct mode of risk communication. It is our responsibility to determine what is appropriate in the circumstances, and this requires an assessment of what the most appropriate method is. It demands attention to the details of the content and the presentation. The information first needs to be the right information for the purpose in hand, so we need to be conscious of the message and its purpose. It needs to be communicated effectively, so we must frame the message according to the intended recipients and their abilities to comprehend it. We must also understand the uncertainties behind our risk estimates, and include confidence statements in our communications, so that recipients can take them into consideration in their decision-making.

This article has introduced a number of factors that might usefully be taken into account when planning and carrying out risk communication.

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