BRIEF: WASTE MANAGEMENT CONSIDERATIONS FOR ORAL HEALTH PROFESSIONALS IN RWANDA

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Background:

His Excellency, the President of the Republic of Rwanda, recently met with all in-country doctors (November 7, 2019) and directed that recommendations be developed for medical waste management in Rwanda. This paper is in humble response to His Excellency's call to action.

Environmental pollution is one of the most pressing global issues today. Through the degradation of food, water, and air quality, environmental issues pose a serious and imminent risk to human health, especially for the most vulnerable populations globally. Every industry must actively work to reduce its environmental harm.

A surprising and overlooked source of this pollution is the international dental community, which produces plastic, mercury, lead, and silver waste. These pollutants threaten the health of organisms, including humans. For example, mercury and lead impair the brain development of children. These pollutants also threaten the stability of various economies, especially in low-middle income countries (LMICs), where workers rely on a healthy environment for land and marine life.

Recently, there is a global push to develop oral health initiatives given that dental caries is the most common non-communicable disease worldwide affecting 3.5 billion people. As these initiatives expand, there is urgent need for dental waste management policies. This is especially true in LMICs that are disproportionately impacted by oral disease as well as environmental degradation.

The University of Rwanda's School of Dentistry (UR SOD) is an example of a new oral health initiative. In 2018, the university graduated the first class of pioneer dentists for the country, effectively doubling the number of national dentists in Rwanda. As the new dental program expands, and as Rwanda expands its national dental infrastructure, it is a critical and most opportune time for Rwanda to initiate environmentally-friendly dental materials and dental waste policies. By being among the first nations to ban plastic bags, Rwanda established itself as environmentally progressive, and now has the opportunity to establish vital and robust environmentally protective dental waste policies for the nation.

Types of Dental Waste:

Plastic: Consumer dental products, such as toothbrushes and toothpaste, are usually made of plastic. Toothbrushes are typically not recyclable because they become entangled in the machinery. Globally, 23 billion toothbrushes and their wrappings are discarded every year, and in the US alone, the number of discarded toothbrushes is enough to circle the earth four times. Toothpaste tubes are also not recyclable, as they typically contain an interior layer of aluminum, and toothpaste itself contains harmful plastic microbeads. In addition to consumer waste, dental

offices produce unnecessary plastic waste, including patient bibs, headrest covers, syringes, pouches, suction tips, and saliva ejectors. Dental plastic waste, and plastic waste in general, is widespread and must be addressed.

Mercury: Mercury is a major component of dental amalgam. When amalgam is placed and removed, mercury waste is generated. Improper disposal of the mercury is a major concern. Through landfill, wastewater, or incineration disposal methods, mercury pollutes the land, water, and air, respectively. Through these pathways, mercury can enter humans and other organisms, leading to issues such as neurotoxicity, reproductive toxicity, and hypertension.

Lead and Silver: In the dental office, lead and silver products are found in x-ray products such as films, solutions, and protective lead aprons. For example, x-ray films contain up to 77% lead by weight. The improper disposal of these products causes lead and silver to accumulate in the environment, threatening the health of organisms, including humans. For instance, lead can cause anemia and neurological deficits in children.

Recommendations:

Waste Prevention: Every dental office should conduct a dental waste audit, as it would be difficult to reduce waste without knowing what types of waste are being produced. Specifically, these audits would allow offices to estimate total waste production, create concrete and reasonable waste reduction goals, and monitor progress towards goals. Audit steps could include weighing the total amount of waste produced daily, sorting this waste into different categories, and calculating the proportion of each category by weight (consult the Green Healthcare Programme for further details).

To reduce general office waste, offices should purchase items in bulk and request that supply companies combine orders to reduce packaging and shipping frequency. Purchasing in bulk could also be applied to masks, gloves, and other general medical items that must be disposable for sanitary reasons.

We also recommend several approaches for reducing dental-specific waste. To reduce plastic waste, offices can purchase alternative products such as biodegradable cups, biodegradable or bamboo toothbrushes, microbead-free toothpaste, washable cloth patient bibs and headrest covers, and sterilizable metal suction tips. In this way, offices can minimize environmental impact while simultaneously reducing supply and waste management costs. To reduce mercury waste, offices should install amalgam separators, chairside traps, and vacuum filters, as well as consider mercury-free restorative materials, such as resin composites and glass ionomers. To reduce lead and silver waste, offices should replace conventional film with digital imaging, which would also reduce radiation exposure. As Rwanda's information technology sector continues to expand, digital imaging would blend seamlessly with electronic health records and inspire future digital use in healthcare.

Waste Handling: Minimizing environmental impact is not just about reducing waste production, but also ensuring that produced waste is properly handled. For example, to collect mercury waste, dentists should install amalgam separators as well as chairside traps and vacuum filters, which would capture larger amalgam pieces that escape suction tips. Once collected, mercury-laden amalgam can be stabilized with sulfides. Furthermore, we recommend that dentists send all hazardous waste to properly outfitted waste disposal companies. The development of these

companies in Rwanda should be a priority moving forward, which would allow dentists to properly dispose of mercury and other hazardous dental waste, such as lead and silver.

To improve plastic handling methods, offices should switch from garbage disposal to recycling, whenever possible. We recommend the development of dental product recycling programs as well. Ideally, these programs would allow dentists to return plastic waste to be recycled into new dental products.

Educational Reforms: It is imperative to ensure that future oral health professionals embrace environmentally-friendly habits. Education has the power to instill such habits, so we ask UR SOD to take initiative and develop curricula centered around proper waste disposal. This curriculum should teach students about the following:

- The importance of protecting the environment
    - How organism and human health is linked to environmental health
    - How dentistry plays a role in environmental impact
    - How environmental degradation affects oral health
- The types of dental waste produced by dentists and consumers
- Ways to reduce waste generation
    - Available alternative materials
- Proper disposal techniques
- Ways to become environmental leaders within the community and promote environmentally-friendly dentistry
    - How to educate patients about environmental issues and encourage the use of environmentally-friendly dental products
    - How to develop Study Club materials or professional development courses on waste reduction and management for practicing colleagues

Policy Implementation: The Government of Rwanda (GOR) is ready to prioritize the management of dental waste. By enacting policies that improve environmental protection and accountability, Rwanda can lead on this critical issue, both regionally and internationally. GOR can build on the legacy of its plastic bag ban and its newly enacted single-use plastic ban by considering the implementation of a ban related to plastic dental products. For example, Rwanda could join New Zealand, the UK, and the US in banning microbeads in toothpaste and other personal care products. Additionally, GOR could encourage companies to create environmentally-friendly dental products with minimal packaging, and implement national awareness campaigns to encourage the use of such products.

For the dental community, GOR should develop national guidelines regarding dental waste. Recently, the Ministry of Health established the National Guidelines on Health Care Waste Management. Moving forward, the Ministries of Health and Environment could create national, dental-specific waste management guidelines. Such guidelines would improve the dental community's understanding of dental waste management, reduction, and disposal, and in turn protect the environment and the health of all Rwandans.

Conclusion:

Dental waste is an overlooked and pervasive issue that must be addressed. The dental community in Rwanda, and the international dental community at large, must actively mitigate negative environmental impacts. Crucial solutions including reducing waste, properly handling waste, and implementing educational initiatives and policy reforms. With LMICs being disproportionately

impacted by global environmental degradation, thoughtful dental waste policies are a moral and ethical imperative to protect the environment and every organism living in it.

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