Journal of
Mass Communication & Journalism

Perko, J Mass Communicat Journalism 2013, 3:7
DOI: 10.4172/2165-7912.1000e148

Editorial Open Access

Research Challenges on Communication about Low Radiation Doses

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Background

Despite 50 years of extensive research, risk perception and its communication is a relatively new discipline in social science. Previously, research has investigated ionizing radiation risks more in terms of case studies, rather than as a prerequisite for building an intellectual and theoretical capacity, for both scientists and the public at large. The term "ionizing radiation" is utilized for radiation which has sufficient energy to remove electrons from atoms, thus creating ions. Society takes advantage of this form of radiation for medical applications, generating power and in support of many manufacturing processes. Industry and regulators alike use the term "low doses" to describe a situation when the dose received by an individual is relatively small. But here lies a key issue for those whose responsibility it is to communicate risk in that there are a number of different definitions of what low dose really means both numerically and in terms of its potential effects (especially over time and in relation to genomic instability).

Four interrelated challenges of risk perception and risk communication in the field of low doses of ionizing radiation and the field of medical use of ionizing radiation will be discussed in this paper to identify new research topics. First, the issue of technical information and the use of risk estimates; second, the issue of perception and communication related to uncertainty of scientific information; third, the goal of communication by experts and/or authorities (persuasion for acceptance versus information for informed decision-making); and finally, the role of social networks in the interpretation of risk from low radiation doses. The paper will not discuss the different definitions of how we should define low doses.

Technical information and probability related to perception and communication of low doses

Official sources of information related to ionizing radiation may refrain from giving a detailed explanation to the public, especially in cases when the experts estimate the risk as very small, or reduced to as low as possible. When requested to do so by the society, experts often present their findings to the public with little interpretation or explanation, as shown for instance by the public communication after the Fukushima accident [1]. Moreover, past practices emphasize the experts' dilemma in deciding how much explanation about low doses they should provide to the public. In the nuclear field it is known that the public in the main lacks knowledge and has only rarely (acknowledged) first hand experiences with radioactivity [2-5]. For instance, the results of a survey in Belgium showed in 2009 that less than 25% of the people knew that radioactivity is also used by the food industry, and the majority of the respondents (80%) had no (acknowledged) personal experience with nuclear technologies or installations [4].

Although the provision of technical information about low radiation doses seems straight forward and is intended to be as objective as possible, its technical nature can be viewed by the public as an indication of distance or even arrogance from the experts. Once the expert begins to explain numbers (percentage or frequency, mortality rate or survival rate, relative or absolute…), it is unavoidable that he/she introduces subjective judgments about these numbers. Quantitative information about risks and benefits is usually only meaningful to people with a basic understanding of probability and numerical concepts, ability called numeracy. For instance, the quantitative interpretation of a mammography dose did not make any sense to most of the patients involved in the study [6]. Furthermore, when the expert explains risk estimates the individual person or general public he/she recognizes the various (subjective) interpretations made. This recognition sometimes leads to public controversies and expert discourse about interpretations, making the decisions related to risk time-consuming as well financially-consuming. Thus, communicating probability information about risk to the public is difficult [7]. One difficulty to overcome in risk communication research is that the role of experts and authorities often involves estimating risk and actual harm across larger populations or specific groups, whereas individual members of the public are most interested in risk or harm to themselves and their families. Information about expected doses to a population is not readily interpreted on an individual level. Thus, depending on the personal health situation a certain dose may be highly beneficial if preventing the spread of cancer, or utterly detrimental if received by accident by a healthy person. How to develop existing knowledge of radiation into accessible formats of information should be the issue of a research interest.

Additionally, an individual member of the public needs to feel that their opinion, and their emotions, are respected as legitimate in this process which is for the experts more challenging than the mere discussion of a scientific result related to risk. Therefore experts often explain the risk from low radiation doses in terms of risk and benefit. A risk communication strategy that explains both the costs and the benefits can be a highly effective approach in helping the public reach decisions about management of low doses or medical use of ionizing radiation. However, this approach to risk communication, firstly assumes that the risk assessments are correct and that experts agree on the validity of the assessments and secondly, that the public is willing to accept some risk, even if a no-risk option is preferred. More research is needed in this field as well.

Communication and interpretation of scientific uncertainty

Communication of risk essentially attempts to communicate uncertainty. Uncertainty drives science forwards, and keeps scientists looking for answers. But non-scientists are less aware of this. Instead, the public looks to scientists for definitive answers that help them make decisions. So, while uncertainty leads the scientist to research, it can

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Received November 20, 2013; **Accepted** November 21, 2013; **Published** November 23, 2013

Citation: Perko T (2013) Research Challenges on Communication about Low Radiation Doses. J Mass Communicat Journalism 3: e148. doi:10.4172/2165-7912.1000e148

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lead the lay person to indecision. Moreover, controversy of opinions exists even among experts and scientists themselves, thus the public has to decide whom to believe. Such contradictions are commonly present in the research field of health effects of low radiation dose, however a research related to communication about uncertainty is still missing.

Goal of communication: persuasion for acceptance versus information for informed decision-making

Although the ideal of risk communication is to support the stakeholders to make informed decisions related to radiation risks and to establish two-way communication and joint problem solving [8], the communication applied in the radiological field is far from best standards. In practice, such communicationisin some fields frequently limited to providing the public with results of scientific analyses in order to increase the acceptance of risk, in other words to persuade. Similarly, social science research has focused mainly on identifying which risks are considered acceptable by the society [9]. There was a considerable body of research in the 1970s and 1980s about "How much risk people say they are willing to accept" mainly in the context of nuclear power development and the discussion on "How safe is safe enough"[10]. The findings show that that people perceive most risks as unacceptably high, but in some circumstances still tolerable [11-13] depending on benefits and alternatives. For example, when it comes to nuclear installations for production of radio nuclides for medical use, people feel that even tolerable risks should be reduced to the lowest level that is reasonably possible. However, behavioural scientists have been focused instead on what people want to know about a risk and how to give information on appropriate behaviour and risk management. The research related to low doses in this field is still missing.

Increasing audience knowledge is often set as a primary objective of risk communication efforts either in order to accept the risk or to make better decisions. Educating the public and providing knowledge have at this point interesting contradictions. Many risk communicators, mistakenly, measure the success of risk communication by what the population knows about the risk, and whether it believes it knows enough to make a decision. But knowledge may not always play a role in determining people's behaviour. Knowledge about radon, for example, is uncorrelated with actually doing a home radon test [14]. Research results suggest that effective risk communication has to focus not only on knowledge, but also on other aspects such as risk perception [15]. Yet, radiological risk perception is not a stable, neither uniform way of thinking and the understanding of this still has to be developed.

The role of social networks in radiological risk communication and risk perception

Risk communication messages from trusted sources play an important role in forming individuals' perceptions. People interpret and deliver such messages via interactive processes with others. Social networks serve to filter and channel technical information and expert interpretations of that information to the network's members. In addition, these networks offer their members opportunities to collect peer feedback on opinions about the risk and related controversies. We need to better understand, how to make individuals actually verify information in a correct way in spite of social pressure, and how such an approach could be inspired also more generally in information distribution.

Conclusions

It is clear that the communication of risk in general and the potential risk in relation to low doses of ionizing radiation in particular is a complex subject and needs to be scientifically investigated. Internationally recognized organizations like (ICRP, WHO, IAEA etc.) provide a relatively consistent view about such risks but there still remains an opposing view to the internationally set safety standards and guidelines. Moreover, uncertainty related to health effects from low doses of ionizing radiation exists. It is important therefore to look for better ways to communicate such risks. The right-to-know and participation principles are nowadays enshrined in local, national, regional and international, and trans-national laws and regulations. The mass media, both traditional and new, play an extremely important role in this respect. The mass media are of interest due to their role not only in distributing (educational) information related to ionizing risks, but also in presenting and clarifying different views and opinions important for democratic risk governance.

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