



Risk communication and public health

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Public health related crises have caused huge negative impacts on health, the economy, national and even international security. International experience shows that risk communication is an important means to facilitate different stakeholders to cooperate and share information in a public and environmental health crisis. In order to identify the role of risk communication in public health, this article will explore the literature for definitions of the terms: risk, communication and risk communication, describe the four development stages of risk communication and explain the role that risk communication plays in each stage, and will cover the principles, benefits of and barriers to effective risk communication, and the practices of risk communication in public health.

Keywords: Risk, Communication, Risk Communication, Public Health

INTRODUCTION

Public health related crises have caused enormous negative impacts on health, economies, and even national security in the world. The management of public health crises contain lots of uncertainties and responding process needs to collect data from various sources and from multidisciplinary fields. It therefore needs all stakeholders engaged in and effective and efficient multi-sectoral collaboration to conduct a public health event. However, because stakeholders' perception of risk, and the needs or benefits of response are not always the same, and the barriers to multi-sectoral collaboration are existing, it is a common challenge to bring stakeholders together and integrate them into the processes of public health events risk management; both vital for policy makers to develop proper strategies for coping with outbreaks. Risk communication helps to improve the communication of risk information and improve the effectiveness and efficiency of multi-sectoral collaboration, and therefore can be an ideal tool for experts and the public to improve the management of public health events.

This paper will explore the literature for definitions of the terms: *risk, communication* and risk communication. Risk communication has at least two characteristics. One is that it includes all messages and interactions among all parties during the risk assessment and risk management process, the other is that it is a two-way communication process and engages all stakeholders in the whole process of risk assessment and risk management. There are four stages in the historical development of risk communication: ignoring the public, explaining risk data to the public, building dialogue with the public, and integrating the public, and the roles of participants in each stage are different. The role of effective risk communication can improve collaboration, coordination and commitment during the whole process of risk assessment and risk management. There are a number of benefits that derive from good risk communication. However we also need to address

GJMEDPH 2016; Vol. 5, issue 4

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Conflict of Interest—none

Funding—none



some barriers that hinder effective risk communication.

In the public health field, risk communication should be a multi-level and multi-faceted process which aims to help stakeholders to reach a common understanding to cope with an unfolding public health emergency. There are a vast number of guidance documents in the literature, outlining principles, rules or elements of effective risk communication. An analysis of these guidelines can identify some key principles of effective risk communication.

RISK COMMUNICATION

Concept of Risk and Communication

Risk

The term “risk” had been defined in many ways. It was first introduced in 14th century in order to help Italian merchants to cope with losses of ships (Hampel 2006). Peter Sandman defined risk as the sum of “hazard” and “outrage”. He believes that the perceptions of risk of experts and lay people are rather different. Experts assessed risk as the expected mortality, or “hazard”. In contrast, the public paid little attention to “hazard” but focused on “outrage” (Sandman 1987).

In 2002, Torgersen et al used a formula to define and calculate risks: $R = W \times S$, where R is the risk value, W is the probability that damage will occur, and S is the expectation of the magnitude of damage. This quantitative concept of risk allows for comparison of risks (Torgersen, von Bergmann-Winberg et al. 2002). Similarly, Manuela and Main express risk as an estimate of the probability of a hazard-related incident or exposure occurring and the severity of harm or damage that could result. Risk is a combination of two important factors. One is the probability of an adverse event occurring, the another is the consequences of that event (Manuela and Main 2002).

Hubbard linked the risk to uncertainty and compared the two terms uncertainty and risk. He pointed out that uncertainty is the existence of more than one possibility and the outcome value is not known. However, risk is a state of uncertainty where some of

the possibilities involve a loss, catastrophe, or other undesirable outcome (Hubbard 2009). Jaeger et al defined risk as a situation or event in which something of human value, including humans themselves, has been put at stake and where the outcome is uncertain (Jaeger, Webler et al. 2013). Jones drew a conclusion that risk contains three levels of meanings. First and most obvious – risk is a probability issue. Second – risk has both a frequency and a magnitude component. And third – the fundamental nature of risk is universal, regardless of context (Jones, CISSP et al. 2006).

We adopt the definition of *risk* from WHO in 2002:

'...risk as a probability of an adverse outcome, or a factor that raises this probability' (WHO 2002). There are four aspects involved in *risk* definition. First, risk can mean a probability that describes a likelihood of an event occurring. Second, risk can mean a factor that raises the probability. Third, risk can mean a consequence. Fourth and last, risk can mean a potential adversity or threat.

Communication

Like *risk*, the definitions of communication are abundant and the understandings of the term vary in different social spheres. In the 20th century, communication has been systematically studied and became an important research issue with the significant progress of communication technologies, such as radio, TV, telephone, computer and internet (Littlejohn and Foss 2010).

Merten collected 160 different definitions of communication in 1977 and developed a simple stimulus-response model for communication in 1999: The process of a communication is that a communicator is sending a stimulus to a recipient. The stimulus could be a message or information (Hampel 2006). Krippendorff developed a ‘container model’ in which the information is transferred from one container to another container. And the meaning of the information is defined by the sender. However, the information may be misunderstood by the recipients due to either a lack of ability of recipients to understand or because the message itself was ambiguous (Krippendorff 1987). This model regards communication as just a stimulus transmission



process, and communication is independent from its context. It is not complete.

In social science, Hampel believed that communication has higher level of complexity than the container model (Hampel 2006). Social scientists emphasize that the transmission process is highly dependent of. The sender is not simply sending a message but labeling the meanings with a certain cultural context which is not same as in other social contexts. The recipient is not simply receiving the message either, but actively reconstructing the meaning based on his knowledge and cultural understanding.

In a word, communication is a complex activity of information transfer from senders to recipients. It concludes three important elements: a sender, a message, and a recipient, and requires that the communicating parties share an area of communicative commonality. Which information the senders choose to deliver, how this information is labelled by senders, and the abilities and the ways of decoding this information by recipients, collectively decide the quality and effectiveness of communication. Because it is not necessary for a recipient to be informed in advance, communication can usually happen automatically and occur across vast distances in time and space.

Concept of Risk and Risk Communication

Although people have always communicated about risk, the field of risk communication (RC) is relatively new. Interest in *risk communication* began in the 1970s/1980s. The US Public Health Service (UPHS) pointed out that RC became recognized as a necessary component in risk management and community decision making in the mid-1980s based on experience in a series of public health emergencies and environmental contamination (UPHS 1995). Since the first American national conference on risk communication in 1986, the RC field has gained greater interest and attention among agencies, policymakers, the media, and the public.

However, risk managers frequently meet difficulties in the process of risk management, the process of identifying, assessing and prioritizing risks in order to

minimize, monitor, and control the probability and/or impacts of adverse events (Hubbard 2009). There are at least three challenges in an ideal risk management. First of all, it is very difficult to prioritize a risk with a high probability of occurrence but lower loss, or a risk with lower probability of occurrence but higher loss. Second, it is difficult for organizations to identify all risks, especially intangible risks. Intangible risks include those risks that have a high probability of occurring but are ignored by the organization because the organization does not have the capacity to identify the risk, and also include relationship risks in ineffective collaboration (Mobley 2011). Third, risk management also faces difficulties in allocating resources, including human resources and funding resources, which are often seen as resources that could have been spent on more profitable activities. Risk communication can help to overcome the difficulties above. However, because of its short history, the concept of risk communication is still evolving. Covello and Slovic defined risk communication as "*any purposeful exchange of information about health or environmental risks between interested parties*" (Covello, Slovic et al. 1986). This definition emerged from the experiences and lessons learnt from the response to health emergencies and environmental contamination that occurred in America in the 1980s, and hence is focused on risk communication for health and environmental topics.

For the purposes of this research work, we adopt the definition of risk communication from the report, *Improving Risk Communication*, published by Committee on Risk Perception and Communication at American National Research Council (NRC) in 1989, "*Risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management.*" (NRC 1989) p21.

According to the definition above, risk communication has at least two characteristics. One is that it includes all messages and interactions



among all parties during the risk assessment and risk management process. The messages come from not only scientific data provided and announced by experts, but also from individuals' personal beliefs and feelings concerning risks, and all the reactions to risk assessment and risk management. All messages are not strictly about risk but are the necessary materials for policy making.

Meanwhile, this definition emphasizes that risk communication is a two-way communication process and engages all stakeholders in the whole process of risk assessment and risk management. This helps to make stakeholders aware of the process at each stage of risk assessment and risk management, and ensures that the logic, outcomes, significance, and limitations of the risk assessment are clearly understood by all the stakeholders.

The two characteristics of risk communication above ensure that both the public and experts receive all necessary information; ensure that policy makers consider all parties' benefits to develop a holistic policy to minimize the risk; ensure that the lay people gain the chance to receive scientific knowledge and experts' analysis and collaborate with risk managers.

Evolutionary Stages of Risk Communication

Based on the role of risk communication in the processes of risk assessment and risk management, Covello and Sandman divided the evolution of risk communication into four historical stages (Covello and Sandman 2001): ignoring the public stage, explaining risk data to the public stage, building around dialogue with the public stage, and integrating the public stage.

The character of the first stage is that the public has been completely ignored during the risk assessment and risk management. In fact, this stage lacks any form of risk communication and thus belongs to the pre-risk-communication stage. There are two aspects of ignoring in this stage. One is that the risk assessors and risk managers ignore the public because they believe that their goal (for example in health and environment issues) is to protect laypeople's health and environment rather than let the public to join in policymaking to avoid messing things up. Another is

that the public has been content to be ignored for a long time.

The second stage requires risk managers to deliver risk information to the public and therefore, is the first level of true risk communication. During 1970s and 1980s, the responses to several major public controversies over the management of chemical risks (pesticides and dioxins) triggered the emergence of risk communication. Effective risk communication practices were becoming the most important responsibilities for the industry and governments (Leiss 2004). In this stage, risk communicators began to learn how to explain risk information better, how to avoid or eliminate scientific language or jargon, how to make charts and graphs better, and how to deal with the media. In this stage, the transfer of risk information remains one way but the effectiveness of communication is improved. So far, many organizations or parties still use risk communication strategies from this stage.

The third stage of risk communication is built around dialogue with the public and community, especially with interested and concerned stakeholders. It is the first time that risk information is communicated in dual ways, both flowing from risk assessors and risk managers to the public, and flowing from other stakeholders to policymakers. It highlights the difference of risk perception between technical experts and laypeople, and leads to emphasize that the essence of risk communication is not just explaining risk numbers but also exchanging information from each party. From this stage, policy makers are more likely to develop proper policies by assessing risk data and the needs from all stakeholders.

Stage four involves treating the public as a full partner and integrates them into the processes of risk assessment and risk management. It reflects the best status of risk communication: all stakeholders are involved in the risk assessment and risk management; they can fully and freely exchange information; and the responses (policies or strategies) to a certain risk meet the needs of all stakeholders. However, to some extent, this type of communication is challenging to achieve because it



requires both individuals and organizations to change their habits and the inertia of their old behaviours, thinking in order to engage the public in meaningful, respectful and frank dialogue.

The characteristics of the four historical stages of risk communication have been summed in **Error! Reference source not found. 1:**

Table 1 Characteristics of Four Stages of Risk Communication

	1 st stage	2 nd stage	3 rd stage	4 th stage
Risk data explaining	No	Yes	Yes	Yes
Dialogue to the Public	No	No	Yes	Yes
Communication Direction	N/A	One-way	Two-way	Two-way
Public Participation	No	No	Part	Full
Risk Assessment and Risk Management	Yes	Yes	Yes	Yes
Public's changes	No need	No need	No need	Need
Organizations' changes	No need	No need	No need	Need
Risk Communication	None	Weak	Strong	Strong

Principles of Risk and Communication

Effective risk communication can improve collaboration, coordination & commitment during the whole process of risk assessment and risk management. However, to achieve the goal, risk communication practices and researchers need to abide by certain risk communication principles.

A number of risk communication principles have been discussed in the literature (Covello, McCallum et al. 1989, Brown and Campbell 1991, Chess and Salomone 1992, Pidgeon, Hood et al. 1992, Sadar and Shull 1999, Morgan 2002, Government of Canada 2006, Glik 2007, Höppner, Buchecker et al. 2010, Lundgren and McMakin 2013). We summarize the principles of risk communication in risk management as follows:

- 1) Risk communication should involve the parties potentially affected by risk management decisions. Listening to them and delivering related risk information to them are two crucial steps in risk management decision making process.
- 2) Involvement should start early and run throughout the risk management process.
- 3) All stakeholders should have equal access and capacity to participate.
- 4) The public seeks empowerment: People in

- 5) Risk managers should allocate adequate financial resources and time in the risk management process.
- 6) Risk managers should develop a written interaction plan.
- 7) Risk communication should enhance the dialogue and trust among all parties, including government officials, recognized experts and other recognized groups in society and the general public.
- 8) Risk managers should understand and accept that the public wants zero risk for involuntary risks.
- 9) Risk communication should give priority to public concerns about what technical information and risk messages should be communicated. The government must learn as much as possible about public needs and expectations to respond to them effectively.
- 10) Risk managers should provide all information possible and as soon as possible.
- 11) Risk managers should be honest about what they know and what they do not know.
- 12) Risk managers should use all proper means to communicate with people.



- 13) Risk managers should try to use small, informal groups to convey risk information; minimize use of large meetings and use mass media for basic information transmission. Such small meetings will allow a personal two-way conversation between the public and experts, and help build trust.
- 14) Risk managers when they communicate through the media should follow the 'Five Fs' rule: Fast (fast response), Factual (give the source of any data and facts), Frank (be as open as possible and respond honestly), Fair and Friendly.
- 15) Communicate repeatedly because risk communication is an ongoing activity rather than a one-off event.
- 16) Use clear, simple language and should not use purely scientific or statistical terms.
- 17) Tell people what to do to improve their safety.
- 18) Tailor information for special groups and use local people to disseminate information.
- 19) Support people in their search for more information.
- 20) Pay attention to ethical and political sensitivity.

Benefits and Barriers of Risk Communication

There are a number of benefits that derive from good risk communication. However we also need to address some barriers that hinder effective risk communication.

Benefits

The most important benefit of risk communication is improved policy-making, both individually and collectively. Policy-making is a social process, rather than a purely scientific one (Fletcher 2007) and it requires stakeholders' involvement or engagement. Risk communication encourages stakeholders' engagement and community participation and enriches the information needed by decision makers. Decision makers therefore may more clearly understand what the experts and the public are really concerned about. In turn, the outcomes, policies or strategies, may better help the target community to minimize the adverse impact of a risk.

Other benefits of risk communication : meaningful participation in decision making lay a fully informed public; an appreciation of limited resources and difficult choice involved in decision making; increased coordination, collaboration and commitment among various levels of government; increased trust and credibility of experts and governments; and the improved working relationships between diverse interest groups. Thus good risk communication gives the public all necessary information of the risks and how the risk is being managed.

Barriers and Problems

Risk communication is a process that needs stakeholders' engagement and community participation. Inevitably, however, barriers and problems arise. Numerous barriers and problems in risk communication have been identified in literature (Cranston 1992, Renn 1992, Rich, Conn et al. 1992, Rohrmann 1992, UPHS 1995, Perez-Floriano, Flores-Mora et al. 2007, Hou 2009). The main barriers and problems in risk communication include:

- 1) Different perceptions. For example, a key barrier is the term *risk*: how it is measured, described, and perceived. Moreover, different individuals or groups have their own risk perceptions, which easily result in a risk miscommunication.
- 2) Trust and credibility. Trust and credibility are the fundamental elements in risk communication. Varying levels of trust in the source rather than varying levels of knowledge decide the extent of perception of risk (Eiser, Miles et al. 2002). The public tends to cooperate with the organizations with higher credibility.
- 3) Benefits. Both social benefits and economic benefits play an important role in risk communication. Benefits may greatly affect the perception of risk, and the outcomes of risk management, in turn, will benefit different groups. Benefits also decide the degrees of collaboration among stakeholders.
- 4) Culture. Culture greatly affects risk communication. Cultures include the habits of a ethnic group, the management style of an organization, and leadership in a community.



- 5) Technical difficulty. Sometimes, the information sharing in multi-sectoral collaboration is blocked by technical difficulty and thus reduces the quality of risk communication.
- 6) Staff and funding. Inadequate staff and funding support usually result in failed risk communication.

RISK COMMUNICATION IN PUBLIC HEALTH

The Role of Risk Communication in Public Health

Since the turn of the century, the WHO has documented a historically unprecedented number of outbreaks of emerging infectious disease, and lessons drawn from their management have confirmed the critical importance of effective communication. Communication is as critical to outbreak control as laboratory analyses or epidemiology (WHO, 2004). Risk communication should be a multi-level and multi-faceted process which aims to help stakeholders define risks, identify hazards, assess vulnerabilities and promote community resilience, thereby promoting the capacity to cope with an unfolding public health emergency (WHO, 2011).

It is not the same as communication in a clinical setting, for example between doctors and patients. The application of risk communication in the public

arena often involves events of interest to the whole society and poor risk communication may even lead to massive panic such as happened with the epidemic of SARS, avian flu. If risk communication is poor, negative consequences are likely. For example, the government might lose the public's trust if they release contradictory information or are perceived to hide information. This will lead to difficulty in implementation of future policy which can protect the public health or in the short-term lead to people or agencies ignoring critical advice that might save lives. The public might be misled by the inappropriate information or suggestion and even adopt some unhealthy choices (Balicer, Omer et al. 2006, Humphreys and Solarsh 2008).

Governments and health agencies have responded to public health crises with the rapid development of risk communication plans and guidelines, the vast majority locating risk communication as an essential component of the larger processes of risk analysis and management. Health Protection Scotland's guidance document for communicating with the public about health risks contains an illustrative model in this respect (Health Protection Scotland 2008); the role that risk communication plays in the risk management process is evident (Figure 1).



Fig 1 The Role of Risk Communication in the Risk Management Cycle



Practices of Risk Communication in Public Health

"After 2002, risk communications guidelines, technical reports and toolkits were developed specific to the field of public health. Governments around the world had been catapulted into action following the global outbreak of SARS in 2003, revising, updating and creating new guidance documents for risk communication specific to the prevention and control

of communicable diseases" (Reynolds B & Seeger MW, 2005). There are a vast number of guidance documents in the literature, outlining principles, rules or elements of effective risk communication (Table 2).

Table 2 Guidelines of Risk Communication

Guidance	Organisation	Year
Crisis and Emergency Risk Communication	US CDC	2014
Communication for Behavioural Impact Toolkit (COMBI) ----Field workbook for COMBI planning steps in outbreak response-2012	WHO/UNICEF/FAO	2012
Communication for Behavioural Impact (COMBI) ----A toolkit for behavioural and social communication in outbreak response	WHO/UNICEF/FAO	2012
Crisis and Emergency Risk Communication	US CDC	2012
Outbreak Response and Communication Guide	USAID/Global Health	2011
Creating a Communication Strategy for Pandemic Influenza	Pan American Health Organization	2009
Outbreak Communication Planning Guide	WHO	2008
Communicating with the Public About Health Risks	Health Protection Scotland	2008
Crisis and emergency risk communication: pandemic influenza.	US CDC	2007
Strategic Risk Communications Framework	Minister of Health Canada	2006
WHO Outbreak Communication Guidelines	WHO	2005
WHO global influenza preparedness plan: the role of WHO and recommendations for national measures before and during.	WHO	2005
The Crisis and emergency risk communications toolkit	California Department of Health Services	2005
Outbreak communication: best practices for communicating with the public during an outbreak	WHO	2004
Risk communication with the media during a public health crisis	Public Health Preparedness at Saint Louis University	2003
Crisis and emergency risk communication	US CDC	2002
Communication in crisis: risk communication guidelines for public officials	US Department of Health and Human Services	2002

Most of these documents have been developed by government agencies and international organizations. Most focus on risk communication in crisis or emergency situations and include information such as definitions, principles, tips and exercises for practitioners, planning and delivering risk communication, stress and organizational development, message development, audience research, audience relations, message delivery and media relations.

A number of common best practices or elements of effective risk communication in the field of public health can be identified across these documents. Good risk communication engages with and responds to the communities it intends to reach. Good risk communication involves stakeholder involvement, including pre-testing of risk messages and tailoring for specific audiences, is essential for the efficacy and impact of risk communication; to communicate effectively about risks to the health of the public, working relationships amongst all parties involved must be strengthened and mutual trust promoted.



Risk communication is an integral component of a larger framework for risk management. Effective risk communication ensures clear objectives, consistent messages, and transparent and credible decision-making (Infanti, Sixsmith et al. 2013).

Principles of Risk Communication in Public Health

There are several important principles that should be followed by the experts and by the lay public. Based on analysis of these five guideline document and one

best practices study (Table 3). Nine key principles are identified as essential for a comprehensive risk communication for outbreaks: trust; announcing early, transparency, listening, planning, honesty, frankness, and openness, empathy and caring, accepting and involving the public as a partner, coordinating and collaborating with other credible sources.

Table 3 Principles of Effective Risk Communication

Organization/Researcher	Year	Guidelines/Plan	Principles
Pan American Health Organization	2009	Creating a Communication Strategy for Pandemic Influenza	<ul style="list-style-type: none"> • Accept and involve the public as a partner. • Plan carefully and evaluate your efforts • Listen to the public's specific concerns • Be honest, frank, and open. • Work with other credible sources • Meet the needs of the media. • Speak clearly and with compassion
WHO	2008	World Health Organization Outbreak Communication Planning Guide	<ul style="list-style-type: none"> • Trust • Announcing early • Transparency • Listening • Planning
Health Protection Scotland	2008	Communicating with the Public About Health Risks	<ul style="list-style-type: none"> • empathy and caring • competence and expertise • transparency and openness • planning for communications • early communication
U.S. Department of Health and Human Services	2002	Crisis Emergency Risk Communication	<ul style="list-style-type: none"> • Accept and involve the public as a legitimate partner • Listen to the audience • Be honest, frank, and open • Coordinate and collaborate with other credible sources • Meet the needs of the media • Speak clearly and with compassion • Plan carefully and evaluate performance
FAO/WHO	1998	The Application of Risk Communication to Food Standards and Safety Matters	<ul style="list-style-type: none"> • Know the audience • Involve the Scientific Experts • Establish Expertise in Communication • Be a Credible Source of Information • Share Responsibility • Differentiate between Science and Value Judgement • Assure Transparency • Put the Risk in Perspective



DISCUSSION AND CONCLUSION

There are many uncertainties in risk itself and in risk management. Traditional means of policy making cannot meet the needs of all stakeholders anymore. Meanwhile, the difficulties in multi-sectoral collaboration have reduced the effectiveness and efficiency of risk assessment and risk management.

The functions of risk communication, such as dealing with the uncertainty, increasing trust and improving the collaboration among stakeholders, make it a useful tool to overcome the problems in collaboration and cooperation. In this sense, risk communication can play an important role in emergency management in order to develop adaptation strategies. Good risk communication skills help to communicate correct perceptions of risk, enhance the collaboration and facilitate the integration of all stakeholders into the assessment of vulnerability to climate change.

There is still continued room for improvement in risk communication policy, guidance and research on how to build and maintain trust with the public before, during and after outbreaks of communicable diseases. Most guidelines are mostly top-down communications, with little consideration for individual member-state implementation. The WHO and CDC recommendations are not always based on formative evaluation studies, which undermines their validity (Gesser-Edelsburg, Mordini, James, Greco, & Green, 2014). There are few systemic evaluations of the effectiveness of risk communication during actual crisis communication events (Glik DC, 2007).

Risk communication for communicable diseases often fails to reach its intended communities, including those people most at risk such as happened hurricane Cyclone Katrina. Despite the advice in the guidance documents, and the availability of various planning tools for pre-crisis event risk communication and readiness efforts, studies on how countries actually respond to emergency situations involving communicable diseases reveal that many still need to concentrate on advanced planning at all levels of public health (Paek H-J et al, 2008; Barnett DJ et al, 2005; Fisher D et al, 2009; Goddard et al, 2006). The early stages of the SARS epidemic went largely

unnoticed. Many clinicians were unaware of the epidemic threat posed by the "atypical pneumonia"; cases went undetected because of poor surveillance and an inadequate network of clinical laboratories, and poor information transfer meant that the epidemic had gained considerable strength before it was recognized. China's delayed detection of the outbreak and its poor level of communication during the response to the emergency probably led to many avoidable cases of SARS and damaged China's economy and reputation (Vong, O'Leary et al. 2014).

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