African Union

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

Waste Management for COVID-19 in Healthcare Settings for Africa

FAQs Frequently Asked Questions

How can we estimate how much health care waste is being produced?

Inpatient facilities caring for COVID-19 patients produce around 2.5kg of waste each day, in outpatient clinics it can be much less, around 0.2kg per day (1). Of this between around 75-80% is non-hazardous general waste, and about 20-25% is hazardous, this could be infectious or sharps waste (around 1%) or in tertiary facilities even radioactive or cytotoxic waste from cancer care for example (2-4).

These estimates must be refined in light of specifics at each healthcare facility. For example, intensive respiratory care may produce even more waste per bed and vaccination sites will produce a higher proportion of sharps waste compared to a general facility (4). Health facilities in higher income areas may produce more waste per bed (4,5).

To create specific estimates, keep accurate records of the amount and types of waste being generated over time. These records can then help to create accurate forecasting and develop localized plans for management. There are tools available to help monitor the amount and types of waste being created (2,3,5).

How can we reduce quantities of health care waste?

Health care waste can be difficult to treat and dispose of safely. The environmental and health impacts of waste put extra pressure on resources. Therefore, it is important to try and reduce the quantities of waste wherever possible. Ensure waste is segregated properly at the point of disposal (more details about the segregation of wastes is available below). It is cheaper and easier to manage general waste through a municipal waste system than infectious or sharps waste which needs treatment before final disposal. Organic general wastes like food and paper can be composted rather than being wasted. Non- hazardous general waste may also be sorted for recycling (5).

Where possible procure high quality reusable PPE and put this in a local system for decontamination. This will reduce pressure on resupply as well as waste. Where possible use filtered rather than bottled water and reduce use of items like disposable food containers and cutlery. Negotiate during procurement to reduce unnecessary packaging and to plan so that any stocks do not expire. Other tips for reducing quantities of health care waste may be considered (6).

How has COVID-19 impacted the types and volumes of health care waste?

Quantities of solid waste being generated by health facilities have increased across the globe during response to COVID-19. This is largely due to greater use of PPE in both general care and during treatment of COVID-19 patients. Greater use of items such as single use food packaging has also increased pressure on municipal waste systems (7). Many countries have reported challenges managing the quantity any types of waste being generated during the COVID-19 response (7-8).

Novel strategies, such as autoclaving infectious waste to allow subsequent sorting and recycling of material, using waste to generate energy and even using incinerator ash in cement production have been tried in various countries to overcome the problem of additional health care waste (8).

How should COVID-19 waste that is produced at the point of care be segregated?
COVID-19 waste (i.e., plasters, testing supplies) that are potentially contaminated with the virus should be considered infectious/biohazard waste and placed into an infectious waste bin, that is clearly labelled, and placed in a secured area at the point-of-care to ensure no contamination. A leak-proof bag should be placed in the infectious waste bin (9). Preferably, a three-coloured bin system will be used, whereby one bin will hold infectious waste, one bin will hold general waste, and the final bin will be for sharp waste (10). All bins should have a cover. Ensure that a color-coding chart is close by to inform HCWs and patients what type of waste each colour bin holds. If three-coloured bin systems are not available, clearly label the bins, including pictures of the specific items that should go into each bin to ensure both patients and HCWs can identify the specific items to go into each. Of note, healthcare waste produced in waiting areas can be considered non-infectious. It should be bagged, sealed, and correctly disposed of correctly (10).

For sharps used during COVID-19 patient care, all sharps should be placed in a puncture-proof container, that is clearly labelled for sharps only and is single use (11). Once the sharps container is ¾ full, it should be properly sealed and disposed of as per the HCF policy (11). All HCWs involved in waste management activities should wear the appropriate PPE for that activity (10, 11).

If bio-hazard bags are in short supply for infectious COVID waste, can they be reused?
No. If bio-hazard bags are in short supply, then use another form of rubbish bag, preferably one that is made of thick, strong, impermeable material, and label the bin to indicate that it contains infectious/biohazard waste (11). Never take out the rubbish in any bio-hazard bag, dispose of it in an incinerator or final storage area, and never reuse the bag. This creates opportunities for HCW infections from infectious materials collected in the bag. If the bio-hazard bag is not available, general waste bag should be used and a big tag should be used as well to label the bag for proper handling (12).

All HCWs whose job is to transport waste must always wear correct PPE, including rubber gloves, goggles and a mask; impermeable apron or impermeable gown and close toed shoes or rubber boots. Separate waste into that which is reusable PPE, including goggles or reusable face shields and aprons or gowns if reusable, and that which is not (12).

How should COVID waste be transported through the HCF to a final storage area?
Waste handlers should move waste from areas of production to storage areas, at least once daily, more frequently, if volume of waste is high. Use a cart or wheel barrel to transport waste. No containers or bins within HCF rooms should ever overflow (12).

All non-reusable waste should be placed in sealed bins at the site where it is being disposed of. Bins should be emptied outdoors into larger containers and transported to where it will be incinerated or stored (12). Clean and disinfect reusable items. Transport clean and disinfected PPE back to storage for reuse. Transport non-reusable waste to the incinerator on site if there is one, or to the site where vehicles take waste away (13).

How can COVID waste be quickly removed to an offsite storage area?
For transport of non-reusable waste from HCF to final storage or treatment facilities, including swabs and cartridges, identify established safe waste management processes among the MoHs and partners in countries. Focus on logistics (i.e., waste management among partners), recycling, and policy development with partners (13).

How should COVID-19 waste be stored?
Medical waste caused by COVID-19 should be handled as infectious waste and stored separately from other waste. Such waste should not be stored for more than 24 hours within the working premises be it clinic, wards, sample collection site, or vaccination post. Sharps should be stored separately in specifically constructed sharps containers (14). The waste collection bin should be secured to avoid entry into the area by clients, patients or their relatives, community members, any unauthorized persons, or animals (13,14).

How can medical waste caused by COVID-19 be safely stored at a healthcare facility?
Storage of COVID-19 generated waste should not be accumulated within the working premises except a designated central storage area. The waste must be collected on a regular basis and transported to a central storage area within the HCF before being treated or removed. The collection must follow specific routes through the HCF to reduce the passage of infectious waste through wards and other clean areas. Infectious wastes must be collected in leak-proof containers carefully sealed and transported to a central storage facility or delivery point in a way that prevents direct contact. The dedicated place to store medical waste caused by COVID-19 should be lockable and with no possibility for animals or insect access (14).

How should COVID-19 waste be treated?
For infectious waste like that of COVID-19, incineration should be used. No chemical disinfectants should be used unless the waste is in liquid form. Rapid construction of brick or clay incinerators may be helpful. Residual waste remaining after incineration treatment options is mostly disposed of on land. This should be in a controlled or sanitary landfill, if available. Only general waste produced during caring for COVID-19 patients should be buried in municipal landfills (if possible). It should be noted that another landfill or burial site should be designated for only infectious waste. Instructions for burial of COVID-19 waste should also be followed (14).

How do we treat general waste from the healthcare facility before disposal?
No treatment for general wastes. It is disposed as normal waste through the general waste bin (14).

What are the possible options for the treatment of the medical wastes during COVID-19?

Method One
Incineration: This is a procedure of burning (combustion) of waste in an incinerator. Incineration and other high-temperature waste treatment methods are referred to as thermal treatment of waste (15).

What is an incinerator?
Incinerator is a specialized facility of equipment designed to burn the waste at a high temperature of at least 1,560^{0}F (850^{0}C) (15).

What are the sizes of incinerator?
The size of the incinerator depends on the size of the healthcare facility most of the time and also if the medical waste disposal is handled on-site (in the facility) or off-site (out of the facility, may be in a specified area by the healthcare facility management), the amount of waste generated, and there may be local or national laws that mandate or regulate the size of the incinerator and where it should be located (15).

How is the debris of the incinerator handled?
The waste in the incinerator is reduced by 85% – 90% after combustion. This debris can be reduced further if the recyclable materials such as metals could be removed from the ash before the ash is sent to the landfill. Some countries use the ash for agricultural purposes (15).

Method Two
Autoclaving: This is a procedure of decontaminating infectious wastes, sharps or materials or objects that are contaminated with body fluids or tissues using moist heat (16).

What are Autoclaves?
Autoclaves are equipment used to sterilize medical equipment and supplies by subjecting them to pressurized saturated steam at 121 °C (250 °F) for between 15 to 20 minutes or 134 °C for 5 to 10 minutes depending on the size of the load to be autoclaved or the nature of the materials to be sterilised (16,17). It is allowed to use this equipment to treat infectious waste to prevent disease transmission and keeping the waste handlers safe (18).

What are the examples of medical wastes that can be treated by autoclaving?
Infectious wastes, cotton wools with bloods, sample bottles with human specimen (blood, body fluids), laboratory wastes, plasters and wound dressings, and some other medical wastes. Wastes that have been autoclaved appropriately (with the right temperature and right time) could be handled as non-infectious wastes (19).

What are the wastes that cannot be autoclaved?
Medical Waste that cannot be autoclaved are chemicals, pharmaceutical and radioactive wastes (20). Contact your local authority to arrange collection of these wastes, they must be stored securely.

What are the sizes of autoclave?
Size of autoclaves varies between 5 litres to 5000 litres depending on the purpose, the size of the waste to be treated or the equipment to be sterilised by autoclaving (21).

Method Three
What does chemical waste treatment mean?
Chemical treatment: This is an option used to decontaminate liquid wastes before transporting the waste out of the healthcare facility (22). This method is cheap, but it must be done correctly. Safety guidelines and specifications regarding chemical treatment should be available at every facility. Most common types of chemicals used in treating liquid medical wastes are chlorine, calcium oxide and sodium hydroxide. Staff must be trained on how this is done before applying this method (23).

Method Four
Microwave oven treatment (dry heat): This is similar in nature to autoclave but microwave uses dry heat instead of the moist heat used by the autoclave. The dry heat decontaminates various types of medical waste but care must be taken when the temperature is selected (23).

What are the examples of medical wastes that can be treated by microwave oven?
Infectious wastes, cotton wools with bloods, laboratory wastes, Plastic sample bottles with human specimen (blood, body fluids), plasters, wound dressings and some other medical wastes can be treated by microwave. However, these wastes should be placed in microwave friendly containers before microwaving the waste for safety against fire (24). Microwave method of waste treatment works better for solid wastes that are not completely dry. The moisture in the waste enables the heat to penetrate deeper into the wastes making the treatment more effective. It is advisable to sprinkle water on the medical waste before microwaving to achieve desirable results (24).

Method Five
Irradiation waste treatment
What does irradiation waste treatment mean?
Irradiation treatment: This method of medical waste treatment focuses on the application of gamma radiation to deactivate microorganism that may be present in the waste and also kill the living cells in the waste. The process is not common like those discussed previously because it is expensive to install, requires strong regulations and skilled personnel to use (25).

What are the methods of disposal for the treated wastes from Healthcare setting?
The treated waste from the healthcare setting could be treated same way as the general wastes and therefore follow the methods of waste disposal for general wastes such as burying in landfill, grinding for agricultural purposes, recycling of the useful part of the waste etc (26).

References

1. Programme UNE. Waste Management during the COVID-19 Pandemic (2021) from reseponse to recovery [Internet] Available from: https://wedocs.unep.org/bitstream/handle/20.500.11822/33416/WMC-19.pdf?sequence=1&isAllowed=y

2. Emmanuel J, Pieper U, Rushbrook P, Stringer R, Townend W, Wilburn S, et al., (2014) Safe management of wastes from health-care activities [Internet], Available from: https://apps.who.int/iris/bitstream/handle/10665/85349/9789241548564_eng.pdf;sequence=1

3. IFRC. MEDICAL WASTE MANAGEMENT (2011) Annex 3.1 p129. [Internet], Available from: https://www.icrc.org/en/publication/4032-medical-waste-management

4. World Health Organisation (WHO) (2016) Protecting People Through Health Care Waste Management: Key facts [Internet]. Available from: https://washinhcf.org/wp-content/uploads/2019/03/Pieper_WHO-Global-HWCM_IHCWM_April2016.pdf

5. Healthcare Without Harm. Measuring and Reducing Plastics in the Healthcare Sector [Internet] (2021) Available from: https://noharm-europe.org/sites/default/files/documents-files/6886/2021-09-23_Measuring-and-reducing-plastics-in-the-healthcare-sector.pdf

6. Kalantary RR, Jamshidi A, Mehdi M, Mofrad G, Jafari AJ. (2021) Effect of COVID-19 pandemic on medical waste management: a case study; 831–6.

7. Maalouf A. Impact of COVID-19 pandemic on medical waste management in Lebanon 2021; 0(0).

8. Kumar A, Islam N, Billah M, Sarker A., (2021) Science of the Total Environment COVID-19 pandemic and healthcare solid waste management strategy – A mini-review. Sci Total Environ [Internet]; 778:146220. Available from: https://doi.org/10.1016/j.scitotenv.2021.146220

9. WHO. (2014). Safe management of waste from healthcare activities. 2nd edition. Edited by: Yves Chartier, Jorge Emmanuel, Ute Pieper, Annette Prüss, Philip Rushbrook, Ruth Stringer, William Townend, Susan Wilburn and Raki Zghond. 9789241548564_eng.pdf;sequence=1 (who.int)

10. World Health Organisation (WHO) (2020) Water, sanitation, hygiene, and waste management for SARS-CoV-2, the virus that causes COVID-19 Interim guidance. Water, sanitation, hygiene, and waste management for SARS-CoV-2, the virus that causes COVID-19 (who.int)

11. IGES. (2020). Waste management during the COVID-19 pandemic: from response to recovery. United Nations Environment Program. ISBN No: 978-92-807-3794-3

12. Ministry of Ecology and Environment of the People's Republic of China, (2020) Guide on Management and Technical on Emergency Treatment and Disposal of Medical Waste Caused by COVID-19 (Trial) http://bcrc.tsinghua.edu.cn/en/atm/7/20200315220825173.pdf

13. Guide on Management and Technical on Emergency Treatment and Disposal of Medical Waste Caused by COVID-19 (Trial) http://bcrc.tsinghua.edu.cn/en/atm/7/20200315220825173.pdf

14. Waste Management during the COVID-19 Pandemic from Response to Recovery. United Nations Environment Program. Institute for Global Environmental Strategies https://wedocs.unep.org/bitstream/handle/20.500.11822/33416/WMC.pdf?sequence=1&isAllowed=y

15. Liu et al., (2018) Characteristics and treatment methods of medical waste incinerator fly ash: A review. Processes, 6(10), 173. Available from: https://www.mdpi.com/2227-9717/6/10/173

16. National Research Council. (2000) Waste Incineration Overview. In Waste Incineration & Public Health. National Academies Press (US). Available from: https://www.ncbi.nlm.nih.gov/books/NBK233614/

17. Jang, Y. C., Lee, C., Yoon, O. S., & Kim, H. (2006) Medical waste management in Korea. Journal of environmental management, 80(2), 107-115.

18. Medical Waste incineration (2021) Inciner8. Available from: https://www.inciner8.com

19. Qiu, W., Cappello, J., & Wu, X. (2011) Autoclaving as a chemical-free process to stabilize recombinant silk-elastinlike protein polymer nanofibers. Applied physics letters, 98(26), 263702.

20. Windfeld, E. S., & Brooks, M. S. L. (2015). Medical waste management–A review. Journal of environmental management, 163, 98-108.

21. Oyawale, F. A., & Olaoye, A. E. (2007). Design and construction of an autoclave. available from http://ir.library.ui.edu.ng/handle/123456789/2008

22. Wang, J., Shen, J., Ye, D., Yan, X., Zhang, Y., Yang, W., Li, X., Wang, J., Zhang, L., & Pan, L. (2020). Disinfection technology of hospital wastes and wastewater: Suggestions for disinfection strategy during coronavirus Disease 2019 (COVID-19) pandemic in China. Environmental pollution, 262, 114665.

23. Ilyas, S., Srivastava, R. R., & Kim, H. (2020). Disinfection technology and strategies for COVID-19 hospital and bio-medical waste management. Science of the Total Environment, 749, 141652.

24. Ghernaout, D., & Elboughdiri, N. (2020). Urgent proposals for disinfecting hospital wastewaters during COVID-19 pandemic. Open Access Library Journal, 7(5), 1-18.

25. Gyawali, S., Rathore, D. S., Shankar, P. R., Kc, V. K., Jha, N., & Sharma, D. (2016). Knowledge and practice on injection safety among primary health care workers in Kaski District, Western Nepal. *The Malaysian journal of medical sciences: MJMS*, *23*(1), 44.

26. Minoglou, M., Gerassimidou, S., & Komilis, D. (2017). Healthcare waste generation worldwide and its dependence on socio-economic and environmental factors. *Sustainability*, *9*(2), 220.