MEDICAL WASTE: RISK PERCEPTION AND COMMUNICATION

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Introduction

On May 23, 1988, needles, syringes, blood vials, and other medical waste washed up on the beaches of New Jersey. This incident marked the beginning of a series of medical waste incidents along beaches in New England, the Gulf of Mexico, the Great Lakes, and other locations throughout the Unites States (CSG 1988; OTA 1988). In early July medical waste was found on the beaches of New York. By mid-July medical debris began turning up on beaches from Connecticut to Martha's Vineyard, and in August medical wastes washed ashore in Maryland and North Carolina (Boston Globe, September 4, 1988). Many beaches in New Jersey, New York, and other states were closed due to such incidents. Although complete data are not available on the economic costs of beach closings and adverse publicity, it is clear that the tourist industry experienced a major decline in revenues as did related businesses. For example, a survey done in New Jersey found that tourism was down more than 20 percent and revenues were down almost 10 percent (NJDEP 1988).

Intensive media coverage of beach incidents and beach closings continued unabated throughout the summer of 1988. Medical waste on the beaches even became a important topic in the 1988 presidential campaign. Beach problems were, however, only part of the medical waste problem. In Indianapolis, for example, children were found playing with discarded needles and vials of blood, two of which were infected with AIDS. The needles and vials had been dumped

outside a medical office. The public responded with outrage after it was disclosed that the open disposal of such waste was legal (OTA 1988). Similar concerns were raised when it was learned that 1,400 bags of medical waste had been illegally dumped in a New York City warehouse and that the disposal company had submitted false documents about its disposal (OTA 1988).

These and similar incidents created a strong public demand for immediate governmental action and for tighter regulation of the generation, handling, and disposal of medical waste. Politicians in affected communities were overwhelmed with complaints and requests for immediate action.

Public outrage directed at responsible institutions led to intense political activity. On the federal level, Congress promulgated the Medical Waste Tracking Act in 1988 and stipulated that EPA issue regulations covering medical wastes within six months of enactment (Environmental Reporter 1988, p. 1747).

Many states also enacted new regulations, although some states had already taken action after EPA completed its final Manual for Infectious Waste Management in May of 1986. A survey done in February 1988 documented the dramatic change in state policies. While 28 states had no regulatory structure addressing infectious waste in 1986, by 1988 all but 11 states and the District of Columbia had regulations in place (CSG 1988).

Public outrage over medical waste and related economic and political consequences highlights the importance of public perceptions and the need for improved risk communication and public education. Public perceptions of medical waste play an important role in determining public responses to medical waste (including responses by tourists and consumers), demands for political change (including demands for increased regulation and improved enforcement), and increased attention by risk management institutions. Public perceptions play a particularly important part in the medical waste problem given the agreement among experts and public health officials that the actual risk to public health posed by medical waste at the beaches or in landfills is exceedingly low (OTA 1988; EPA 1988). Organizational responses to medical waste were only triggered in part by the actual health risks. Of equal if not greater importance were the public perceptions of these risks and the response to these perceptions by the media, public opinion leaders, and decision makers.

In spite of the importance of public perceptions in initiating a range of social and political responses to the medical waste problem, it appears that no rigorous study exists on this topic. The lack of data on public perceptions of medical waste stands in stark contrast to the vast amount of literature that exists on the potential health effects of medical waste, on remedial actions, on disposal technologies, and on policies and legal requirements. Our review of the literature found no studies on public attitudes towards medical waste, on public beliefs about the potential risks of medical waste, or on public preferences for different remedial options. The lack of studies in this field is difficult to understand. Given the economic losses at stake and the political resources already committed to the

issue, one would assume that studies of public perceptions would have received higher priority.

Due to the lack of empirical evidence on public perceptions, this paper relies largely on analogies with similar risk problems and on theoretical insights from the broader literature on public perceptions of risk. Our analysis is based on well-established theories of risk perception and communication, but the conclusions must be considered tentative. Empirical studies are needed to confirm our analysis and to test the suggested hypotheses.

This paper is divided into three parts. In the first part, we apply risk perception concepts to the medical waste problem and discuss the impacts of qualitative risk factors on public perceptions of medical waste. The second part focuses on the economic and social impacts of recent medical waste incidents and discusses these impacts within the theoretical framework of the social amplification of risk. The third part reviews the applicability of risk communication research to the medical waste problem and includes general guidelines for developing a public education and risk communication program. The major insights from our analysis are summarized in the conclusions.

Risk Perception and Medical Waste

Starting with the pioneering work of Paul Slovic and his colleagues at Decision Research (Slovic et al. 1982; Slovic 1987), psychological methods have been employed to explore the characteristics of risk that influence judgments by people about the seriousness of a risk and its acceptability. The following aspects of risk have been found to affect the perceived riskiness of a substance, activity, or technology (Slovic et al 1982, Covello 1983; Vlek and Stallen 1981, Renn 1981):

    a) the expected number of fatalities or injuries:
    b) the catastrophic potential
    c) the probabilities associated with adverse outcomes
    d) qualitative characteristics of the risk situation
    e) beliefs about the risk source
    f) stigmas or verbal clues that trigger emotional responses

Although the perceived average number of fatalities correlates with the perceived riskiness of an activity or technology, the relationship is weak and generally explains less than 20 percent of the variance (Renn 1983). The major disagreement between technical experts and the public is not on the number of people that might be harmed by a hazardous activity, but on the importance of this information in judging the seriousness of a risk and its acceptability. Most technical experts multiply the probability of potential negative outcomes times the magnitude of these outcomes. However, laypersons are more inclined to put less

weight on probabilities and more weight on outcomes if the outcomes convey an image of dread and if the outcomes are plausible causes of the exposure (Slovic et al. 1987). Based on the risk perception literature, we would therefore expect most people perceive the risk of medical waste as a serious threat because the potential outcome is death (e.g. from AIDS) or chronic illness and because the pathway to infection is easy to imagine and appears intuitively plausible. In contrast, the catastrophic potential of a medical waste incident, i.e. the number of people affected in each incident, is likely to be judged small, although some people may be concerned epidemic resulting from large-scale exposure to medical waste.

In general, low-probability/high-consequence risks are usually perceived as more threatening than more probable risks with low or medium consequences (Borcherding et al. 1986)). But recent studies indicate that many people associate the catastrophic potential of an activity or technology with the magnitude of exposure rather than the magnitude of actual consequences (Emani et al. 1989). The more people feel that a potential risk could affect them personally, the more they feel threatened by the risk. Since people can easily identify themselves with potential victims of infections waste and can picture themselves as being engaged in the same type of activities (children playing near hospitals or people walking on the beaches), they are likely to conclude the risk is ubiquitous and may well affect them in the near future.

In addition to perceptions of the magnitude of a risk, the perceived properties of the risk and characteristics of the risk situation exert a major influence on risk perceptions (Slovic 1987; Covello 1983). Among the most influential qualitative factors are: dread; nature of risk; personal control; familiarity with risk; the perception of equitable sharing of the benefits and risks; and the potential for blame (the possibility to assigning blame to a person or institution for creating a risky situation). A more comprehensive list of qualitative risk factors is shown in Table 1. With respect to medical waste, the following qualitative risk factors are particularly important:

a) Lack of personal control: People are likely to feel that they have no control over the potential risk from exposure to medical waste. Concerns generated by a perceived lack of personal control can be offset by trust in risk management institutions (Lee 1981). However, if people lose confidence in these institutions or believe that their performance is flawed, they will demand stricter regulation, enforcement, and legal action (Renn 1983).

b) Dread: Dread is one of the most decisive factors in risk perception (Slovic 1987). Dread describes the potential for fear associated with adverse risk consequences. If the adverse risk consequence is believed to be AIDS or another dreaded disease, people are more likely to take the risk more seriously than a risk that may lead to minor illness or occasional deaths. Probabilities play only a

minor role in such situations. The fear of being infected by medical waste and the imaginability of contracting AIDS dominates the consideration of probabilities.

c) Blame: The possibility of assigning blame to an institution or a person for a risk is a powerful promoter of public concern, especially if the risk is perceived to be dreaded and not subject to personal control (Sandman et al. 1987; Emani et al. 1989). The public expects that serious and dreaded risks which can affect innocent bystanders and which cannot be mitigated through personal control will be strictly regulated by risk management institutions. Persons and institutions will be blamed for the presence of such a risk or, even worse, an actual incident or hazardous event, regardless of whether personal or institutional failure is involved. These observations help explain why the message that many of the syringes found at the beaches were disposed by drug addicts and not by hospitals or clinics apparently made so little impression on the public. The task of risk management institutions is to prevent the public from contracting dreaded diseases, regardless of the source of these risks.

d) Inequities: The perception that some people are more exposed to the risk than others aggravates the perception of the seriousness of a risk. This is especially the case if inequitable exposure cannot be linked to a moral justification (Kasperson 1986). In most medical waste situations, affected individuals are almost randomly victimized. Consequently, there is no social or moral justification for exposing this population to such a risk. However, more obvious inequities exist among communities. For example, beach communities suffered economic losses whereas other resorts may have benefited from waste incidents by absorbing potential beach tourists. Furthermore, public outrage is almost certain if children are especially vulnerable and exposed to a risk that they or their parents have not created.

Although these qualitative risk factors promote a negative perception of the risks of medical waste, other factors may counteract this unidirectional influence. For example, exposure to medical waste is likely to be seen as less risky than exposure to chemical or radioactive waste. Most people are familiar with syringes or other waste products and have learned to avoid contact with infectious items. Furthermore, the consequences of being infected are well known and do not extend to future generations (Slovic et al. 1982). Thus, responses typical for risks such as radioactive and chemical waste are not to be expected in the case of medical waste. Behavioral responses to medical waste are more geared towards protective actions and political pressure than to political protest, such as demonstrations or civil disobedience. In spite of the lack of overt protests or political demonstrations, however, the amount of public outrage and the magnitude of economic consequences clearly indicate that the public is profoundly concerned about medical waste.

In addition to these qualitative aspects of risk perception, another factor affecting public perception is how people understand probabilities. Common sense reasoning is governed by a deterministic model: something is either safe or unsafe, healthy or unhealthy, acceptable or unacceptable. Such a dichotomous approach is a simplification of the complexity involved in probabilistic events, but it provides a convenient and useful guide to action in everyday life. Cognitive processing of probabilities is influenced by the following intuitive heuristics (Kahneman and Tversky 1974):

a) Availability: Events that come to people's mind immediately are rated as more probable than events that are less mentally available.

b) Anchoring: Probabilities are adjusted to the information available or the perceived significance of the information.

c) Representativeness: Singular events experienced in person or associated with properties of an event are regarded as more typical than information based on frequencies.

d) Avoidance of cognitive dissonance: Information that challenges perceived probabilities that are already part of a belief system will either be ignored or downplayed (Festinger 1957).

All the above mechanisms are likely to influence public perceptions of the probability for contracting a serious disease from exposure to medical waste. Frequent media coverage of singular events have imprinted on people the possibility of contracting AIDS or other diseases. Such incidents become readily available to one's memory and thus are perceived as more probable. The salience of the AIDS issue provides a clear anchor for judging the medical waste problem as serious and significant. The confrontation with real victims on TV or in the newspapers leads to identification processes with the victim and reinforces the notion that oneself or a member of one's family could be the next victim. Studies have demonstrated the power of identification with victims for raising public concern and outrage (Roeglin 1977). Finally, past experience of most people in contracting infections (particularly the flu) seems to contradict statements by experts that sharps, needles, or syringes washed upon the shore do not pose a serious threat to human health. It appears likely, therefore, that people will overestimate the probability of contracting diseases from exposure to medical waste.

In addition to risk perception factors, public concern and outrage are also a function of attitudes about the cause of the risk, be it a technology, a human activity, or a natural event (Otway 1980, Lee 1986, Swaton and Renn 1984). Attitudes encompass a series of beliefs about the nature, consequences, history,

and justifiability of a risk cause. Due to the tendency of people to avoid cognitive dissonance among beliefs, most people are inclined to perceive risks as more serious and threatening if other beliefs contain negative connotations. A person, for example, who associates the use of pesticides with profit-seeking behavior of agro-industrial corporations is more likely to think that the concomitant risks are higher than a person who associates pesticides with the global struggle of societies to fight hunger and malnutrition.

Medical waste triggers few positive associations or beliefs. The term "waste" in itself is associated with terms such as "hazardous", "unproductive", "perilous" , and "unpleasant". In addition, the term medical waste is a powerful visual reminder of human fragility, disease, and death, and thereby contrasts visually with our notions of human dignity and spirituality. People avoid even looking at medical waste, let alone being confronted with such waste during a leisure activity such as swimming or walking. These observations point to the symbolic cues that are suggested by medical waste. The environment of beaches signals cleanness, pleasure, youth, and, to a certain degree, "innocence". Beaches are a major thematic element in paintings illustrating pastoral settings or depicting paradise (Marx 1978). People are fascinated by beaches and the ocean. Strength, natural beauty, timeliness, and pleasure go hand in hand with perceptions of the beach environment. Furthermore, the lack of protective clothing at beaches not only exposes people to natural surroundings (sun and water) but also make people more vulnerable to other hazards. The presence of medical waste at the beaches is a powerful intrusion on the beach image. The stigma of blood, the negative aesthetic reaction to human or animal tissue, the threat to human integrity from sharps and syringes, and the symbolic presence of disease and death forms a powerful contrast to the image and symbols represented by the beach environment. Thus, an important issue in public perception of medical waste is not only the threat to human health but the threat to a powerful collective image and symbol represented by the beach. The risk of medical waste is often used to rationalize this concern, but may originate in subconscious emotions linked with powerful symbols and images.

The Social Amplification of Risk and Its Application to Medical Waste

The concept of the social amplification of risk is based on the thesis that hazardous events interact with psychological, social, institutional, and cultural processes in ways that can heighten or attenuate individual and social perceptions of risk and shape risk behavior. Behavioral patterns, in turn, generate secondary social or economic consequences. These consequences extend far beyond direct harm to human health or the environment, and include significant indirect

impacts, e.g. liability, insurance costs, loss of confidence in institutions, and alienation from the community (Kasperson et al. 1988).

The extent of social amplification of risk is only partially related to the actual level of risk. For medical waste, most experts agree that public health risks from exposure to medical waste are quite small. The chances of contracting AIDS from medical waste, for example, is considered to be negligible (Washington Post, August 23, 1988). One reason the risk is so small is that the AIDS-causing HIV is very fragile and does not survive long outside of the body. In addition, most medical waste is now either incinerated or autoclaved before it is transported to landfills. Both processes will kill any organisms present, including HIV.

Despite this, significant uncertainties exist that can influence the social amplification of risk. For example, a widely cited report by the Congressional Office of Technology Assessment states that the health risks from improperly discarded medical waste are real but unknown and therefore require more study (OTA 1988).

Uncertainty about the risks of medical waste, together with the risk perception factors mentioned earlier, provide a powerful stimulus for the social amplification of risks associated with medical waste. All socially amplified risks have in common that they trigger economic, social, and political consequences that are not directly related to the health risks involved. Such secondary effects can trigger demands for additional protective actions and institutional response. Conversely, they may place obstacles in the path of needed protective actions.

The concept of social amplification provides a framework for describing and analyzing the impacts of the medical waste problem on economic, social, and political institutions. For example, many people decided to avoid the beaches because the risks were perceived to be too great and spent their vacations elsewhere or used the money they saved for other purposes. Declines in tourism coupled with a negative image of beach communities led to ripple effects for other businesses and for communities. If significant medical waste incidents continue next summer, the economic losses for affected communities will be substantial and may trigger additional political and social action.

Medical waste incidents also lend themselves to new policy initiatives by environmental groups. For example, environmental groups have been successful in linking medical waste problems to other environmental problems, such as ocean pollution. Specifically, several environmental groups have attempted to build on public concerns about medical waste to promote anti-pollution legislation that is only marginally related to medical waste. Public concerns about medical waste have allowed these groups to gain momentum in the policy arena and to use these incidents as ammunition in the battle for environmental protection. Several groups have also amplified medical waste incidents as a means of enlarging their political base and strengthening their position.

In addition to pressure from environmental groups, political actors were under pressure from the general public, the health care industry, and affected

businesses. The presidential campaign provided an additional incentive to transform the issue into political action. Congress promulgated new legislation, EPA initiated a new taskforce for tackling the problem and specifying new regulation, and many state governments passed new laws or regulations. These activities caused other actors in the arena to articulate their points of view and to respond to new and pending legislation.

These secondary effects of medical waste incidents will almost certainly have tertiary impacts. New regulations and laws will require more funds. Hospitals and clinics are already concerned that they will have to bear the additional costs of the waste tracking system. Given that the health care is experiencing a major financial crisis, the economic impacts of stricter regulation of medical waste may force some heath facilities to cut expenses in other fields or to compromise occupational safety. Furthermore, off-site incineration may be the only alternative for many hospitals to meet the new regulations. Such facilities are expensive, difficult to site, and their operators may refuse to accept medical waste. Thus hospitals may be forced to store medical waste on-site, at least temporarily, which in turn may pose health risks to employees and patients. Going one step further, the medical supply industry may be affected. Sales of disposable medical items--once advocated as a method for reducing risks among medical personnel--may decrease and permanent use items may be substituted. Political pressure may be exerted to force recycling requirements on the medical supply industry, e.g., requirements to reprocess all medical waste and to dispose of unusable substances. Finally, public perception may influence the corporate image of medical supply companies, which in turn may lead to decreased demand or boycotts of consumer products offered by these companies.

Many of these impacts have yet to materialize, but some are likely to occur as a result of medical waste incidents. Similar processes have taken place in the chemical industry with hazardous waste. Public outrage and political actions were highly amplified in the political arena and caused major economic and political repercussions (e.g., superfund legislation). It is still too early to predict the likely amplification effects of medical waste risks. In the following section we focus on the amplification processes that have already occurred and discuss the significance of these processes for risk perception and communication.

Economic and Political Consequences of the Medical Waste Incidents

Medical waste incidents have had severe economic consequences. Shore communities, in particular, have experienced substantial financial losses due to decreased numbers of visitors and tourists. A study conducted in New Jersey, for example, found that total expenditures by visitors and tourists to New Jersey shore communities dropped from $8,437,630 in 1987 to $7,691,990 in 1988, representing

a 9% loss in revenue (New Jersey Shore Survey, 1988). The same study found that 33% fewer people took day trips to the New Jersey shore than in 1987. According to the study, concerns about medical waste and ocean pollution were foremost in the minds of those who considered themselves less likely to visit the New Jersey shore in 1989 (New Jersey Shore Survey, 1988).

Beach communities in other parts of the Northeast experienced similar economic losses. In many communities, beaches were closed for one or more days due to medical waste being found, including needles, syringes, and vials of blood containing AIDS antibodies. The problem was compounded when many beaches had to be temporarily closed due to sewage spills and high fecal bacteria counts. According to managers and operators of motels, restaurants, recreational fishing companies, and transportation companies, sales and customer counts for the region stretching from Staten Island to the tip of Long Island were off by as much as 80% from 1987 (Newsday, 48, No. 358).

Nearly all beach communities in the Northeast experienced financial losses, even areas where no medical waste was found. Based on interviews with more than 100 company and government officials, a major New York newspaper concluded that concerns over medical waste and other forms of ocean pollution had cut attendance at Long Island and New York City beaches by half and discouraged over 500,000 people from making extended visits to the region during the hottest summer in 44 years (Newsday, 48, No. 358). Beach front and inland businesses alike felt the impact. According to John G. Sheridan, Suffolk County Commissioner of Parks, Recreation, and Conservation, "The season ended Sunday, July 10, when medical waste washed ashore at Smith Point County Park and seven television camera crews showed up to record the event.The words 'medical waste' and 'AIDS' shut down the summer of 1988" (Newsday, 48, No. 358).

In addition to these direct economic impacts, medical waste incidents have had substantial indirect economic impacts. These relate mainly to the rising costs of medical waste management and disposal. Stricter regulations and the shortage of landfills and licensed incinerators have greatly increased the costs of medical waste management and disposal. At many hospitals, for example, the cost of hauling infectious waste has increased over 500 percent (Washington Post, August 23, 1988).

Given these increased costs, incentives for illegal dumping have also increased. Increased costs of medical waste management and disposal are also likely to result in increased medical costs. According to Robert Ostrowski, Deputy Chief of Safety at the National Institutes of Health, "Every hospital will soon have to have hazardous waste experts on their staff...That can only drive medical costs up even more." (Washington Post, August 23, 1988).

It is expected that the newly enacted medical waste tracking system will triple already high medical waste handling costs (Washington Post, August 23, 1988). One of the main beneficiaries of these changes will be professional waste

management and disposal companies. Stricter regulations have stimulated the growth of this industry, which now grosses over $300 million a year (New York Newsday, 48, No.338).

For a variety of reasons, hospitals, clinics, and other producers of medical waste are increasingly turning to these professional waste management companies. Most existing hospital incinerators, for example, do not meet new regulations. Moreover, increasing numbers of cities are refusing to accept medical waste at their disposal facilities because of liability concerns.

This trend toward off-site incineration contrasts with the increasingly difficult task of locating and operating solid waste incinerators and landfills. As a result, medical waste is now an important part of a much larger problem: the lack of available space and acceptable disposal methods for all types of solid waste. According to Sylvia Lowrance, Chief of Solid Waste at the Environmental Protection Agency, "In the populated areas of the Northeast, we are rapidly running out of space...A third to a half of all landfills will be full by 1992" (Washington Post, August 23, 1988).

Many of the problems surrounding medical waste disposal are compounded by the fact that few communities want to be a disposal site for medical waste. Many landfills that used to accept untreated medical wastes "are no longer taking it," according to Robert Spurgin, Vice President of Medical Waste Systems at Browning Ferris Industries, a leading waste management firm (Washington Post, August 23, 1988). In addition to the increasing scarcity of landfills, tighter rules governing the incineration of medical products and greater use by hospitals of disposable items have aggravated medical waste problems.

To reduce costs, generators of medical wastes are aggressively searching for viable alternatives. These include cheaper and more efficient disposal methods and products that are more easily disposable (New York Newsday, 48, N0.338).

In addition to economic consequences, medical waste incidents have had severe political consequences. One of the most important of these is the continuing battle between local, state, and federal officials. Throughout the Northeast, for example, local officials have spoken out on the need for tougher federal regulations and for uniform and acceptable national standards (Washington Post, October 4, 1988). Several Congressmen have openly blamed U.S. Environmental Protection Agency for the medical waste incidents of 1988: James J. Florio of New Jersey, a supporter of several pending bills to deal with medical waste, charged at a briefing that the EPA had long had the authority to deal with the problem but had done very little (New York Times, October 6, 1988). At a congressional hearing, Rep. Tom McMillen (D-Md.) and Rep. James Scheuer (D-N.Y.) criticized the Environmental Protection Agency for what they claimed was a lack of research and guidance in disposing of medical wastes and other hazardous substances (Washington Post, October 4, 1988).

At a hearing of the House regulation and business opportunities subcommittee, experts argued that a hodgepodge of state laws has evolved in the

absence of federal regulation. This has had several consequences, including conflicts over the definition of medical waste and shipments of wastes from states with strict regulations to states with weaker or no regulations (Washington Post, August 10, 1988).

Due to increasing political pressure, President Reagan signed a bill in 1988 that requires the EPA to track medical waste from hospitals, labs, and clinics to their site of disposal. Initially this system would apply to only 10 states (Washington Post, November 3,1988). However, more states can join the system if they wish.

It is still not clear if these more stringent programs are warranted or economically feasible. The EPA itself has questioned whether it has the authority to implement a nationwide policy to control medical wastes (Washington Post, August 23,1988). Furthermore, it also now appears that most of the waste involved in last year's medical waste incidents did not come from hospitals or clinics. In New York, for example, environmental officials believe that much of the medical waste that washed up on shore came from New York City's thousands of small testing laboratories and doctor's offices, including those that treat drug addicts. These small health care facilities are, however, likely to be excluded from the newly enacted medical waste tracking system.

Environmental officials have also identified New York's sewer system as a source of medical waste on the beaches. After heavy downpours, sewers and sewage plants discharge untreated sewage into the harbor. At least part of the medical waste that washed up on beaches appears to have been needles, syringes, and other medical waste that was either washed off the streets or flushed down toilets by self-medicating patients (e.g., diabetics), drug addicts, and other users of health care or medical products. Addicts also may have left needles on beaches (Boston Globe, September 4, 1988).

These non-hospital sources of medical waste are difficult to regulate and control. It is likely therefore that medical waste will continue to wash up onto beaches. Given this, it is critical that programs be designed to educate people about the role of such sources in medical waste incidents. It is also critical that people not be given the impression that the new medical waste tracking law will necessarily result in major reductions in medical waste on the beaches. Credibility will be lost if public expectations are raised too quickly and these expectations are not met.

Risk Communication and Medical Waste

Risk communication, as it relates to medical waste, can be defined as any purposeful exchange of information between interested parties about the health or environmental risks of medical waste. More specifically, risk communication about medical waste is the conveying or transmitting of information between

parties about (a) levels of health or environmental risks associated with medical waste; (b) the significance or meaning of these health or environmental risks; or (c) decisions, actions, or policies aimed at managing or controlling these health or environmental risks. Interested parties include government, agencies, corporations, industry groups, unions, the media, scientists, professional organizations, public interest groups, and individual citizens (Covello et al., 1986, p. 172).

A major prerequisite for successful communication about the risks of medical waste is trust and credibility. If people do not trust the source of the message or distrust the organization that delivers the message, the communication effort is unlikely to succeed.

Several factors influence public perceptions of trust and credibility. These include:

Attractiveness of the information source. This factor is positively evaluated when the source is perceived to be likable, similar to the receiver, and/or physically attractive (Lee 1986; McGuire 1985; Chaiken and Stangor 1987).

Sympathy or empathy of the receiver with the source. This factor is positively evaluated when the receiver is able to identify with the source of information (McGuire 1985; Eagly and Chaiken 1984).

Perceived competence. This factor is positively evaluated when the source is perceived to be knowledgeable about the subject and to have the experience needed to make prudent judgments (Lee 1986).

Perceived fairness. This factor is positively evaluated when the source is explicit about the goals or intent of the communication and is perceived to be fair and honest about potential counterarguments or dissenting views (Lee 1986; Tyler 1984; Rempel and Holmes 1986).

Honest motives. This factor is positively evaluated when no hidden agendas or motives are perceived (Rosnov and Robinson 1967; Eagly et al. 1981).

High social status and power of the communication source. This factor can play an important role but its impact depends heavily on the issue and the composition of the audience (McGuire 1985; Chaiken and Stangor 1987; Lee 1986).

Many of these findings on trust and credibility are derived from psychological studies conducted in artificial laboratory environments. Nonetheless, they provide insights on how to establish and maintain credibility in

communications about medical waste. They also serve as a starting point for developing a credible public education program.

Important insights about trust and credibility can also be derived from the literature on organizations and institutions. For example, researchers have found that:

(a) credibility is closely linked to sympathy. Errors, mistakes, and other indicators of institutional incompetence are more likely to be forgiven if the audience sympathizes with the source (Lipset and Schneider 1983). Conversely, lack of sympathy tends to make people more critical of institutional performance.

b) Perceived competence, a prerequisite for institutional credibility, is closely linked to perceptions of successful task performance and favorable benefit-cost ratios. People also use information about public image and prestige in making initial judgments about institutional competence and credibility (Matejko 1988).

c) Perceived fairness and openness, both prerequisites for institutional credibility, are closely linked to the transparency of decision making processes, to opportunities for public scrutiny, to opportunities for institutional control (e.g., checks and balances), and to levels of satisfaction with procedures for making decisions. Surprisingly, there is little correlation between actual opportunities for public participation and perceived openness (Lipset and Schneider 1983; cf. theoretical concept Luhmann 1980).

d) Loss of institutional credibility is closely linked to perceived incompetence, poor performance, incomplete information or dishonesty, the withholding of information, obscure and hidden decision making processes, denials of obvious problems, and denials of vested interests (Midden 1988; Matejko 1988; Lipset and Schneider 1983; Bergesen and Warr 1979).

e) Enhanced institutional credibility is closely linked to perceived competence, efficient and effective performance, prompt responses to public requests, consonance with esteemed social values, public accessibility, unequivocal and highly focused transfers of information, flexibility in response to crisis situations or public demands, and demonstrations of public accountability (Lipset and Schneider 1983; Rourke et al. 1976; Pinsdorf 1987).

Research on crisis communications suggests that institutional credibility can also be enhanced by immediate and dramatic acts of compassion and concern. Such acts include on- site tours by the head of the organization. Companies have achieved similar results by taking a product off from the market even though only a small fraction of the product was contaminated (Pinsdorf 1987).

Summary

Several of the major points made in this paper can be summarized as follows:

a) Medical waste policies, programs, and communications are bound to fail unless they address public perceptions of risks. Several factors contribute to misperceptions and overestimations of the risks of medical waste. These include intense media coverage and various psychological processes and biases (e.g., memorability and imaginability) that affect judgments about risk.

b) Expert and lay people are likely to differ in their perceptions of the risks of medical waste. Experts and lay people often rely on different types of information in judging the seriousness of a risk. For example, lay people tend to rely on information about qualitative risk factors (e.g., voluntariness, fairness, and control) whereas experts rely primarily on information about probabilities and consequences.

c) Several factors operate to amplify public perceptions of the risks of medical waste. These include: dreaded consequences (e.g., AIDS), lack of personal control, perceptions of inequities, and institutional failures. Other factors operate to attenuate public perceptions of risk. These include familiarity and low catastrophic potential.

d) Images conveyed by ocean and beach environments contrast sharply with images conveyed by medical waste. Syringes, blood vials, and human tissues are powerful reminders of death, fragility, and disease. By comparison, ocean and beach environments conjure up images of health, vitality, and cleanliness.

e) Due in part to intense media coverage of medical waste incidents, negative public perceptions, and other amplification processes, many people avoided beaches and spent their vacations elsewhere. Losses in business revenues and political repercussions were substantial.

f) A major problem in designing effective risk communication programs is institutional credibility. Institutional credibility, in turn, depends on various factors, including perceptions of compassion, performance, competence, flexibility, fairness, and openness.

Conclusions

What can we learn from the literature on risk perception and communication and how can we apply this knowledge.

First, people must be convinced that government and industry are deeply concerned about medical waste problems, are responding vigorously, and are taking needed actions to protect the public's health and prevent the occurrence of medical waste incidents.

Second, since institutional credibility is determined in part by perceptions of institutional performance, successes must be widely publicized. For example, people are likely to react positively to announcements of successful remedial programs and actions by medical waste generators, especially actions that are performed voluntarily and that are taken prior to government regulation.

Third, despite the best efforts of public and private organizations to track, manage, and reduce medical waste, incidents involving medical waste on beaches and in public places are likely to reoccur. Given this, efforts must be made to inform the public and the media (e.g., through pamphlets, workshops, and other channels) that medical waste incidents are likely no matter what is done. This message can best be framed by pointing out (1) the multitude of pathways by which medical waste ends up on beaches, shorelines, and in other public places (e.g., through illegal dumping, accidental spills, illegal intravenous drug use, self-medicating patients, ambulant medical services, and overflows of sewer systems); and (2) the impossibility of regulating and controlling all such sources and pathways.

Fourth, in addition to establishing realistic goals and taking a proactive approach, education and communication programs need to emphasize possibilities for self-protection. As noted earlier, personal control is a major factor in risk perception. Risks that people feel they have control over are perceived to be less threatening and more acceptable than risks over which they have no control. Actions that may give individuals a greater sense of control range from wearing sandals at the beach to immediate treatment after contact with medical waste. Actions that may give communities a greater sense of control range from monitoring programs to training sessions for personnel that clean up beaches. It needs to be emphasized, however, that personal and community control options are effective only if people believe that regulatory agencies and other responsible parties are also taking actions to control and reduce risks. Public outrage will be intensified if people believe that they are being used to make up for a lack in institutional commitment.

Fifth, given the nature and complexity of public perceptions of medical waste, resources need to devoted to improved communications planning. Such planning involves several elements. Most prominent among these are involving target audiences, selecting sources and channels, and designing clear messages.

Sixth, medical waste programs and policies should reflect the fact that concerns about medical waste will vary substantially from community to community. These variations will reflect differences among communities in public awareness, attitudes, environmental history, knowledge, and confidence in risk management institutions. Beach communities, for example, are likely to far more concerned about medical waste than other communities. Special programs will be needed to address these concerns.

Seventh, given that concerns about the medical waste are aggravated by physical or visible cues, efforts should be made to render medical waste that has been properly treated and inspected into a form that is unrecognizable, such as through grinding or combustion.

Eighth, medical waste policies and programs should reflect the fact that there is no such entity as "the public;" instead, there are many publics, each with their own interests, needs, concerns, priorities, and preferences. If communications about medical waste are to achieve their intended goals, they must be tailored and targeted to these diverse publics.

Ninth, given that most people are poorly informed about medical waste issues, greater attention needs to be given to developing messages in terms that people can understand. Messages should contain as few technical or scientific terms as possible. Although scientific and technical jargon may be useful as professional shorthand, it can pose substantial barriers to successful risk communication with the public. Greater attention also needs to be given to developing public and school education programs designed to increase scientific literacy as it relates to medical waste. At a minimum, such programs should provide information on concepts that are basic to scientific assessments of the risks of medical waste, such as exposure, transport and fate, and dose response. Information should also be provided on the tradeoffs that often have to be made in solving medical waste problems.

Tenth, greater attention needs to be given to where people get most of their information about medical waste, e.g., the mass media, friends, relatives, local officials, government agencies, or industry. Greater attention also needs to be given to who people trust as sources of information about medical waste, e.g., doctors, environmental groups, news reporters, or government officials. Medical waste policies and programs should be based on such information.

Eleventh, improved public understanding and knowledge about medical waste can not take the place of trust and credibility. People are often more interested in trust and credibility than in mortality statistics and the details of quantitative risk assessment. One implication of this finding is that greater attention and resources need to be given to activities that encourage and promote scientific consensus, consistency, and cooperation among competing sources of information about the risks of medical waste. Greater attention also needs to be given to creating opportunities for public participation and other processes that promote trust and credibility.

Twelfth, given that credibility is closely is linked to perceptions of shared values and opinions, education and communication programs should emphasize and address the specific values and concerns that people reveal through public meetings, media interviews, surveys, focus groups, and other communication channels. If people believe that medical waste is a serious risk that requires immediate attention, this attention has to be granted and the communication process has to address this need. Arguing that the risks are less severe than perceived is not an effective strategy. This does not imply that the risks should be overemphasized, but that communicators should be willing to listen to people and acknowledge the legitimacy of their fears, emotions, and concerns. The greater the degree to which people's fears, emotions, and concerns are taken seriously, the greater the chance that they will be willing to listen to messages about the risks of medical waste and the greater the chance that they will be willing to view these risks in perspective.

Thirteenth, medical waste education and communication programs should incorporate information about all factors that influence public perceptions of medical waste risks and problems. In addition to concerns about health, environmental, and aesthetic consequences, these include concerns about voluntariness, control, alternatives, fairness, equity, and other qualitative characteristics of risk. It is not sufficient to confine the communication process to the discussion of health or environmental probabilities and consequences. Communications should, at a minimum, include discussions about voluntariness, about possibilities for personal and community control, and about different management and monitoring options. Communications should also include information about the past behavior of responsible institutions. One value of such discussions is that people are often willing to accept involuntary risks if they have confidence in the institutions responsible for managing risks.

Fourteenth, greater efforts should be made to forge and maintain alliances among groups or organizations perceived to have high knowledge or trust on

medical waste issues. Where appropriate, efforts should be made to enlist trustworthy organizations as intermediaries.

Fifteenth, programs and communications sponsored by multiple organizations are typically more effective than programs and communications sponsored by a single organization. Credible messages that are issued jointly are considerably more persuasive than messages issued separately by different interest groups. People assign high credibility to unequivocal, clear messages supported and issued by groups perceived to have competing or conflicting interests.

Finally, given that significant numbers of people are deeply concerned about medical waste and want to play a larger role in the decision making process, efforts to inform such participation must be based on detailed information about what people think about medical waste, what they know, what they want to know, and what they want done. The success of medical waste policies, programs, and communications will depend on the degree to which these needs and issues have been adequately recognized, considered, and addressed.

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