Risk Management, Communication and Healthcare Waste Management During the Covid-19 Pandemic: Addressing the Information Gap

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Introduction

Accentuating the importance of adding healthcare waste management to current Covid-19 safety protocols is the underlying premise of this article. When the Coronavirus outbreak was first declared a global pandemic on March 11, 2020, the World Health Organization (WHO) propagated several key safety protocols aimed at curbing its spread and saving lives. Based on what was known about its etiology at the time, experts concluded that testing, physical distancing, facemasks, frequent handwashing, travel bans, isolation, lockdowns, quarantine, cleaning and disinfection must be at the core of safety protocols. Vaccination was later added as an essential safety protocol following the development of vaccines in the latter parts of 2020. Countries around the world adhered to the WHO safety protocols and used them as their underlying risk management framework. Since the onset of the pandemic to date, approximately six billion infections and six million deaths have been reported to the WHO and more that twelve billion vaccine doses have been administered globally (WHO, 2022). Treating, vaccinating and providing care for patients contributes to the generation of massive volumes of potentially infectious toxic and hazardous waste that require effective management provisions. This is an area where many developing countries have historically faced tremendous challenges the extent to which is widely documented (see for example, Abdulla *et al.,* 2008; Ahmed, 1997; Al-Khatib et al., 2009; Askarian *et al.,* 2004; Coker, 2009; Gupta & Boojh, 2003; Boadi, & Kuitenan, 2002; Da Silva et al., 2005; Diaz et al., 2005; Mohee, 2005; Socunya, Matias & Lapid, 1997). Yet, healthcare waste management is conspicuously missing from the safety protocols disseminated by the WHO. In February 2022, almost two years after the outbreak, the WHO noted that the COVID-19 pandemic has led to large increases in healthcare waste, straining under resourced healthcare facilities in least developed countries and exacerbating environmental impacts from solid waste (WHO, 2022). Such lack of attention creates an information gap that can potentially exacerbate the pandemic, especially in developing countries. Abridging the information gap requires a robust risk communication strategy that prioritizes healthcare waste management as an essential nonpharmaceutical intervention in the fight against Covid-19.

Healthcare Waste

Healthcare wastes are potentially infectious, hazardous and are generated during the diagnosis, treatment and immunization of humans and animals (Burke, 1994; Etter et al., 1992; Rutala & Weber, 1991). Infectious residue in healthcare waste contains pathogens such as bacteria, fungi, viruses and parasites in adequate concentrations to cause diseases to a potential host when there is a sufficient dose, presence of infectious agents, portal of exit, a mode of transmission, a portal of entry and a susceptible host (Pruss *et al.,* 1999). Examples of such waste include discarded human/animal pathological parts and organs, microbiology laboratory wastes, human blood, body fluids, facemasks, and sharps objects as well as materials and accessories that come into contact with such wastes (WHO, 2007; Pruss et al., 1999). Hazardous materials in healthcare waste may not necessarily cause infections but can nonetheless cause injuries, diseases to humans as well as deleterious effects on ecosystems and biota (Aumonier, 2003; Daughton & Ternes, 1999; WHO, 2007). Examples of such waste include discarded chemical, pharmaceutical and genotoxic residue as well as containers and materials used in the storage of such products are considered as BMW (Pruss et al., 1999). Other types of hazardous healthcare waste include pressurized containers, radioactive residue as well as wastes with high content of heavy metals such as mercury (Etter et al., 1992; Rutala & Weber, 1991; Pruss et al., 1999). Given its dangerous composition, experts

recommend adherence to a strict code of conduct for generators and handlers of healthcare waste (see table 1). Adherence to this code of conduct is a major problem for developing countries.
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Table 1: Code of Conduct for Generators and Handlers of Healthcare Waste. Pruss et al., 1999.

Generators	Incineration plant operators	Landfill Operators	General Public
Safe handling	**Waste handling**	**Waste handling**	**Public education Awareness**
Use of protective equipment	Safe receiving, handling, storage and loading techniques	Use of protective equipment	**Health hazards**
Segregation	**Plant Operation**	**Plant Operation** Health hazards	
Use of colour coded bags and/or containers	Safe removal of ashes and residues Detection of defects and malfunctions Operation of the plant	Safe procedures for landfill operation Procedures for emergency response	
Storage	**Maintenance**		
Prevention of public access	Inspection, cleaning, lubrication, Replacement		
Maintenance of security	Overhauls		
Transportation	**Safety and Emergency**		
Use of protective equipment	Use of protective equipment Contingency plans during breakdowns and maintenance Dealing with spillages accidents and other unforeseen incidents		
Health hazards			
Disinfection			
Prior treatment			
Safe Disposal			
	Administrative Procedures Record keeping License/regulations Reporting of accidents		

Public Health Risk Management

Risk management is a broad concept utilized across multiple disciplines and spheres. In the context of the environment and public health, risk management involves the blending of information from multiple sources, both scientific and non-scientific in identifying and crafting suitable intervention strategies to address challenges. The scientific component of risk management typically involves four stages: hazard identification or risk assessment; dose-response relationship; exposure analysis; and risk characterization (Hrudey, 1996; Lange & Dietrich, 2002; Russell & Gruber, 1987). The objective of identifying hazards and problems is to determine if available scientific information adequately addresses the causal relationship between a contaminant such as, the Coronavirus and an established impact on public health and/or ecosystems (Gosselin & Guidotti, 1999). The d*ose–response* assessment addresses the quantitative relationship between exposure and response especially under circumstances where adverse public health and ecological effects are affected. Gosselin & Guidotti, (1999) describes *exposure* assessment as a process whereby qualitative insight and quantitative data are sought on the degree, duration, frequency, sources and routes of exposure of contaminants. Finally, r*isk characterization* interprets the relationship between exposure, dose-response and other relevant information (Covello, 1989). It is worth emphasizing that although risk assessments cannot establish full scientific certainty, quantification can provide a basis for estimating the magnitude of an effect of exposure to contaminants (Russell & Gruber, 1987). This provides an avenue to identifying potential threats, set priorities and design suitable intervention strategies or provide a basis for further study (Lave, 1987; Russell & Gruber, 1987).

An essential non-scientific component of risk management is effective communication. This is crucial to the dissemination of vital information to the public as a means of changing attitudes and modifying individual and societal behaviours. During the 2014-2016 outbreak of Ebola Virus Disease in Guinea, West Africa for instance, officials coordinated communication strategies that addressed cultural differences (Bedrosian et al., 2016). This approach focused on identifying trusted local spokespersons and Ebola survivors who could relate to diverse communities and was successful in curbing the spread of the virus (Ibid., 2016). This underscores the importance of considering socio-economic and financial realities when communicating risk issues during public health emergencies. Failure to do so may produce undesired results. A case in point is the failure to promote healthcare waste management as a viable prevention option. While there is currently no strong evidence to support any assertion that healthcare waste mismanagement contributed to the spread of the Coronavirus, risks to public health and the environment cannot be ignored. As Cairns (1999) states: "Unrecognized risks are still risks; uncertain risks are still risks; and denied risks are still risks." Therefore, communicating risks about healthcare waste must be prioritized.

While communication is a vital component of risk management, it can nonetheless be complex and delicate undertaking especially under conditions of uncertainty and multiple studies have demonstrated its limitations especially during periods of crisis. These include the dissemination of incorrect information especially through social media and some mainstream media platforms. In a study, Winters et al (2018) assessed the effect of information sources on Ebola-specific knowledge and behavior during the 2014–2015 outbreak of Ebola Virus Disease (EVD) in Sierra Leone and concluded that while exposure to multiple information sources was associated with higher knowledge and protective behaviors, there were some misconceptions due to exposure to different mediums of communication. Similarly, in Wuhan, China, Shang, Li & Chen (2020) attribute the

devastating consequences of the virus to ineffective public health risk communication borne out of the Chinese government's monopoly of information. The authors noted that the reluctance on the part of government officials to disclose information to the public worsened the negative impacts of the outbreak and consequently, the lack of awareness and ignorance of self-protection ensured that the disease was able to infect others during gatherings and contact between people in an unperceivable way (Ibid. 2020). In the United States, Kim, Kyun & Kreps (2020) point to serious public health risk communication errors across multiple local, national and international governmental agencies in responding to complex health emergencies in the past few decades. At the same time, analyzing risks can be subjective and value laden and can contribute to polarization of views (Slovic, 2001). Experts and scientists can inject personal goals and interpretations during risk analysis (Lave, 1987). This was evident in the politicization of the pandemic response in different parts of the world especially, in the United States. Under such conditions, a risk communication strategy may exacerbate an already volatile situation and cause pulse outbreaks to reach chronic levels with devastating consequences. When the virus was first reported, scientists, experts, governments and the public scrambled for information due to its unknown origins, causes and treatment. Information was difficult to come by and perhaps this explains why healthcare waste management was not highlighted in the safety protocols. At the same time, the release of dichotomous information from multiple sources can create panic and confusion.

Despite its limitations, risk communication is critical during public health emergencies such as the ongoing pandemic. To offset these challenges, experts advise that for risk communication to be effective, there is a need for communicators to understand societal perceptions, values and concerns regarding the issue(s) at stake (Hance et al., 1989; Covello, 1989). One way of way of achieving this goal is through a two-way communication process where information, knowledge and experience are exchanged by all parties for informed decisions to be made (Leiss & Krewski, 1989). Essentially, a two-way communication can build public trust and contribute to the modification of behaviour. Conversely, a top-down or one-way communication approach involving the dissemination of scientific and technical information from experts to the public can generate misunderstanding, confusion, apathy and distrust (Covello, 1989; Jardin & Hrudey, 1997). It is also imperative that risk communicators are cognizant of the language used in the communication since reliance on technical jargons and quantitative analysis may be confusing, exacerbate fears and raise suspicions (Covello, 1989; Jardin & Hrudey, 1997; Suckling, 1992; Rogers, 2003). Further, risk communication must be facilitated in an atmosphere of honesty and transparency to quell scepticism and suspicion among the public (Hance *et al.,* 1989).

Conclusion

Healthcare waste management deserves urgent attention especially in developing countries during this pandemic. It must be considered as one of the most vital non-pharmaceutical intervention strategies at a time when the Coronavirus is rapidly mutating and presenting grave challenges. One way of achieving this is through a robust risk management approach that considers a vast array of socio-economic and technical factors. An efficient risk communication strategy is also needed as a means of disseminating information to populations in least developed countries where the lack of technical, financial and organizational resources remains a huge challenge. During public health emergencies such as infectious disease outbreaks, effective risk communication has been shown to act as a much-needed auxiliary, in addition to scientific methods. Whilst most developed countries have put in place adequate measures to ensure optimum outcomes in the management

process, the reverse is true in developing countries. This magnifies risks to populations in these countries and can have far-reaching global consequences as exemplified by Covid-19. It is essential for public health institutions including the WHO to recognize this pertinent gap and take measures to address it through a germane risk management framework. Effective communication must be an integral part of such a framework which must be tailored to meet the needs of least developed countries.

Works Cited

Abdulla, F., Qdais, H., & Rabi, A. (2008). Site investigation on medical waste management practices in northern Jordan. Waste Management, 28, 450-458

Ahmed, R. (1997). Hospital Waste Management in Pakistan. Case Study Report. Urban Waste Expertise Programme, UWEP, the Netherlands.

Al-Khatib, I., Monou, M., Alsubu, M.M., & Kassinos, D. (2009). Dental Solid and Hazardous Waste Management and Safety Practices in Developing Countries: Nablus District, Palestine. Waste Management and Research, vol 28, No 5 pp436-444

Askarian, M., Vakili, M., Kabir, G. (2004). Results of a hospital waste survey in private hospitals in Fars province, Iran. Waste Management, 24, 347-352

Aumonier, J.R. (2003). Risk management of pharmaceuticals in the environment: the human pharmaceutical industry viewpoint. Paper presented at the EnvirPharma, Lyon, France.

Bassey, B.E., Benka-Coker, M.O. and Aluyi, H.S. (2006). Characterization and management of solid medical wastes in the federal capital territory, Abuja Nigeria. African Health Sciences. 6(1)58-63

Bedrosian, Sara R., et al. "Lessons of Risk Communication and Health Promotion — West Africa and United States." MMWR Supplements, vol. 65, no. 3, 8 July 2016, pp. 68–74., https://doi.org/10.15585/mmwr.su6503a10.

Boadi, & Kuitenan. (2002). Urban Waste Pollution in the Korle lagoon, Accra Ghana. The Environmentalist, (22) 301-309

Burke, E.L., (1994) A survey of recent literature on medical waste. Journal of Environmental Health 56 (9), 11-14

Cairns, J.J., (1999). Absence of certainty is not synonymous with absence of risk. Environmental Health Perspectives, 107 (2), A56-A57.

Coker, A. (2009). Medical waste management in Ibadan, Nigeria: obstacles and prospects. Waste Management 29, p.804-811

Covello, V.T. (1989). Informing people about risks from chemicals, radiation, and other toxic substances: a review of obstacles to public understanding and effective risk communication. In: W. Leiss (Ed.), Prospects and problems in risk communication (pp. 1-49). Waterloo: University of Waterloo Press.

Da Silva, C., Hoppe. A., Ravanello, M & Mello, N. (2005). Medical waste management in the south of Brazil. Waste Management, 25, 600-605

Daughton, C.G., & Ternes, T.A. (1999). Pharmaceuticals and personal care products in the environment: Agents of subtle change? Environmental Health Perspectives, 107,907-938.

Diaz, L.F., Savage, G.M., & Eggerth, L.L. (2005). Alternatives for the treatment and disposal of healthcare wastes in developing countries. Waste Management, 25: 626- 637

Etter, R.G., Kisser, J.V.L., & Shuler, S.E. (1992). Medical Waste combustion. Current and future prospects. Waste Age 21, 77-78

Gupta, S., & Boojh, R. (2006). Biomedical Waste Management Practices at Belrampur Hospital, Lucknow, India". Waste Management and Research 54: 584-591

Hance, B. J., Chess, C., & Sandman, P. M. (1989). Setting a context for explaining risk. Risk Analysis, 9(1), 113-117.

Hassan, M., Ahmed, S., Rahman, K., & Biswas T. (2008). "Pattern of Medical Waste Management: Existing Scenario in Dhaka City, Bangladesh" Public Health 8:36

Henschel, K.-P., Wenzel, A., Diedrich, M., & Fliedner, A. (1997). Environmental hazard assessment of pharmaceuticals. Regulatory Toxicology and Pharmacology, 25, 220- 225.

Hrudey, S.E. (1996). A critical review of current issues in risk assessment and risk management. In D. Del Bel Belluz & J.H. Shortreed (Eds.), Technical for risk issues in business and regulatory decision-making (p. 17-31). Waterloo: Institute for Risk Research. http://www.riskworld.com/Nreports/1997/risk-rpt/pdf/EPAJAN.PDF

Jardine, C.G., & Hrudey, S.E. (1997). Mixed messages in risk communication. Risk analysis, 196 17(4), 489-498.

Jobling, S., Nolan, M., Tyler, C.R., Brightly, G., & Sumpter, J.P. (1998). Widespread sexual disruption in wild fish. Environmental Science and Technology, 32, 2498-2506.

Klangsin, P., Harding, A.K. (1998). "Medical waste treatment and disposal methods used by hospitals in Oregon, Washington and Idaho". Journal of Air and Waste Management Association 48, 516-526.

Kim, Do Kyun, and Gary L. Kreps. "An Analysis of Government Communication in the United States during the COVID-19 Pandemic: Recommendations for Effective Government Health Risk

Communication." World Medical & Health Policy, vol. 12, no. 4, 2020, pp. 398–412., https://doi.org/10.1002/wmh3.363.

Lange, R., & Dietrich, D. (2002). Environmental risk assessment of pharmaceutical drug substances—conceptual considerations. Toxicology Letters, 131, 97-104.

Leiss, W., & Chociolko, C. (1994). Risk and responsibility. Montreal & Kingston: McGillQueen's University Press.

Manyele. S.V. (2004). Effects of improper hospital-waste management on occupational health and safety. African Newsletter on Occupational Health and Safety. 14: 30-33

Mao, I., Chen, C., Lin, Y & Chen, M. (2007). Airborne particle PM 2.5/PM10 mass distribution and particle-bound PAH concentrations near a medical waste incinerator. Atmospheric Environment (41) 2467-2475

Mato R., Kassenga, G. (1997). A Study on the problems of management of medical solid wastes in Dar es Salaam and their remedial measures. Resource, Conservation and Recycling 25, 271-287

Mato, R., & Kaseva, M. (1999). "Critical review of industrial and medical waste practices in Dar es Salaam City". Resource, Conservation and Recycling 25, 271-287

Mbongwe, B., Mmereki, B., & Magashula, A. (2008). Healthcare Waste Management: Current Practices in Selected Healthcare Facilities, Botswana. Waste Management 28, 226-233

McLean, M., Watson, H.K. and Muswema, A. (2006). Veterinary waste disposal: practice and policy in Durban, South Africa (2001-2003). Waste Management 27: 902- 911

Mohee, R., (2005). "Medical wastes characterization in healthcare institutions in Mauritius". Waste Management, 25, 575-581

Muhlich, M., Scherrer, M., Daschner F.D. (2003). "Comparison of infectious waste management in European hospitals". Journal of Hospital Infections 55: 260-268.

Nemathaga, F., Maringa, S., & Chimuka L. (2007). Hospital Solid Waste Management Practices in Limpopo Province: A Case Study of Two Hospitals. Waste Management

Pruss, A., Giroult, E., & Rushbrook, P. (1999). Eds. "Safe Management of Wastes from Health-care Activities" World Health Organization, Geneva

Rogers, M. D. (2003). Risk analysis under uncertainty, the Precautionary Principle, and the new EU chemicals strategy. Regulatory Toxicology and Pharmacology, 37, 370-381.

Rutala, W.A., & Weber C. (1991). Infectious waste – mismatch between science and policy. The New England Journal of Medicine, 325, (578-581)

Sanderson, H., Johnson, D. J., Reitsma, T., Brain, R. A., Wilson, C. J., & Solomon, K. R. (2004). Ranking and prioritization of environmental risks of pharmaceuticals in surface waters. Regulatory Toxicology and Pharmacology, 39, 158-183.

Slovic, P. (2001). The risk game. Journal of Hazardous Materials, 86, 17-24.

Socunya, R., Matias, L., & Lapid, D. (1997). Hospital Waste Management in the Philippines: Two Case Studies in Metro Manila. Urban Waste Expertise Programme, UWEP. The Netherlands.

Soliman, S., Ahmed, A. (2007). "Overview of Biomedical Waste Management in Selected Governorates in Egypt: A Pilot Study" Waste Management 27 1920-1923

Sumo, John et al. "Risk communication during disease outbreak response in post-Ebola Liberia: experiences in Sinoe and Grand Kru counties." The Pan African medical journal vol. 33,Suppl 2 4. 28 May. 2019, doi:10.11604/pamj.supp.2019.33.2.16877

Suckling, C.W. (1992). Toxicity, toxicology and nutrition, in Risk: analysis, perception and management, The Royal Society: London. P.35-65

Tamplin S., Davidson, D., Powis, B & O'leary, Z. (2005). Issues and options for the safe destruction and disposal of used injection materials". Waste Management 25: 655- 665.

Winters, Maike, et al. "Risk Communication and Ebola-Specific Knowledge and Behavior during 2014–2015 Outbreak, Sierra Leone." Emerging Infectious Diseases, vol. 24, no. 2, Feb. 2018, pp. 336–344., https://doi.org/10.3201/eid2402.171028.

World Health Organization. (2007). "Wastes from Healthcare Activities" Fact sheet No 253. November 2007 accessed April, 2008

World Health Organization. (2022). "WHO Coronavirus (COVID-19) Dashboard September 2020 accessed September 2020. https://covid19.who.int/

World Health Organization. (2022). "Global analysis of health care waste in the context of COVID-19.: status, impacts and recommendations. Geneva: 2022. Licence: (CC BY-NC-SA 3.0 IGO). February 2022. Accessed May 2022