INFECTION CONTROL AND MEDICAL WASTE MANAGEMENT PLAN (ICWMP)

DRAFT VERSION

Subcomponent 2.2. Public Health Preparedness

Croatia Earthquake Recovery and Public Health Preparedness Project (P173998)

REPUBLIKA HRVATSKA
Ministarstvo
zdravstva

MINISTRY OF HEALTH

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Contents

1 INTRODUCTION

1.1 Project context

The World Bank (WB) is providing support to the Government of Croatia in implementing the "Croatia Earthquake Recovery and Public Health Preparedness Project". Project consists of three components, of which Component 2 Public Health Surveillance and Preparedness has a purpose of strengthening core public health preparedness and health system capabilities for Ordinance on medical waste management (OG 50/15, 56/19) the prevention and effective management of future infectious disease outbreaks and will support the provision of:

- medical equipment and supplies;
- national guidelines for surveillance updated for 15 health conditions;
- sentinel surveillance sites for respiratory viruses for quarterly reports;
- assessment of surveillance system (domestic and international);
- surveillance sites established for gender-related violence;
- COVID19 cases reported and investigated per approved protocol (disaggregated by gender) (Percentage);
- emergency medical service vehicles, isolation units and telemedicine;
- emergency medicine training;
- personal protective equipment;
- repair and rehabilitation of public health laboratories.

1.2 Project component 2

Component 2 consists of two sub-components:

Subcomponent 2.1: Case management and Surveillance

This subcomponent will focus on case detection and confirmation, contact tracing, recording and reporting capabilities, and surveillance to strengthen the Government's capacity to promptly and proactively manage future outbreaks. Also, this component will ensure repair and rehabilitation of public health laboratories.

This subcomponent will:

- strengthen disease surveillance systems and equipment, public health laboratories and epidemiological capacity for early detection and confirmation of cases;
- support the repair and rehabilitation of public health laboratories1;
- support the development of systems for active contact tracking and reporting of new cases;
- support epidemiological and laboratory investigation of selected health conditions.

Subcomponent 2.2: Public Health Preparedness

This subcomponent will support the health care system for preparedness planning to provide optimal medical care, maintain essential community services, and minimize risks for patients and health

[1] "Rehabilitation'" is structural strengthening of existing buildings to meet a higher seismic performance.

personnel, in part by training health facilities staff and frontline workers on risk mitigation measures and providing them with supplies and equipment for future emergencies.

This subcomponent will include:

- providing emergency medical vehicles, medical and laboratory equipment and supplies, medicines, technical assistance and training to public health officials and health care workers, all to strengthen capacity of the health system to respond to public health outbreaks;
- providing personal protective equipment (PPE) and gear for health care workers and public health rapid response personnel (such as relevant medical specialists, veterinarians, and entomologists);
- providing equipment and supplies for telemedicine to monitor and support patients to support the health system as needed;
- repurposing and equipping selected health care facilities to deliver critical medical services and cope with increased demand for services in a public health outbreak;
- supporting institutional and organizational restructuring of facilities for managing public health emergencies and training of health care staff, accordingly, including sector-wide planning activities for medium- and long-term needs.

1.3 Objective and purpose of ICMWMP

The Infection Control and Medical Waste Management Plan overall objective is to prevent and/or mitigate the negative effects of infection spreading and medical waste on human health and the environment. This Infection Control and Medical Waste Management Plan (ICWMP) will be developed to address the risk of COVID-19 spreading, system-level control of infectious diseases and potential inadequate medical waste management.

The plan includes advocacy for good education and compliance system in infection control and medical waste management and is to be used by employees of health institutions including (but not limited to) health, sanitary and cleaning workers who manage medical waste in mobile and fixed units, as well as health centres that are included in the project. All the health facilities and health services supported through the World Bank project are to have appropriate procedures and capacities in place to adequately manage medical waste in line with national and WB policies. The plan includes infrastructure, good practices and procedures for the waste collection, segregation, storage, transportation, treatment and disposal. A monitoring program has been developed including indicators to address potential negative impacts of medical waste and to ensure that unforeseen impacts are detected, and the mitigation measures implemented efficiently. The monitoring plan includes indicators for the storage, segregation, transportation and disposal of the medical waste, and monitoring of infection on the site.

1.4 Description of sub-projects

a) Procurement of decontamination and insulation tents

Sub-project activity consists of procurement of a total of 37 medical decontamination and 37 medical insulation tents/units which will be used in 32 hospitals in the Republic of Croatia with Emergency department to be used exclusively in crisis situations. The decontamination tent/unit is intended for immediate decontamination and cleaning of persons or equipment in case of an epidemic or nuclear, biological or chemical (NBC) exposure. The tents/units will be placed within the hospitals' premises, which are located in the urbanized areas. Some of the hospitals may be cultural heritage (CH) protected under the national regulation and mitigation measures that will prevent any adverse impact to CH are prescribed in the Environmental and Social Management Plan (ESMP), disclosed in December 2021 for this activity.

b) Equipment for the Croatian Public Health Institute

No.	Equipment	Risk impact (in use phase)	Comment/Explanation of risks
1.	Microscope light 5x – use in laboratory • translucent microscopic body with Kohler illumination • LED light of minimum 2.4W white light with a lifespan of at least 60,000 hours	Low	-
2.	Microscope fluorescent 2x - use in clinical laboratory • examination of fluorescent dye stained smears • upright microscope body with macro and micro screw • LED light source (minimum power equivalent to 100 W halogen bulbs) with a lifespan of at least 50,000 hours with high color reproduction accuracy - for transient light • utility requirements - 220/240 V, 50 Hz, ±10 %	Low	-
3.	Microscope invert – use in virology laboratory • cultivation of the cell culture in glass tubes and Petri plates, to study live cells by viewing the cells from the bottom of the cell culture apparatus • metal body of a microscope with a lens for light microscopy • utility requirements - 220/240 V, 50 Hz, ±10%	Low	-
4.	Automated mycobacterial detection system – use in microbiology laboratory • cultivation of mycobacteria from all clinical samples • utility requirements • 220/240 V, 50 Hz, ±10% • equipment provided with an adequate Uninterruptible Power Supply (UPS) system with not less than 2 hours of back-up	Low	-
5.	Automated real-time nucleic acid amplification test system (including reagents)	Moderate	Contamination Infectious
6.	Thermoblock	Low	-
7.	Automatic serology apparatus	Low	-

8.	Real-time-PCR device	Low	-
9.	Digital PCR system (including reagents)	Moderate	Contamination Infectious
10.	PCR plate sealer system	Low	-
11.	Freezer -80 2x	Low	-
12.	Refrigerator + freezer 4x	Low	-
13.	Bead beater	Low	-
14.	Sample mixer	Low	-
15.	PCR apparatus	Low	-
16.	Centrifuge 20 places 2x	Low	-
17.	Incinerators 3x • technical requirements • for fast - thorough sterilization 5-7 seconds • strong heat - central temperature up to 800 °C • constant temperature when not in use 480 °C • maximum sterilization diameter of 14-35 mm • heater body length up to 100 mm • utility requirements ○ electrical supply - thorough sterilization 5-7 sec ○ AC220V ± 22V, 50Hz ± 1Hz, approx. 200W	Low	--
18.	Incubator 37 Co2	Low	-
19.	Incubator 37	Low	-
20.	MALDI TOF • automated MALDI-TOF Mass Spectometry system for r microbial identification of bacteria yeasts, molds and mycobacteria • utility requirements • electrical, water and/or gas supply – USP and applicato the plates must be delivered with the instrument	Low	-
21.	Fully automatic high-speed pre-post vacuum steam sterilizer	Low	-
22.	Automatic identification of microorganisms	Low	-
23.	Automatic urinoculture reading apparatus	Low	-
24.	Apparatus for rapid molecular detection of bacterial resistance mechanisms	Low	-
25.	Chemical cabinet 2x	Low	-
26.	Multifunctional device (printer, scaner) 4x	Low	-
27.	COVID serology kits	Low	-
28.	NGS (next-generation sequencing) reagents • Whole Genom Sequencing (WGS) of *Mycobacterium tuberculosis* and SARS-CoV-2 samples • Reagents for sample preparation and sequencing of the whole genome - for 1000 samples of SARS-Cov-2 and 300 samples of Mycobacterium spp per year - for 3 years	Low	-
29.	NGS data analysis and storage	Low	-
30.	Automated slides stainer	Low	-

c) Emergency medical vehicles with negative pressure for transport of infectious patients

d) Medical equipment for emergency medical interventions (manual defibrillators and transport ventilators)

e) Vital Sign Telemonitoring - Telemedicine Connecting HMS Vehicles to OHBP (Unified Emergency Hospital Admission)

1.5 Administrative Organization of Health Care in Croatia

The Ministry of Health (MoH) in Croatia has the role of manager of the health care system with broad powers: management of legislation in the field of health care, preparation of budgets, monitoring of health status and health needs, education of health workers and supervision of the reform process of the health care system in Croatia.

Croatian Health Insurance Fund (CHIF) is in charge of implementation of basic or mandatory, supplementary and additional (voluntary) health insurance. In the implementation of mandatory health insurance, CHIF performs, among others:

- implements the policy of development and improvement of health care from compulsory health insurance;
- performs tasks related to achieving rights and obligations of insured persons from compulsory health insurance;
- plans funds for rights from compulsory health insurance within the framework of planned revenues in the state budget;
- provides the Minister of Health with an opinion on the network of the public health service, and an opinion on the network of contractual subjects of occupational medicine;
- carries out the tasks of contracting health care from compulsory health insurance with health institutions and private health workers included in the public health service network.

The health system is financed from different sources. Contributions for health insurance in Croatia are mandatory for all employed citizens and for employers. For dependent members of working family members, health services in Croatia are covered by contributions paid by the working family member. Self-employed workers in Croatia are also required to pay health insurance contributions. Croatian citizens who are classified as socially vulnerable are exempt from paying health insurance contributions; groups such as pensioners and people with low incomes continue to have full access to public health facilities and health services regardless the contribution level.

Health services in the framework of the implementation of health care in Croatia are provided in health centers, institutions for emergency medical assistance and pharmacies in Croatia. Every municipality in Croatia has a health center that provides health care services to patients through a network of general medical examinations provided by general practitioners. Health centers are obliged to provide emergency medical assistance, diagnostic services - laboratory and radiological and public health services, which includes hygiene. In rural and remote areas of Croatia, health centers are under the supervision of hospitals for the provision of specialist outpatient care, although there are restrictions regarding the provision of hospital health care and maternity care.

Private health institutions are also present in the Croatian health care system. Private healthcare institutions most often rent space in health centers owned by the state. Private practices must meet certain criteria set by the Croatian Ministry of Health, which include a minimum number of enrolled patients and a minimum range of healthcare services.

Hospitals in the Republic of Croatia are categorized into four categories: national hospitals, county hospitals of regional significance, county hospitals and local hospitals. Health care in the Republic of Croatia is performed at the primary, secondary and tertiary levels and at the level of health institutes. Health care at the primary level is provided through: general/family medicine, health care for preschool children, women's health care, outpatient health care, health care in the patient's home, dental health care (multivalent), hygienic-epidemiological health care, preventive and educational measures for the health care of school children and students, laboratory diagnostics, pharmacy and emergency medical assistance. Health care at the secondary level includes specialist-advisory health care and hospital health care. Healthcare activity at the tertiary level includes the performance of the most complex forms of healthcare from specialist-advisory and hospital activities.

2 PARTICIPATING HEALTHCARE FACILITIES (HCFS)

2.1 Description of participating HCFs

Targeted healthcare facilities are 32 hospitals distributed in 26 cities and 19 counties throughout Republic of Croatia.

No.	Hospital	City	County
1.	University Hospital Centre ZAGREB	Zagreb	City of Zagreb
2.	Sestre milosrdnice University Hospital Centre		
3.	Clinical hospital DUBRAVA		
4.	Clinical hospital MERKUR		
5.	Clinical hospital "SVETI DUH"		
6.	University Hospital for Infectious Diseases "DR. FRAN MIHALJEVIĆ“		
7.	Children hospital ZAGREB		
8.	General Hospital ZABOK and Hospital of Croatian Veterans	Zabok	County of Krapina-Zagorje
9.	General Hospital VARAŽDIN	Varaždin	County of Varaždin
10.	County Hospital ČAKOVEC	Čakovec	
11.	General Hospital „DR. TOMISLAV BARDEK“ KOPRIVNICA	Križevci	County of Koprivnica-Križevci
12.	General Hospital BJELOVAR	Bjelovar	County of Bjelovar – Bilogora
13.	General Hospital VIROVITICA	Virovitica	County of Virovitica – Podravina
14.	County General Hospital POŽEGA	Požega	County of Požega – Slavonia
15.	County General Hospital PAKRAC and Hospital of Croatian Veterans	Pakrac	
16.	General Hospital "DR. JOSIP BENČEVIĆ" SLAVONSKI BROD	Slavonski Brod	County of Slavonski Brod – Posavina
17.	General Hospital NOVA GRADIŠKA	Nova Gradiška	
18.	County General Hospital VINKOVCI	Vinkovci	County of Vukovar – Sirmium
19.	National Memorial Hospital VUKOVAR	Vukovar	
20.	Clinical Hospital Center OSIJEK	Osijek	County of Osijek-Baranja
21.	County General Hospital NAŠICE	Našice	

22.	General Hospital KARLOVAC	Karlovac	County of Karlovac
23.	General Hospital and Homeland War Veterans Hospital OGULIN	Ogulin	
24.	General Hospital "DR. IVO PEDIŠIĆ" SISAK	Sisak	County of Sisak-Moslavina
25.	Clinical Hospital Center RIJEKA	Rijeka	County of Primorje-Gorski Kotar
26.	General Hospital PULA	Pula	County of Istria
27.	General Hospital GOSPIĆ	Gospić	County of Lika-Senj
28.	General Hospital ZADAR	Zadar	County of Zadar
29.	General Hospital of COUNTY OF ŠIBENIK-KNIN	Šibenik	County of Šibenik-Knin
30.	General and Veteran Hospital "HRVATSKI PONOS" KNIN	Knin	
31.	University Hospital of SPLIT	Split	County of Split-Dalmatia
32.	General Hospital DUBROVNIK	Dubrovnik	County of Dubrovnik-Neretva

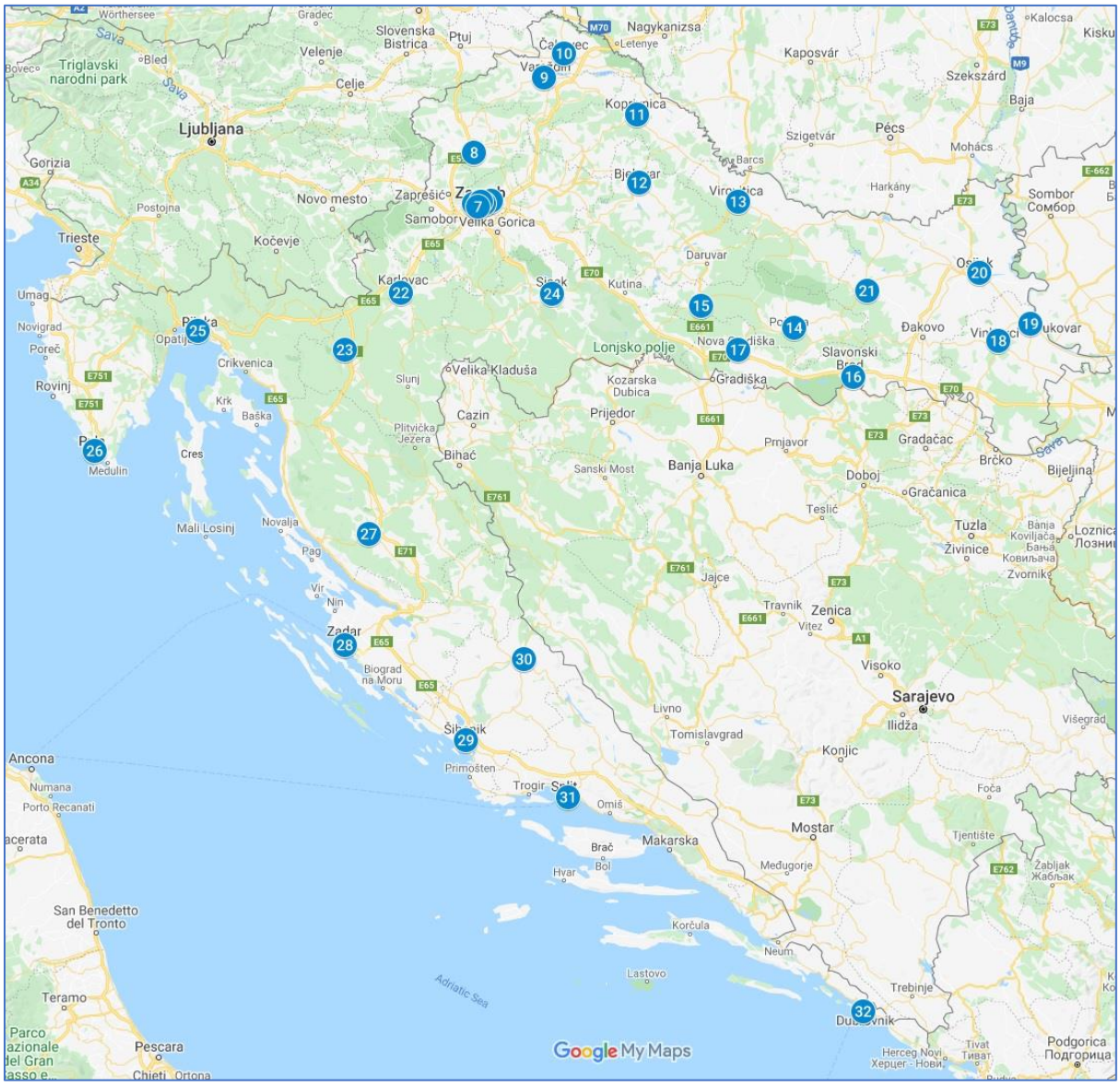

Figure 1. Locations of hospitals in the Republic of Croatia with Emergency department which are the end-users of medical tents (source: Google Map)

1. **<u>University Hospital Centre ZAGREB, Kišpatićeva Street 12, 10 000 Zagreb</u>**

The KBC Zagreb is the largest and in terms of the number and variety of health services provided by a unique health institution in the Republic of Croatia, with the capacity of 1799 beds. The hospital hands over the generated waste to licensed waste collectors.

It consists of 11 associated facilities: 1 - education centre and administration; 2 - emergency medicine centre; 3 - internal medicine clinic; 4 - main building; 5 - education centre West; 6 - pathology and cytology; 7 - Green building (Polyclinic); 8 - White building (Polyclinic); 9 - Red building (psychological medicine); 10 - Villa (Nutrition counselling); 11 - Jordanovac (pulmonary hospital).

2. **<u>Sestre milosrdnice University Hospital Centre</u>**

Sestre milosrdnice University Hospital Centre is one of the oldest and largest medical institutions in the Republic of Croatia. It has a total of: 16 clinics and 6 institutes / 3 clinical, Unified Emergency

Hospital Reception, Hospital Pharmacy, Institute for Clinical Medical Research and non-medical organizational units. The hospital hands over the generated waste to licensed waste collectors.
The headquarters of the clinical center is in Zagreb at Vinogradska cesta 29, and later the Tumor clinic at 197 Ilica and the Trauma clinic at 19 Draskovićeva Street were added to it.

3. **Clinical Hospital Dubrava**

Dubrava University Hospital is one of the leading hospitals of national significance that provides secondary and tertiary healthcare. It is the most modern and the most technically and technologically complex facility in the public health system of the City of Zagreb. In the scope of surgical and internal medicine disciplines, hospital departments (30) are organized as units with about twenty beds that are based on the principle of stepped care. In addition to intensive care units, there are also standardized hospital units where semi-intensive and standard patient care is provided. Dubrava University Hospital is the teaching base of the School of Medicine, Dentistry, Pharmacy and Biochemistry of the University of Zagreb, School of Medicine of the Catholic University of Croatia etc. The hospital hands over the generated waste to licensed waste collectors.

Departments in Clinical Hospital Dubrava are: Central Hospital Pharmacy, Central Operating Unit, Clinical Department of Diagnostic and Interventional Radiology, Clinical Department of Laboratory Diagnostic, Clinical Department of Pathology and Cytology, Clinical Department of Prosthetic Dentistry, Department of Neurosurgery, Department of Cardiovascular medicine, Department of Anaesthesiology, Reanimatology and Intensive Care Medicine, Department of Cardiac and Transplant Surgery, Department of Clinical Microbiology and Hospital Infections, Department of Day Surgery, Department of Ear, Nose and Throat, Department of Emergency Medicine, Department of Internal Medicine, Department of Maxillofacial Surgery, Department of Neurology, Department of Nuclear Medicine, Department of Ophthalmology, Department of Physical Medicine and Rehabilitation with Rheumatology, Department of Plastic, Reconstructive and Aesthetic Surgery, Department of Psychiatry, Department of Scientific Research and Translational Medicine, Department of Surgery, Department of Transfusion Medicine, Department of Urology, Dermatovenerology Unit and Policlinic.

Due to its significance during the COVID 19 epidemics (2020-2023) as a designated COVID 19 hospital, and consequent waste management challenges, waste management in Clinical Hospital Dubrava will be further elaborated in a separate chapter (annex).

4. **Clinical hospital MERKUR, Zajčeva Street 19, 10 000 Zagreb**

Clinical hospital MERKUR consists of: a clinic for surgery, a clinic for internal diseases, a university clinic for diabetes, endocrinology and metabolic diseases Vuk Vrhovac, a clinic for women's diseases and childbirth, a clinical institute for diagnostic and interventional radiology, a clinical institute for pathology and cytology, institute for otorhinolaryngology, clinical institute for medical biochemistry and laboratory medicine, institute for clinical cytology and cytogenetics, department of urology, department of anesthesia, resuscitation and intensive care. The hospital hands over the generated waste to licensed waste collectors.

5. **Clinical hospital "SVETI DUH", Sveti duh 64, 10 000 Zagreb**

It is the oldest hospital in Croatia. The hospital has 500 hospital beds for adults and 70 beds for newborns. The total capacity of specialist - consultative health care and specialist diagnostics is 120 clinics and diagnostic services. The hospital is organized as a unique technological unit consisting of 9 inpatient services and 16 specialist consulting and diagnostic services organized in 6 clinics and 8

institutes and the Central Emergency Department. The hospital hands over the generated waste to licensed waste collectors.

6. **University Hospital for Infectious Diseases "DR. FRAN MIHALJEVIĆ“, Mirogojska 8, 10 000 Zagreb**

The clinic is a highly specialized public health institution where medical, teaching and scientific work is planned, organized and carried out. The clinic is a teaching and scientific-research base of the Faculty of Medicine of the University of Zagreb. The clinic is the leading institution for infectious diseases in Croatia. It consists of 6 clinical institutes and 10 departments of the Clinic with a total of 232 hospital beds. **The Clinic has a Level 3 Biosafety Laboratory, which diagnoses dangerous agents**. The hospital hands over the generated waste to licensed waste collectors. or.

7. **Children hospital ZAGREB, Vjekoslava Klaića Street 16, 10 000 Zagreb**

The clinic is a unique health institution in Croatia and this part of Europe in providing the highest level of health care for children and adolescents. The clinic is a center of pediatric excellence where medical practice, science and teaching come together. It consists of 2 clinics: the Clinic for pediatric surgery and the Clinic for pediatrics and 5 institutes: Department of Pediatric Orthopedics, Department of Pediatric Radiology, Department of Pediatric Oncology "Dr. Mladen Ćepulić", Department of Laboratory Diagnostics and Department of Pediatric Anesthesiology, Reanimation and Intensive Care Medicine. The hospital hands over the generated waste to licensed waste collectors.

8. **General Hospital ZABOK and Hospital of Croatian Veterans, Bračak 8, 49 210 Zabok**

The hospital is a center for providing medical services in the field of hospital health care for patients in northwestern Croatia and beyond.
It consists of the following services and departments: Department of Internal Medicine, Department of Surgery, Department of Neurosurgery, Department of Pediatrics, Department of Surgery and Obstetrics, Department of Anesthesiology, Reanimation and Intensive Care, Department of Unified Emergency Hospital Admission, Department of Physical Medicine and medical rehabilitation, Department of Radiology, Department of Transfusion Medicine, Medical Biochemistry Laboratory, Department of Pathology and Cytology. The hospital also has a Polyclinic with outpatient clinics: internal medicine clinic, surgical clinic, neurological clinic, ophthalmology, dermatology and venereology, speech therapy, anesthesiology, otorhinolaryngology, urology, psychiatry and psychology. The hospital hands over the generated waste to licensed waste collectors.

9. **General Hospital VARAŽDIN, Ivana Meštrovića Street 1, 42 000 Varaždin**

The General Hospital Varaždin is a secondary health care institution, categorized as a "County hospital of regional significance IIA" and provides health care to insured persons of the Croatian Institute for Health Insurance for the area of Varaždin County and beyond, i.e. for the needs of patients in the northwestern region as a regional hospital of category II A. The hospital hands over the generated waste to licensed waste collectors.

10. **County Hospital ČAKOVEC, Ivana Gorana Kovačića 1E, 40 000 Čakovec**

County Hospital Čakovec is a health institution founded by Međimurje County. The hospital's activity is divided into functional units: inpatient health care, specialist-advisory health care with specialist diagnostics and day hospital and laboratory tests at the level of primary health care. The hospital hands over the generated waste to licensed waste collectors.

11. **General Hospital „DR. TOMISLAV BARDEK“ KOPRIVNICA, Željka Selingera 1, 48 000 Koprivnica**

General Hospital "Dr. Tomislav Bardek" in Koprivnica is the county hospital of Koprivnica - Križevci County, which provides health care to the population of the county, but also to the population of the

peripheral areas of the surrounding counties. Through teamwork with the optimal use of available medical equipment and other resources, and in accordance with current legislation, it provides inpatient, specialist - consultative health care with specialist diagnostics, laboratory diagnostics at the level of primary and secondary health care and education of health workers. In addition, it participates in primary and secondary prevention programs as well as in health promotion. The hospital hands over the generated waste to licensed waste collectors.

12. **General Hospital BJELOVAR, Mihanovićeva 8, 43 000 Bjelovar**

Bjelovar General Hospital is the only hospital in Bjelovar-Bilogora County for the treatment of acute diseases. It consists of the Department of Internal Medicine, the Department of Surgery, the Department of Anesthesiology, Reanimation and Intensive Care and Central Sterilization, the Department of Pediatrics, the Department of Psychiatry, the Department of Neurology, the Department of Gynecology and Obstetrics, the Department of Radiology, the Medical Biochemistry Laboratory and the Transfusion Department of Medicine, Department of Pathology and Cytology, Center for Emergency Medicine and hospital pharmacy. The hospital hands over the generated waste to licensed waste collectors.

13. **General Hospital VIROVITICA, Ljudevita Gaja 21, 33 000 Virovitica**

According to the categorization, the hospital in Virovitica belongs to the General Hospital. It consists of the following services and departments: Department of Psychiatry, Department of Radiology, Department of Physical Medicine and Rehabilitation, Department of Transfusion Medicine, Department of Pathology and Clinical Cytology, Medical - Biochemical Laboratory, Unified Emergency Hospital Reception and Hospital Pharmacy. The hospital hands over the generated waste to licensed waste collectors.

14. **County General Hospital POŽEGA, Osječka Street 107, 34 000 Požega**

The main activity is hospital activity, specialist-advisory health care with specialist diagnostics and scientific-research activity in the field of biomedicine and healthcare and teaching activity in the field of education of health workers. The hospital is the teaching base of the Faculty of Medicine in Osijek. The organizational units of the hospital are: Internal Medicine, Surgery, Gynecology and Obstetrics, Neurology and Psychiatry, Pediatrics, Clinical Radiology, Department of Surgery and Central Sterilization, Department of Emergency Medicine, Department of Transfusion Medicine, Department of Hematology-Biochemical Diagnostics, Department of Pathology and cytology, Department of Clinical Microbiology, Department of Anesthesia, Hospital Pharmacy and Unit for Scientific Research. The hospital hands over the generated waste to licensed waste collectors.

15. **County General Hospital PAKRAC and Hospital of Croatian Veterans, Bolnička Street 74, 34 550 Pakrac**

The hospital provides care for patients from the areas of Pakrac and Lipik and patients from nearby towns belonging to Sisak-Moslavina, Bjelovar-Bilogor and Brod-Posavina counties. The activity of the Hospital is the implementation of hospital, polyclinic-advisory health care, diagnostics, health care, accommodation and nutrition during the stay in the Hospital, as well as medical activities. The General Hospital includes activities, services, departments and departments with associated polyclinic-council health care. By granting the status of a veteran's hospital, veterans are given simpler and faster access to health care, with support and cooperation with the Ministry of Veterans. The hospital hands over the generated waste to licensed waste collectors.

The organizational units of the hospital are: Department of Surgery, Department of Internal Medicine, Department of Gynecology and Obstetrics, Department of Pediatrics, Department of Anesthesia with a central intensive care unit, Department of Laboratory Diagnostics, Department of Clinical Radiology,

Department of Pathology, Cytology and Clinical microbiology, Unified Emergency Hospital Reception and Central Hospital Pharmacy.

16. **General Hospital "DR. JOSIP BENČEVIĆ" SLAVONSKI BROD, Andrije Štampara, 35 000 Slavonski Brod**

The departments and services of the hospital are: Department of Internal Medicine, Department of Surgery, Department of Anesthesia, Resuscitation and Intensive Care, Department of Gynecology and Obstetrics, Department of Infectology and Dermatovenerology, Department of Ophthalmology and Optometry, Department of Otorhinolaryngology, Department of Psychiatry , Department of Neurology, Department of Psychiatry, Department of Pathology and Cytology, Department of Laboratory Diagnostics, Department of Clinical Radiology, Hospital Pharmacy, Department of Transfusion Medicine and Center for Emergency Medicine. The hospital hands over the generated waste to licensed waste collectors.

17. **General Hospital NOVA GRADIŠKA, Josipa Jurja Strossmayera 17A, 35 400 Nova Gradiška**

General Hospital Nova Gradiška is the headquarters health institution in the western part of the Brod-Posavina County. The activity of the Hospital is the implementation of hospital, polyclinic-council health care, diagnostics, health care, accommodation and nutrition during the stay in the Hospital, as well as pharmacy activities. The hospital hands over the generated wastes to licensed waste collectors.

18. **County General Hospital VINKOVCI, Zvonarska 57, 32 100 Vinkovci**

Services and departments of the hospital: Department of Surgery, Department of Internal Medicine, Department of Pediatrics, Department of Gynecology and Obstetrics, Department of Anesthesiology, Reanimatology and Intensive Care Department of Psychiatry, Department of Neurology, Department of Pathology and Cytology, Department of Radiology, Department of for transfusion medicine, Department of Physical Medicine and Rehabilitation, Department of Medical Biochemistry, Department of Urology, Hospital Pharmacy and Center for Emergency Medicine - unified emergency hospital reception. The hospital hands over the generated waste to licensed waste collectors.

19. **National Memorial Hospital VUKOVAR, Županijska 35, 32 000 Vukovar**

National Memorial Hospital "Dr. Juraj Njavro" Vukovar is organized as a health institution owned by the Republic of Croatia. Departments and departments of the hospital are: Department of pediatrics, Department of internal activities, Department of surgical activities, Department of gynecology and obstetrics, Department of neurology, Department of psychiatry, Department of anesthesiology, reanimatology and intensive medicine, Department of physical medicine, rehabilitation and rheumatology, Department of radiology, Department of pathology and cytology, Department of laboratory and transfusion medicine, Hospital pharmacy, Center for emergency medicine, Department for memorial and educational activities, which includes the Museum "Place of Remembrance VUKOVAR HOSPITAL 1991". The hospital hands over the generated waste to licensed waste collectors.

20. **Clinical Hospital Center OSIJEK, Josipa Huttlera 4, 31 000 Osijek**

A modern health center in Osijek and Eastern Croatia that follows modern scientific medical achievements in the homeland and in the world. Clinics and institutes in the hospital are: Clinic for Surgery, Clinic for Pediatrics, Clinic for Neurology, Clinic for Gynecology and Obstetrics, Clinic for Eye Diseases, Clinic for Anesthesiology, Reanimation and Intensive Care, Clinical Institute for Nuclear Medicine and Radiation Protection, Clinical Department of Diagnostic and Interventional Radiology, Clinical Department of Pathology and Forensic Medicine, Department of Urology, Department of Physical Medicine and Rehabilitation, Department of Dermatology and Venereology, Unified Emergency Hospital Admission, Central Ordering, Internal Medicine Clinic, Psychiatry Clinic, Clinic for Infectology, Clinic for Otorhinolaryngology and Head and Neck Surgery, Clinic for Neurosurgery, Clinic for Orthopedics and Traumatology, Clinical Institute for Clinical Cytology, Clinical Institute for

Laboratory Diagnostics, Clinical Institute for Transfusion Medicine, Institute for Maxillofacial and Oral Surgery, Institute for Oncology, Institute for Children and Adolescent psychiatry and hospital pharmacy. The hospital hands over the generated waste to licensed waste collectors.

21. **County Gene ral Hospital NAŠICE, Bana Jelačića Street 10, 31 500 Našice**

The hospital performs the following health activities: specialist-council health care, hospital activities and dialysis activities. In addition to health activities, the hospital carries out scientific and research activities in the field of medical sciences and a part of teaching activities in the field of education of health professionals. Departments in the hospital: Department of Internal Medicine, Department of Surgery, Department of Gynecology and Obstetrics, Department of Pediatrics, Department of Psychiatry, Department of Anesthesiology, Reanimation and Intensive Care Medicine, Department of Palliative Care and Polyclinic for diagnostic and therapeutic activities, Medical - biochemical laboratory, Department of Radiology, Center for Emergency Medicine and Hospital Pharmacy. The hospital hands over the generated waste to licensed waste collectors.

22. **General Hospital KARLOVAC, Andrije Štampara 3, 47 000 Karlovac**

The hospital performs the activity of hospital and specialist - consultative health care as well as the activity of palliative care. The hospital sterilizes its infectious and potentially infectious medical waste (autoclaving or similar) before handing it over to the licensed company for disposal as in.
The hospital includes: Department of Internal Medicine, Department of Surgery, Department of Gynecology and Obstetrics, Department of Neurology with stroke treatment unit, Department of Pediatrics, Department of Psychiatry, Department of Infectology, Department of Urology, Department of Ophthalmology, Department of Otorhinolaryngology, Department of Anesthesiology, Reanimation and Intensive Care Medicine, Department of Physical Medicine and Rehabilitation, Department of Radiology, Department of Medical Biochemical Laboratory, Department of Microbiology, Department of Transfusion Medicine, Department of Pathology and Cytology, Department of Central Surgery and sterilization, Hospital pharmacy and Unified emergency hospital reception. The hospital hands over the generated waste to licensed waste collectors.

23. **General Hospital and Homeland War Veterans Hospital OGULIN, Bolnička Street 38, 47 300 Ogulin**

General Hospital and Homeland War Veterans Hospital Ogulin is a secondary health care institution that provides accessible, continuous health care in a safe environment to everyone. It provides health care services for the population of the municipality of Ogulin as well as neighboring municipalities of Karlovac County that gravitate to Ogulin. Apart from the area of Karlovac County, services are also used by residents of two neighboring counties, Lika-Senj and Primorje-Gorski Kotar. The hospital provides hospital and specialist - council health care for patients suffering from acute diseases as well as palliative care and extended treatment for patients suffering from chronic diseases. The hospital hands over the generated waste to licensed waste collectors.

24. **General Hospital "DR. IVO PEDIŠIĆ" SISAK, Josipa Jurja Strossmayera 59, 44 000 Sisak**

The business of the General Hospital Sisak is the provision of polyclinic-conciliar and stationary health care. The general hospital operates in two locations in Sisak: J.J. Strossmayera 59 and Nikola Tesla 13 and at one location in Petrinja, Vinogradi bb. The following departments are located within the hospital: Unified Emergency Hospital Admission, Department of Infectious Diseases, Department of Surgery, Department of Internal Diseases, Department of Gynecology and Obstetrics, Department of Transfusion Medicine, Department of Radiology, Department of Psychiatry, Department of Pediatrics, Department of Pathology and Cytology, Department of Otorhinolaryngology and Oral Surgery, Department of Ophthalmology and Optometry, Department of Neurology, Department of Medical Biochemistry and Laboratory Medicine (Laboratory), Department of Physical Medicine and Rehabilitation, Department of Dermatology and Venereology, Department of Anesthesiology ,

resuscitation and intensive care, Department of central sterilization, control of intrahospital infections and cleanliness and Department of hospital pharmacy. The hospital hands over the generated waste to licensed waste collectors.

25. Clinical Hospital Center RIJEKA, Krešimirova Street 42, 51 000 Rijeka

Clinical Hospital Center Rijeka is one of the five clinical hospital centers in Croatia and is the central hospital institution of this part of the Republic of Croatia. It is a regional hospital center for three counties, which provides medical care for about 600,000 inhabitants. Rijeka Clinical Hospital Center is the teaching and scientific research base of the Faculty of Medicine and the Faculty of Health Studies of the University of Rijeka. In addition to administration and administrative and technical services, it consists of 18 clinics, 6 clinical institutes, 6 independent institutes, one independent department and a hospital pharmacy. Clinical Hospital Center Rijeka is located in three locations (Rijeka, Sušak and Kantrida). The hospital hands over the generated waste to licensed waste collectors.

26. General Hospital PULA, Santoriova 24a, 52100 Pula, 52 100 Pula

General Hospital Pula is the central and largest health care institution in Istria.
General Hospital Pula is divided into two locations in the city, so activities are also distributed between those two locations, while some are performed at both locations.
At the location in Zagrebačka St. 30, the so-called old hospital, with following departments: Pediatrics, Gynecology and obstetrics, Infectology and febrile conditions, Eye diseases, Ear, Throat and nose diseases, Psychiatry, Skin and venereal diseases, Pathology and forensic medicine, Physical medicine and rehabilitation, Cytology, Nuclear medicine and Laboratory diagnostics.
At the location in Negrijeva St. 6, the so-called At the Naval Hospital, with following departments: Internal diseases, Neurology, Surgical diseases, Hospital pharmacy, Anesthesia and intensive treatment and Transfusiology.
At both locations, there are the following departments: Anesthesia and resuscitation, Laboratory diagnostics, Radiology and Sterilization. The hospital hands over the generated waste to licensed waste collectors.

27. General Hospital GOSPIĆ, Kaniška Street 111, 53 000 Gospić

The activity of the General Hospital Gospić is organized in such a way that it provides health services in inpatient and specialist-consultative health care, and as part of the Polyclinic, a day hospital is contracted and organized for certain activities. It consists of the Department of Internal Medicine, Department of Surgery, Department of Anesthesiology, Department of Gynecology, Department of Pediatrics, Department of Transfusion Medicine, Laboratory, Department of Diagnostics, Department of Services and Hospital Pharmacy. The hospital hands over the generated waste to licensed waste collectors.

28. General Hospital ZADAR, Bože Peričića 5, 23 000 Zadar

General Hospital Zadar is a health institution founded by Zadar County. General Hospital Zadar is registered to carry out: hospital and specialist consultancy, as well as scientific research and teaching activities. General Hospital Zadar is the teaching base of the Faculty of Medicine, University of Osijek, Nursing Studies, University of Zadar. The health care activities of the General Hospital Zadar are carried out in 17 buildings, in two locations. 20 hospital wards and 3 services are organized in this space. As part of the organization of medical activities, the institution formed three services: Internal Medicine Service, Surgery Service and Gynecology and Obstetrics Service, Emergency Medicine Center and Unified Emergency Hospital. Reception, 34 medical departments, 3 polyclinic organizational units and 90 surgeries. The hospital hands over the generated waste to licensed waste collectors.

29. **General Hospital of COUNTY OF ŠIBENIK-KNIN, Stjepana Radića 83, 22 000 Šibenik**

General Hospital of County of Šibenik - Knin consists of: Department of Surgery, Department of Gynecology and Obstetrics, Department of Pediatrics, Unified Hospital Reception Center, Department of Internal Medicine, Department of Nuclear Medicine, Department of Radiology, Department of Transfusion Medicine, Department of Urology, Hospital Pharmacy , Department of Pathology and Cytology, Department of Orthopedics and Traumatology, Department of Otolaryngology, Department of Anesthesiology, Reanimation and Intensive Care Medicine, Department of Physical Medicine and Rehabilitation, Department of Ophthalmology and Optometry, Department of Biochemistry and Hematology Laboratory, Department of Psychiatry, Department of Infectology, Department of Neurology, Department dermatology and venereology. The hospital hands over the generated waste to licensed waste collectors.

30. **General and Veteran Hospital "HRVATSKI PONOS" KNIN, Kralja Svetoslava Suronje 12, 22 300 Knin**

The hospital performs health, specialist - consular and hospital activities. Departments in the hospital are: Department of palliative care, Department of long-term treatment, Department of gynecology and obstetrics, Department of physical medicine and rehabilitation, Internal department, Department of surgery, Department of pediatrics and Department of anesthesiology, resuscitation and intensive care. The hospital hands over the generated waste to licensed waste collectors.

31. **University Hospital of SPLIT, Spinčićeva Street 1, 21 000 Split**

University Hospital of Split is the youngest clinical hospital center in Croatia, the largest hospital center in Dalmatia and the second largest hospital center in Croatia.
University Hospital of Split is the central health institution of Split-Dalmatia County and the entire southern region of Croatia and is located in three locations in Split: Firula, Križine and the center of the city (Split Spa). About 1,000,000 citizens of the Republic of Croatia, and about 500,000 residents of the southern part of neighboring Bosnia and Herzegovina, as well as 500,000 tourists during the season, gravitate to this institution, as a regional hospital.
University Hospital of Split provides specialist health care and hospital activities, as well as health research activities in the field of medical sciences. It consists of 13 clinics, 15 departments and a unit for scientific work. The hospital hands over the generated waste to licensed waste collectors.

32. **General Hospital DUBROVNIK, Dr. Roka Mišetića 2, 20 000 Dubrovnik**

The founder of the hospital is Dubrovnik-Neretva county. General Hospital Dubrovnik carries out the activities of diagnostics, treatment, medical rehabilitation and health care of patients and ensures the stay and nutrition of patients within 38 departments. The hospital has a unit for specialist - consultative treatment that can also be performed in a day hospital through a separate branch of the general hospital and a unit for inpatient treatment. The hospital hands over the generated waste to licensed waste collectors.

3 WASTE MANAGEMENT

3.1 Classification of Health Care Waste

This chapter provides an overview of the categorization of medical waste from the perspective of WBG, WHO and national regulations.

Types of waste according to WHO

Infectious waste	waste contaminated with blood and other bodily fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections (e.g. swabs, bandages and disposable medical devices)
Pathological waste	human tissues, organs or fluids, body parts and contaminated animal carcasses
Sharps waste	syringes, needles, disposable scalpels and blades, etc.
Chemical waste	solvents and reagents used for laboratory preparations, disinfectants, sterilant and heavy metals contained in medical devices (e.g. mercury in broken thermometers) and batteries, etc.
Pharmaceutical waste	expired, unused and contaminated drugs and vaccines
Cytotoxic waste	waste containing substances with genotoxic properties (i.e. highly hazardous substances that are, mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites
Radioactive waste	such as products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutic materials
Non-hazardous or general waste	waste that does not pose any particular biological, chemical, radioactive or physical hazard

Categorization according to the WBG EHS Guidelines for Healthcare Facilities

Infectious waste	Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. tissues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments and other items that may have come into contact with infectious materials.
Sharps	Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, nails etc.
Pharmaceutical waste	Includes expired, unused, spoiled and contaminated pharmaceutical products, drugs, vaccines and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.)
Genotoxic/ cytotoxic waste	Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.
Chemical waste	Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and nonhalogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).

Radioactive waste	Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.
Waste with high content of heavy metals	Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).
Pressurized containers	Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.
General health care waste	including food waste and paper, plastics, cardboard

National legislation

Medical waste can be categorized as hazardous and non-hazardous.
Hazardous medical waste with regard to its hazardous properties and management method is divided into:

- infectious waste;
- sharps;
- pharmaceutical waste;
- chemical waste;
- genotoxic/ cytotoxic waste;
- amalgam waste from dental care;
- other hazardous waste – any waste that has any of the hazardous properties.

Non-hazardous medical waste is waste that has no hazardous properties.
In accordance with the Ordinance on waste management (OG 106/22) and Regulation on medical waste management (OG 50/15, 56/19) the waste generated in the relevant healthcare facilities can be classified into categories listed below.

KEY NUMBER	THE NAME OF THE WASTE
15	WASTE PACKAGING; ABSORBENTS, WIPE FABRICS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED
15 01 02	plastic packaging
15 01 07	glass packaging
15 01 10*	packaging that contains residues of dangerous substances or is contaminated with dangerous substances
15 02 02*	absorbents, filter materials, wiping cloths
16	WASTE NOT SPECIFIED ELSEWHERE IN THE CATALOG
16 01 16	liquid gas tanks
16 02 13*	discarded equipment containing hazardous components
16 05 06*	laboratory chemicals consisting of hazardous substances
16 06 04	alkaline batteries
16 10 01*	aqueous liquid waste containing hazardous substances

18	WASTE GENERATED IN THE PROTECTION OF HUMAN AND ANIMAL HEALTH AND/OR RELATED RESEARCH (except waste from kitchens and restaurants that does not originate from direct health care)
18 01 01	sharps (except 18 01 03*)
18 01 02	body parts and organs including blood bags and blood preserves (except 18 01 03)
18 01 03*	wastes whose collection and disposal is subject to special requirements in order to prevent infection
18 01 04	waste, the collection and disposal of which is not subject to special requirements for the prevention of infection (e.g. laundry, plaster bandages, bedding, disposable clothing, diapers...)
18 01 06*	chemicals consisting of or containing hazardous substances
18 01 07	chemicals not listed under 18 01 06*
18 01 08*	cytotoxics and cytostatics
18 01 09	medicines other than those mentioned in 18 01 08
18 01 10*	amalgam waste from dental care
20	MUNICIPAL WASTE (WASTE FROM HOUSEHOLDS AND SIMILAR WASTE FROM INSTITUTIONS AND COMMERCIAL AND MANUFACTURING ACTIVITIES) INCLUDING SEPARATELY COLLECTED COMPONENTS OF MUNICIPAL WASTE
20 01 01	paper and cardboard
20 01 02	Glass
20 01 08	biodegradable kitchen and canteen waste
20 01 10	Cloths
20 01 11	Textiles
20 01 21	fluorescent tubes
20 01 23*	discarded equipment containing chlorofluorocarbons
20 01 25	edible oils and fats
20 01 27*	paints, inks, adhesives and resins, which contain hazardous substances
20 01 29*	detergents containing hazardous substances
20 01 31* / 18 01 08*	cytotoxic and cytostatic
20 01 32 / 18 01 09	drugs that are not included in 20 01 31* nor 18 01 08*
20 01 39	Plastic
20 01 40	Metal
20 01 35*, 20 01 36, 16 02 13, 16 02 14*, 20 01 21*	electrical and electronic equipment that has not been in contact with infectious agents, hazardous chemicals, or radioactive substances (discarded computers, hospital electrical equipment, fluorescent tubes and other mercury containing waste etc.)
20 03 01	mixed municipal waste
20 03 07	bulky waste

The national regulation is harmonized with the regulation of the European Union. EU waste policy aims to contribute to the circular economy by extracting high-quality resources from waste as much as possible. The goals and general deadlines are for all EU countries: from the recycling of the municipal

waste within specific deadlines (50% by 2025, 60% by 2030, and 65% by 2035) to limiting the share of municipal waste sent to landfills at 10% by 2030. EU waste regulation is very strict and meets the requirements of the WB (WB EHSG, GIIP, ESF) and WHO.

3.2 Waste management regulatory and institutional framework

In the Republic of Croatia, management of waste from healthcare institutions is regulated by waste legislation, excluding the radioactive waste which falls under the scope of radiological and nuclear safety legislation. Waste management and the efficiency of waste management are ensured by the Government of the Republic of Croatia and the Ministry of Economy and Sustainable Development (MoESD) by prescribing waste management measures. The executive body at the state level is the Environmental Protection and Energy Efficiency Fund.

The executive body of the local self-government unit and the executive body of the regional self-government unit, i.e. the City of Zagreb, are obliged to ensure the conditions and implementation of prescribed waste management measures in their area. Responsible body for the establishment of medical waste management system for radioactive waste is Ministry of Interior (MoI).

Framework (umbrella) legislation for waste management of waste generated in medical facilities are Waste Management Act (OG 84/21) and Act on Radiological and Nuclear Safety (OG 141/13, 39/15, 130/17, 118/18, 21/22,114/22). All legislation is in line with EU acquis.

For the classification of waste, HCFs follow Ordinance on waste management (OG 106/22). Handling and storage of waste are carried out according to the provisions of: Ordinance on waste management (OG 106/22), Regulation on medical waste management (OG 50/15, 56/19), Ordinance on disposal of radioactive waste and used sources (OG 88/22), Rulebook on thermal treatment of waste (OG 75/16) and Ordinance on waste disposal sites (OG 4/23).

In order to monitor the goals prescribed by the Law and the Disposal Directive, MoESD collects data on landfills and waste disposal in the Waste Landfill Database. According to the data available in the database on landfills (MoESD: 'Overview of data on landfills and waste disposal in 2020.'), total disposed quantity of all types of waste at 93 active landfills in 2020 (of which 84 municipal waste, and only industrial waste in 9 landfills) amounted to 1,451,749 tons, which is 10.1% less than in 2019. Amongst those, 17 landfills have cassettes for disposing of asbestos waste, but none are equipped for long-term disposal of hazardous waste. In 2019, a total of 439 business entities had a valid permit for waste management, and 420 for non-hazardous waste, be it collection, storage, recovery and/or disposal. Also, 76 business entities had a valid license for hazardous waste management. There are only 2 crematoriums in Croatia (in cities of Osijek and Zagreb).

The collection and processing of hazardous waste is carried out by authorized persons for the collection or processing of certain types of hazardous waste. Depending on the type, hazardous waste is processed in the Republic of Croatia or outside the Republic of Croatia. No infrastructure is available for long-term deposition of hazardous waste.

According to MoESD, in 2021, 32% of the generated medical waste was treated in the final procedures in the Republic of Croatia, 66% were pre-processed in the Republic of Croatia through sterilization procedures and then exported for final processing in other countries, and 2% was exported directly without pre-processing.

In the period from 2015 to 2019, a continuous increase of 8% annually in reported generated quantities of medical was recorded. Even more significant increase in the amount of medical waste generated was recorded in 2020 and 2021 (probably due to COVID19 outbreak). The aforementioned increase in

2020 amounted to 28% compared to the previous year 2019, and in 2021 17% compared to 2020. In 2021, 8,215 tons of medical waste (medical needles, medical infectious material, microbiological waste, waste from health institutions - medical, soiled sticks for swabbing, etc.) was enerated, of which 76% or 6,262 tons hazardous and 24% or 1,953 tons of non-hazardous medical waste. The largest amount of generated medical waste was reported by the activity of providing health care Protection (91%, or 7,493 tons) and most hospitals (90%, or 6,768 tons) of which the largest share (18% or 1,203 tons) is recorded for KBC Zagreb (MoESD: Overview of management data medical waste for 2021).

According to the MoESD report, in 2021 In 2021, out of 8,215 tons of medical waste generated, 8,210 tons (99.9%) were processed/treated, and 5 tons (0.1%) remained in the processor's temporary warehouse. The largest quantities of treated medical waste ended up in the final processing for export.

Out of the 8,210 tons of treated medical waste, a total of 2,663 tons (32%) were fully processed in Croatia, of which 31% (2,589 tons) pre-treatment beforehand in the Republic of Croatia, and 1% (74 tons) was finally processed without pre-treatment. Further, a total of 5,547 tons (68%) of medical waste was exported for final processing (to Germany and Austria), of which 66% (5,397 tons) previously pre-treated in the Republic of Croatia, while only 2% (150 tons) were exported directly without pre-treatment.

Again, according to MoESD: Overview of management data medical waste for 2021, of the 7,986 tons of medical waste that was pretreated in the Republic of Croatia, 3,195 tons (40%) were pre-treated mostly (88%) through autoclaving, and 4,791 tons (60%) were recovered. 77% of autoclaved waste was the disposed in the Republic of Croatia as a non-hazardous waste. 99% of autoclaved waste was infectious waste. Of the 4,791 tons of medical waste pretreated by recovery, the largest amount (94%) was sterilized and then mostly sent to export for energy recovery (97%). 73% of sterilized waste was that collected as infectious medical waste. Only 8% of medical waste finally processed with heat was incinerated, while the rest was a part of energy recovery processing. Out of 150 tons of exported medical waste, 73 tons was incinerated, and 77 tons used in energy recovery. 2 There was no import of medical waste. In 2019, 15 business entities were registered for a total of 15 locations in the database reported the recovery and/or disposal of medical waste.

3.3 Medical waste management requirements and procedures (including national and ESSs, WB EHSG, GIIP)

Medical waste management includes collection and transportation activities and medical waste treatment procedures, temporary storage and disposal, including supervision of these activities and procedures, as well as supervision and measures implemented at locations after medical waste treatment. According to the National Waste Management Plan 2017-2022 (OG 3/17), the waste-management approach is based on the concept of the waste hierarchy. The most preferable approach is to avoid producing waste as much as possible. Where possible, priority is given to reuse/ recycling / recovery treatment process. Waste that cannot be recovered is then dealt applying the least preferable options, such as land disposal, to reduce its health and environmental impacts.

Waste minimization is achieved by setting up the most appropriate purchasing system and stock management system. An important step in waste minimization which is also essential for effective waste management is waste identification (classification). In the process of waste classification, the Ordinance on waste management (OG 106/22), appendix 10. The Ordinance on waste management is fully harmonized with the European List of Waste which comprises of about 800 waste codes. The

[2] MoESD: Overview of management data medical waste for 2021

waste generator is responsible for the classification of radioactive waste according to the Ordinance on disposal of radioactive waste and used sources (OG 88/22). Article 4. describes the classification of radioactive waste according to its typical features as well as prescribes the way of its disposal/ management.

According to the national legislation, medical institutions that annually produce 200 or more kg of hazardous medical waste at one location (large generators of medical waste) are obliged to appoint a responsible person for medical waste management in accordance with national regulations. The appointed person is responsible for:

- ensuring separate collection and temporary storage of medical waste at the place of origin;
- training of personnel related to separation, separate collection, labelling of containers, temporary storage, processing of medical waste at the point of origin and keeping the necessary records and delivery of data based on regulations.

According to the Waste Management Act (OG 84/21) and the Waste Management Rulebook (OG 106/2022) there are a total of 15 properties that will define some waste as hazardous, and it is enough for the waste to have only one of these properties to be categorized as hazardous. One of the properties is 'infectious'. Medical waste and its types are defined under Rulebook on Medical Waste (OG 50/2015, 56/19) and categorized under Annex X, Waste Management Rulebook (OG 106/2022) where all wastes attributed to Group 18 and KB 20 01 31* and KB 20 01 32 from the Group 20, are classified as medical wastes.

Medical waste can be non-hazardous and hazardous. Hazardous medical waste includes:

1. Infectious waste
2. Sharp objects
3. Pharmaceutical waste
4. Chemical waste
5. Cytotoxic and cytostatic waste
6. Amalgam waste from dental care
7. Other hazardous waste - any waste that has any of the hazardous properties as defined in the Waste Management Act and the Waste Management Rulebook.

In all cases, producer of medical waste must either hand over generated medical waste to licensed persons for processing in Croatia or abroad, or process waste so it would become non-hazardous before disposal (either by sterilizing or incinerating). Contagious medical waste is, as a rule, managed in two ways: (i) sterilized (e.g. in autoclaves or by dry heat) and then deposited to municipal landfills; or (ii) incinerated in licensed facilities.

Sampling and testing of waste, by-products, results of waste recovery and determination of hazardous properties of waste can be carried out by a legal entity accredited for the appropriate method of sampling and testing.

Waste testing is performed in accordance with Commission Regulation (EC) no. 440/2008 of May 30, 2008 on determining test methods in accordance with Regulation (EC) no. 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of

Chemicals (REACH) (OJ L 142, 31.5.2008, p. 1.), relevant notes of the European Committee for Standardization or other internationally recognized test methods and guidelines.

All polluters that:

- transfer outside the place of origin of polluting substances in wastewater intended for processing;
- generate and/or transfer outside the place of origin hazardous waste in a total amount greater than or equal to 0.5 tons per year and non-hazardous waste in a total amount greater than or equal to 20 tons per year;
- perform activities of recovery or disposal of waste;
- perform waste collection activities, provision of public municipal waste collection services, and waste trading activities through the process of retail waste trading;

are subject to registry at the Ministry of Economy and Sustainable Development registry of environmental pollution, which contains a list of all 'polluters' in the Republic of Croatia, including producers of hazardous waste. The registry is regulated under the Waste Act as well as the Rulebook on environmental pollution registry (OG 3/22) which stipulates mandatory data reporting.

For medical facilities that annually produce less than 200 kg of hazardous medical waste (small sources of medical waste), the head of the medical facility is appointed as the responsible person for medical waste management.

During the COVID 19 pandemic, the weaknesses of medical waste management and disposal in Croatia became apparent. While no significant issues were recorded with collection, transport and handling large amounts of infections wastes, and no illegal dumping was recorded, and the system is fully functioning in the ‘normal’ times/conditions, it became obvious that the system is struggling in the conditions of unexpected increase of generated medical waste, in particular with temporary storage, processing and disposal of large amounts of infections/hazardous wastes.

To address this issue and find the long-term solution, the GoC is planning to increase autoclaving as well as processing capacity on the national level as well as levels of hospitals.

3.3.1 MW separate collection

Healthcare facilities are obliged to ensure separate collection of waste at the place of origin, keep records, store waste in appropriate containers and temporarily store waste in a specially separated area until processing or until handing over to an authorized person or until export of such waste from the Republic of Croatia. Each type of waste needs to be stored in a separate container, which is labelled with the waste type name and waste code. A separate space for waste storage must be provided in each healthcare facility that produces more than 200 kg of hazardous medical waste yearly.

Waste generated from wide implementation of COVID-19 measures (waste protective gloves, masks, disinfectant waste packaging, etc.), from waiting rooms and similar spaces is considered to be municipal waste and in that manner is handed over to the authorized municipal company. However, waste protective and other equipment generated from treatment of COVID-19 infected patients is treated as infectious waste.

All waste types are handed over to the companies authorized for the waste management, working based in waste management permits issued according to Act on Waste Management. There is a separate authorization for transport, management and export of hazardous waste.

Disinfection and sterilization of the hospital premises is conducted according to the National standards for space cleaning in clinical and hospital health facilities3.

3.3.2 On site handling, collection, transport and temporary storage (medical waste, contaminated medical waste, other hazardous medical waste)

Medical waste must be stored at the point of origin in a locked, covered, temporary warehouse (except for a small source of medical waste) where the inflow of rainwater to the waste is prevented, separated from the main activity.

Apart from the basic requirements for waste storage, the medical waste storage space at the place of origin must meet the following conditions:

- impermeability and resistance of floor surfaces that are easy to clean and disinfect;
- equipped with water and sewerage;
- easily accessible to the staff in charge of internal waste management;
- locked to prevent access by unauthorized persons;
- easily accessible to devices and equipment for waste collection (carts, etc.);
- inaccessibility for animals, especially rodents, birds and insects;
- well lit and ventilated;
- prevented contact of waste with food and the place for food preparation.

Infectious medical waste may be stored for a maximum of 15 days at a temperature of up to +8 °C and at a temperature of +8 °C to +15 °C for a maximum of eight days. If the producer of infectious medical waste cannot ensure the conditions for its storage (including small waste sources), pit must ensure that no more than 24 hours pass from the generation of infectious waste to its submission for processing if the ambient temperature exceeds 20 °C, or 72 hours if the ambient temperature is between 15 and 20 °C. The producer of medical waste is obliged to hand over the produced medical waste to a licensed person for processing or delivery to a treatment/disposal outside the Republic of Croatia.

The producer of medical waste can process this waste independently if owns the appropriate equipment and obtains the appropriate permit for the management of medical waste in accordance with the Law. A small source of medical waste is not obliged to have a waste warehouse at the place of origin, but is obliged to collect hazardous medical waste separately in appropriate containers, and infectious medical waste at the prescribed temperature of up to +8° C, and to process it within no longer than 30 days at the prescribed way or hand it over to an authorized person for processing or deliver it for processing outside the Republic of Croatia.

Radioactive waste

Producer of medical radioactive waste must act in accordance with their own Plan for Disposal of Radioactive Waste, which they are obliged to prepare under the Ordinance on the disposal of radioactive waste and used sources (OG 88/22). It bears full responsibility for radioactive waste and used sources and is obliged to implement the prescribed radiological safety measures and nuclear security measures and prevent unauthorized removal (e.g., theft), loss, sabotage, unauthorized access,

3

https://zdravlje.gov.hr/UserDocsImages/2018%20Natje%C4%8Daji/Standardi%20%C4%8Di%C5%A1%C4%87enja%20prostora%20%2025.%20rujna%202018..pdf

damage, unauthorized transfer or other malicious acts, all for the purpose of enabling adequate protection of individuals, community and the environment from the harmful consequences of ionizing radiation and preventing the misuse of radioactive waste and spent sources. Medical radioactive waste is temporarily stored in a specialized concrete storage within the HCF (usually hospitals) until the radioactivity levels are harmless and acceptable under the law, after which this waste is treated and managed as infective waste.

Also, it must ensure that radioactive waste is disposed of in accordance with the provisions of Ordinance on the disposal of radioactive waste and used sources (OG 88/22).

Storage of radioactive waste and used sources entails:

- the producer of radioactive waste and/or the used source is obliged to store it in a warehouse (meeting requirements of Ordinance on the disposal of radioactive waste and used sources (OG 88/22) until it is released from supervision (when they reach threshold values expressed as activity concentration and/or total activity, at which and below which the obligation to apply the provisions of the prescribed laws ceases);
- if biomedical radioactive waste is also stored in the repository, it is necessary to separate space for this purpose;
- waste generated by the use of short-lived radionuclides during research, diagnostics or therapy, such as cotton wool, tissue, filter-paper, needles, syringes and the like, is kept in storage at the place of origin, until the conditions set by law are met;
- in the case of a mixture of several radionuclides with different half-lives, the storage time in the repository at the place of origin is calculated according to the radionuclide with the longest half-life;
- radioactive waste to which the process of release in liquid or gaseous state or release from supervision can be applied, must be sorted (criteria shall be accepted by the Ministry of the Interior which subscribes construction and other criteria during location and construction permitting process) until made harmless and separated from other radioactive waste immediately after being placed in the repository;
- the producer of radioactive waste and/or used radioactive sources is obliged to periodically check whether the containers used meet the conditions for storing radioactive waste or used sources in the repository (the frequency and method of periodic tank inspections needs to be approved by the Ministry in the process of issuing approval for the activity). Radioactive waste is periodically tested and after proven harmless it is managed as infective waste.

In case wastewater is discharged into municipal sewer sewerage system, the HCF should ensure that wastewater effluent comply with all applicable permits and standards stipulated by Rulebook on issuance of water permits (OG 9/20) and Rulebook on limit values of wastewater emissions (OG 26/20). Residuals of the onsite wastewater treatment works, such as sludge, should be properly handed over to the authorized waste company.

If there are cases where HCF wastewater is transported by trucks to a municipal wastewater treatment plant for treatment it has to be conducted by authorized company, too (municipality / city owned companies responsible for water supply and drainage).

Proper maintenance and disinfection of the storage areas are carried out. During the COVID-19 outbreak, infectious wastes are removed from HCF's storage area in accordance with the requirements regarding infectious waste stipulated by Ordinance on medical waste management (OG 50/15, 56/19*).*

3.3.3 On site safety measures (medical waste, contaminated medical waste, other hazardous medical waste) MW collection, packaging and transport to external facilities (medical waste, contaminated medical waste, other hazardous medical waste)

Collection

The regulation (Ordinance on medical waste management (OG 50/15), Law on Occupational Health and Safety, etc.) prescribes that all HCF personnel handling infectious medical waste must wear gloves and additional protective medical clothing and personal protective equipment (PPE) appropriate to the level of risk they encounter and shall remove any protective medical clothing used prior to leaving the work area and to place it in a designated area or container. When performing procedures where droplet transmission is not expected, gloves and masks are the minimum PPE that shall be worn.

Protective medical clothing and PPE shall not be submitted for laundering unless sterilized aforehand.

When performing procedures where splashing may occur or when infectious medical waste bags or containers may contact more than the worker's hands and wrists, the following medical protective clothing and PPE is required in addition to gloves and masks:

- appropriate protective medical clothing should be of material that does not permit infectious medical waste from penetrating and reaching workers clothes or skin;
- eye protection, surgical face masks, and face shields when personnel may reasonably anticipate facial exposure to infectious medical waste;
- implement immunization for staff members, as necessary (e.g., vaccination for hepatitis B virus, tetanus immunization).

Packaging

The producer of medical waste is obliged to store the produced waste in a container that meets these conditions:

- containers for the collection of hazardous medical waste must be resistant to the effects of the dangerous properties of the contents, to cracking and piercing if sharp objects are involved, to aggressive chemicals and the like, and must withstand normal handling and transport conditions such as vibrations and changes in temperature, humidity and pressure (except containers for non-hazardous medical waste);
- infectious medical waste must be collected separately at the place of origin in hermetically sealed containers resistant to penetration and leakage of liquids from them and transported to a temporary storage without sorting and moving to other containers, in a way that prevents direct contact of vulnerable persons with the waste (except containers for non-hazardous medical waste);
- each container must be marked with an inscription that contains basic information about the waste producer with the name of the institution and department, the key number and the

name of the type of waste in accordance with a special regulation and the date of delivery to the authorized person;
- the data inscription is printed on the container or on a label that must not be smaller than fifty by seventy-five millimeters.

Transport

In the case of transporting hazardous medical waste, the containers must be labelled in accordance with the regulations on the transportation of hazardous substances, and for infectious medical waste, they must also be labelled in accordance with the regulation governing protection against risks due to exposure to biological agents. The key regulatory act which organizes this activity is Ordinance on medical waste management (OG 50/15).

Infectious medical waste must be collected and transported in vehicles in which the temperature does not exceed +15 °C and in a way that prevents direct contact of vulnerable persons with the waste, and during delivery it may not be moved to other containers or subsequently sorted.

If the authorized person for the collection of medical waste is not authorized for treatment at the same time, it must hand it over to the authorized person for the treatment of medical waste or deliver it for treatment to licensed facilities outside the Republic of Croatia. If hazardous medical waste is delivered from the Republic of Croatia for processing, the containers must be marked in accordance with regulations on the transportation of hazardous substances and applicable international agreements (Basel Convention).

3.3.1 MW temporary storage and disposal/processing (medical waste, contaminated medical waste, other hazardous medical waste)

The chapter is based on requirements of Ordinance on medical waste management (OG 50/15, 56/19) and Waste Management Act (84/21).

Medical waste

Medical waste must be stored at the point of origin in a locked, covered, temporary warehouse where the inflow of rainwater on the waste is prevented, separated from the main activity. In addition to the requirements for waste storage, the medical waste storage space at the place of origin must meet the following conditions:

- have impermeable and resistant floor surfaces that are easy to clean and disinfect;
- be equipped with water and sewage;
- be easily accessible to the staff in charge of internal waste management at medical waste producers;
- be locked to prevent access by unauthorized persons;
- be easily accessible to devices and equipment for waste collection (carts and the like);
- be inaccessible to animals, especially rodents, birds and insects;
- be well lit and ventilated;
- be located so that waste cannot come into contact with food and the place for food preparation.

Infectious medical waste may be stored for a maximum of 15 days at a temperature of up to +8 °C, and at a temperature of +8 °C to +15 °C for a maximum of eight days. If the producer of infectious medical waste cannot ensure the conditions for its storage, he must ensure that no more than 24 hours pass from the generation of infectious waste to its submission for processing if the environmental temperature exceeds 20 °C, or 72 hours if the environmental temperature is between 15 and 20 °C.

Infectious medical waste

Infectious medical waste may be stored for a maximum of 15 days at a temperature of up to +8 °C, and at a temperature of +8 °C to +15 °C for a maximum of eight days. Infectious medical waste must be processed within 15 days from the day it is handed over to the licensed processing company. Treatment of infectious medical waste in Croatia is carried out by physical procedures of dry or steam sterilization, or incineration of waste. The waste can also be exported.

The licensed processing company of infectious medical waste must perform an analysis at least six times a year to determine whether microorganisms have been removed from the processed medical waste. Sampling and verification are performed by authorized laboratories.

The absence of microorganism growth based on the analysis proves that the treated infectious medical waste has become non-hazardous production waste. The licensed processing company is obliged to keep the results of the analysis of processed infectious medical waste in written or electronic form for 5 years.

The licensed processing company of hazardous medical waste must assign a new key number to the newly created waste after processing in accordance with a special regulation (Ordinance on waste management (OG 106/22) and Ordinance on medical waste management (OG 50/15, 56/19)) and ensure further processing.

When handing over non-hazardous medical waste resulting from the processing of infectious medical waste for recovery in the territory of the Republic of Croatia, the owner of the waste must also attach a negative analysis result not older than 60 days to the accompanying waste manifest (*cro. pratећi list*).

Pathological waste

Pathological waste must be stored in a freezer, in airtight bags, in the healthcare facility that is the producer of that waste.

Transportation of pathological waste (any human or animal body parts) is carried out in accordance with a special regulation regulating deceased transportation (OG 116/18). Companies which provide deceased transportation services must be properly registered as transporting company in accordance with the special regulation on waste management.

It is prohibited to store pathological waste outside of a health facility, cemetery or crematorium.

Disposal of pathological waste must be carried out under special conditions by burning in crematoriums or burying in cemeteries (according to the Instructions on handling waste generated during the provision of health care (OG 50/20)).

For the purpose of monitoring the data on the origin and course of pathological waste, the producer of that waste is obliged to keep a register and submit the data on the waste to the competent authority (administrative body responsible for the sanitary inspection of the County or the City of Zagreb) in accordance with the special regulation (Instructions on handling waste generated during the provision of health care (OG 50/20)).

Radioactive waste

HCFs generating radioactive waste may perform certain disposal processes for the radioactive waste, in accordance with the Law on radiological and nuclear safety and on the basis of the approval for performing the activity of radioactive waste disposal, except for storage and disposal.

While all other types of generated waste are handed over to the licensed company that are registered at Register of permits and certificates for waste management, MoESD – HCW, the radioactive medical waste is reported to, managed and disposed in accordance with instructions of Department of Environment and Radioactive Waste, at Ministry of Interior. Currently, medical radioactive waste is temporarily stored in specialized radioactive storage depos at HCFs.

Liquid radioactive contaminated wastes

Liquid contaminated waste (e.g. human tissue, blood, feces, urine and other body fluids) requires special handling, as it may pose an infectious risk to healthcare workers with contact or handle the waste.

Steps for the disposal of liquid contaminated wastes are the following:

- wear PPE (utility gloves, mask, protective eyewear and plastic apron);
- upon adequate treatment of liquids to neutralize the hazard present, the treated liquid is carefully discharged down in sanitary facilities or into a flushable toilet and rinse the toilet or sink carefully and thoroughly with water to remove residual wastes, avoid splashing;
- decontaminate containers by placing them in a 0.5% chlorine solution for 10 minutes before washing them;
- remove utility gloves (wash daily or when visibly soiled and dry);
- wash and dry hands or use an antiseptic hand rub as described above.

Pre-discharge treatment will depend on the contamination type and hazard present and can include (but is not limited to) acids and alkalis that will be diluted, pH neutralized and disposed of to the sewer with water. Neutralization can be done with lime, which is cheap and effective. In cases where wastewater is not discharged to sanitary sewage systems, HCF operators would ensure that wastewater is disposed of at wastewater treatment facility with on-site primary and secondary treatment, in addition to chlorine disinfection. Techniques for treating wastewater in this sector include segregation at source and pretreatment for removal / recovery of specific contaminants such as radio isotopes, mercury, etc.; skimmers or oil and water separators for separation of floatable solids; filtration for separation of filterable solids; flow and load equalization; sedimentation for suspended solids reduction using clarifiers; biological treatment, typically aerobic treatment, for reduction of soluble organic matter (BOD); biological or chemical nutrient removal for reduction in nitrogen and phosphorus; chlorination of effluent when disinfection is required. In the case of hazardous medical / infectious liquid waste, dewatering is applied while residual dry matter is sterilized or incinerated.

Solid radioactive contaminated wastes

Solid contaminated waste (e.g., surgical specimens, used dressings and other items contaminated with blood and organic materials) may carry microorganisms.

The waste is handled in the following manner:

- never using hands to compress waste into containers;
- holding plastic bags at the top;
- keeping bags from touching or brushing against the body of a carrier while lifting or during transport.

Following steps are taken in the disposal of solid contaminated wastes:

- wearing heavy-duty or utility gloves when handling and transporting solid wastes;
- wearing mask and glasses if working with material that may splash into face or eyes;
- disposing of solid wastes by placing them in a plastic or galvanized metal container with a tightfitting cover, always recapping needles after use;
- collecting the waste containers on a regular basis and transporting the burnable ones to the incinerator or package for transport if exported;
- handing over the packed waste to licensed collector and company licensed for export of this type of waste.

3.4 Key non-hazardous waste management requirements and procedures

3.4.1 Separate collection, onsite handling, temporary storage

The owner of the waste is obliged to categorize the waste in his possession in such a way as to determine the origin and place of origin of the waste, the group, the subgroup and the key number of the waste and the properties of the waste in accordance with Ordinance on waste management (OG 106/22).

The waste producer is obliged to store its own generated waste at the place of origin separately by type of waste, in a way that does not lead to mixing of waste, and which enables waste treatment, in the storage of its own generated waste. The non-hazardous waste producer may store its own production waste for up to one year from its occurrence, depending on its type.

In general, the national regulation requires that the waste storage facility must meet the following conditions to be able to store waste:

- must be under constant supervision;
- must be equipped with primary waste storage containers that must be:
    - made of material resistant to the effects of stored waste;
    - made in a way that enables safe filling, emptying, venting, sampling and, if necessary, airtight closure and;
    - marked with a legible label containing information on the name of the owner of the waste, the key number and the name of the waste;
- floor area of the warehouse:
    - it must be impermeable to the waste stored in it;

  - it must be constructed in such a way that bulk waste can be easily removed from the floor surface, which includes a concrete or asphalt base for solid waste, and concrete with a coating or additive that prevents liquid absorption in the base for liquid waste;
  - it must not chemically react with the waste and liquid from the waste with which it comes into contact;

- the warehouse must be equipped with ventilation;

- the storage of liquid waste and waste containing liquids must be done in such a way that in the event of liquid waste being spilled or scattered, it is prevented from reaching the environment or the public wastewater drainage system;
- the warehouse in which the technological process of storing liquid waste and waste containing liquids is carried out must be equipped with a secondary tank with a capacity of at least 110 percent of the capacity of the largest primary tank located on the drainage surface of that secondary tank and 25 percent of the capacity of all primary tanks on the same drainage surface, and liquid drains from the drainage surface of the warehouse, if they exist, must be connected to an impermeable collector connected to the waste water treatment tank;
- the secondary tank and the drain surface must not have any damage that could lead to the release of waste into the environment;
- waste with incompatible chemical properties, i.e. types of waste that, through mutual contact or contact with substances present at the location, can cause unwanted interaction, including uncontrolled generation of heat or gas, and thus can cause a danger to human health or a harmful impact on the environment, must be stored separately from each other in separate primary containers, and if such hazardous waste is liquid or contains liquid, it must be kept on separate drainage areas and separate secondary containers;
- the warehouse where gaseous waste is stored must be equipped with primary containers that can be hermetically sealed and that comply with special regulations governing equipment under pressure (including, but not limited to EU Directive 2014/68/EU on Pressure Equipment, Rulebook on pressure equipment (76/2016), and Rulebook on inspection and testing of high-risk pressure equipment (OG 75/20);
- transport to external facilities.

The owner of waste is obliged to hand over to an authorized person separately from other waste: hazardous waste, wastepaper, metal, plastic, glass, bulky waste and textiles and footwear, packaging waste, waste that is considered a special category of waste. The owner of waste who hands over a shipment of waste is obliged to hand over to the person receiving the waste a completed written or electronic Waste Manifest containing information about the waste and the persons involved in the management of that waste. The person who transports waste is obliged to have a completed and certified Waste Certificate with the shipment of waste.

3.4.2 Disposal and processing

The non-hazardous waste producer is obliged to ensure the processing of waste through the process of preparation for reuse, recycling or recovery in accordance with the law, and when this is not possible, it is obliged to ensure the safe and legal disposal of waste to licensed landfills in accordance with the law.

The waste producer is obliged to do this by treating his own waste or entrusting the treatment of waste to a person who is allowed to treat waste in accordance with this Law, or to deliver the waste from the Republic of Croatia for recovery or disposal in accordance with Regulation (EC) 1013/2006 within one year from the generation of waste.

3.5 Capacity building requirements for medical facilities and institutional arrangement

Medical institutions that annually produce 200 kg or more of hazardous medical waste at one location (large sources of medical waste) are obliged to appoint a responsible person for medical waste management in accordance with national regulations.

The appointed person is responsible for:

- ensuring separate collection and temporary storage of medical waste at the place of origin;
- training of personnel related to separation, separate collection, labelling of containers, temporary storage, processing of medical waste at the point of origin and keeping the necessary records and delivery of data based on regulations.

For medical facilities that annually produce less than 200 kg of hazardous medical waste (small sources of medical waste), the head of the medical facility is appointed as the responsible person. The producer and/or owner and possessor of radioactive waste and used sources is obliged to appoint a person responsible for its disposal. The person responsible for the disposal of radioactive waste and used sources must have completed undergraduate and graduate university studies or integrated undergraduate and graduate university studies in a technical or natural profession and special professional education for the handling of radioactive sources and the application of radiological safety measures acquired through regular education, specialist education or additional education, of which there must be written evidence.

3.6 Financing

The waste producer is obliged to bear the costs of all phases of waste management, including the costs of construction and operation of the necessary infrastructure for waste management in accordance with the "polluter pays" principle, integrated to the national legislation. The owner of the waste is responsible for the damage caused by the waste that was in his possession when the damage occurred.

3.7 HCFs under protection as cultural heritage or in areas under nature protection

Some of the health facilities participating in this project are protected by Act on the Protection and Preservation of Cultural Property (OG 69/99, 151/03, 157/03, 100/04, 87/09, 88/10, 61/11, 25/12, 136/12, 157/13, 152/14, 98/15, 44/17, 90/18, 32/20, 62/20, 117/21,114/22) as cultural heritage of the Republic of Croatia, namely:

1. General Hospital Bjelovar

Name: Complex of hospital buildings
Legal status: cultural heritage
Classification: public building
Description: The complex of hospital buildings is located northeast of the town square, outside the orthogonal scheme of city blocks, and consists of three buildings oriented towards Mihanovićeva

Street: the Surgical Pavilion, the Internal Department Building and Villa Marija. The oldest part is the Internal Department, built in 1845 as a military hospital. The surgical department was built in 1924, according to the project of Ignac Fišer, and Villa Marija was built in 1928 as a private sanatorium. The complex of hospital buildings is a significant architectural and urban accent, it represents an integral architectural unit refined with horticultural and park forms.

2. Clinical hospital "SVETI DUH"

Name: Monument to resistance members "Plamen"
Legal status: cultural heritage
Classification: memorial features and places
Description: The "Plamen" monument was erected in 1959 in front of the hospital "Dr. Josip Kajfeš" (today "Sveti Duh" General Hospital), in memory of the seventy-five fallen fighters of the municipality of Črnomerec, and in honor of the 40th anniversary of the Communist Party of Yugoslavia. It is the work of sculptor Ivan Sabolić. The bronze sculpture, placed on a roundel in front of the hospital's main entrance, surrounded by greenery, is placed on a low cubic concrete pedestal covered with black marble slabs. An elongated abstract sculpture of a spiral shape, the flame is a metaphor for the very beginning of the resistance to the fascist regime. The monument belongs to the group of Sabolić's abstract public sculptures conceived as spatially emphasized monumental-symbolic forms.

3. National Memorial Hospital VUKOVAR

Name: Place of remebrance - Vukovar hospital in 1991.
Legal status: cultural heritage
Classification: memorial features and places
Description: The museum space was opened in the basement of the Vukovar General Hospital in 2006. The place is a reconstruction and presentation of the conditions in the Vukovar War Hospital during the Homeland War and the siege of Vukovar from August 25. until 18.11.1991. when the hospital is bombarded by the aggressor-JNA with paramilitary forces. Hospital services with wards were located in the basement corridors and existing fallout shelter and the accommodation of the wounded was organized. 20.11.1991. around 400 wounded, hospital staff and their family members and other civilians were taken out of the hospital, at least 267 people were killed or missing. About 200 people were killed in Ovčara. Above the entrance is a crucified Red Cross. In the corridors, there are multimedia displays of war events, a chronology of all events, plaques with the names of the killed and missing. The space of the fallout shelter is authentic with beds, props, wrapped plaster figures and the Room of Remembrance. The setting was created in memory of the difficult and heroic days of the city of Vukovar.

4. General Hospital ZADAR

Name: Administrative building of General Hospital Zadar
Legal status: cultural heritage
Classification: public building
Description: The ground floor and first floor of the entrance facade are divided horizontally by a cornice that continues through all the facades of the building. The distinctively prominent part differs from other parts of the building. The entrance door is accented with a capital stone and flanked by two simple windows above the transoms of which are relief arches with capital stones. Four pilasters visually divide the floor into three parts. The windows of the first floor are more prominent with gabled transoms. Rizalit ends with an attic-colonnade in the center of which the year 1885 is carved. Above the carved year there is a coat of arms of the neo-baroque type, bordered by volutes and plastically processed motifs of olive branches and snakes. The balustrade continues on the left and right. The

south-eastern and north-western facades follow the profile of the main facade. The northeast facade underwent modifications. In the past, the building had a U-plan with wings open to the northeast, and today, with additions, it forms a whole. The additions are plastered and lower than the rest of the building, open with three opening axes. The north-eastern ends of the former wings of the building each have two opening axes that follow the profile of the ground floor windows of the main facade. The central shallow elevation on the ground floor has a modest door surmounted by a square lintel, flanked by two narrow windows surmounted by openings on the first floor. All facades built in stone are rustically finished in the lower part. Due to the changes in functions, the interior of the hospital underwent changes, but the direction of movement was mostly maintained. The roof covered with gutters follows the original floor plan of the building, while the newer additions are covered with a flat roof.

All Project supported activities taking place in/affecting the buildings must be aligned with the ESS8 of the ESF as well as applicable national CH regulation. Since the installation of the tents does not represent an extensive procedure, no damage is expected during the set up and operational phase. However, potential risk exists in case of fires which could cause damage to the buildings protected as cultural heritage. The risk is assessed as low.

3.8 Potential implications and impacts from sub-project activities

From the implementation of the sub-project activities, potential risks and impacts are expected mainly during the operational phase (usage of the tents in crisis situations, using medical equipment and vehicles, oxygen and other gases supply and storage, etc.) and the end of use phase, due to expected OHS risks (exposure to chemicals, infectious diseases, life and fire safety risks, potential exposure to radiation, etc.), generation of solid hazardous waste, other wastes: contaminated solid waste, textiles and contaminated waste liquids.

Potential environmental and social risks during preparatory phase:

- no or difficult procurement of equipment (e.g., additional tanks for contaminated waste liquid);
- improper identification of employees which should be trained;
- lack of training and manuals/procedures;
- inadequate location for placing the tents and/or other equipment.

Potential environmental and social risks during operational phase:

- generation of different types of wastes, including medical waste, infectious waste, and hazardous waste;
- generation (management and disposal/processing) of contaminated waste liquid after decontamination;
- inadequate waste management facilities and processes for treatment of waste;
- improper waste transportation to and disposal in offsite treatment and disposal facilities;
- fire hazard due to inadequate use of electrical installation;
- labour management related to health and safety of workers;
- emergency events (spillage; occupational exposure to infectious disease; accidental releases of infectious or hazardous substances to the environment and related risks for nearby community; medical equipment failure; failure of solid waste and wastewater treatment facilities; fire).

Potential environmental and social risks during dismantling/end of use phase and storage:

- generation of waste, medical waste, etc.;
- improper decontamination of the tents and associated equipment before storage;
- compliance issues and issues with proper compliance monitoring.

3.9 Emergency Preparedness Plan

The purpose of this section is to provide emergency response for the healthcare facilities with regard to the potential threat associated risks that could affect Health Care Facilities operations (including risks to workers and patients and on operation of waste treatment and disposal options) in line with the requirements of ESS4. Currently HCF's do not have such plan, though elements of it has been developed (e.g. Fire Safety Plan). Emergency incidents occurring in a HCF that are likely to seriously affect medical workers, communities, the HCF's operation and the environment are:

- spillage of hazardous substances;
- occupational exposure to infectious materials or radiation;
- accidental releases of infectious or hazardous substances to the environment;
- medical equipment failure;
- failure of solid waste and waste water treatment facilities and management systems;
- fire;
- explosion.

As development of Emergency Preparedness Plan is not regulated by the law, it is recommended that the individual HCF develop and implement its own Emergency Preparedness Plan that will regulate actions in the event of a threat from the aforementioned threats by defining the necessary measures to prevent or mitigate the consequences of unwanted events and determining the responsible persons and their roles and responsibilities in the implementation of these measures. The Plan can utilize and integrate relevant Plans that already exist (as a response to regulation requirements) such as Fire Protection Plan and Evacuation and Rescue Plan.

The future plan of hospital activities during radiation emergencies shall contain:

- activation of Hospital Incident Command System and the Pre-arranged Response Plan;
- defined Hospital Medical Response Team;
- procedures for equipping the emergency department for decontamination;
- initial actions for emergency personnel following a nuclear detonation;
- hospital approach to patients who appear after a nuclear detonation;
- contamination Control Techniques;
- operating room safety guidelines;
- imaging procedures safety guidelines;
- security planning;
- actions after a radiation event: managing contaminated areas, personnel, and equipment.

Emergency Preparedness Plan will also include detailed standard precautionary procedures in the case of exposure of infective waste (already in use). Standard precautions during professional exposure to infectious diseases include proper facility ventilation, proper hand hygiene, use of personal protective

equipment, safe handling of needles and sharp objects, safety devices for the prevention of stabbing incidents, immunization against hepatitis B.
Activities in case of occupational infections should include:

- Protocol for dealing with a stabbing incident;
- Post-exposure prophylaxis.

In accordance with the Law on Fire Protection, the Law on Occupational Safety and the Law on the Civil Protection System, HCF is subject to preparation of the following mandatory documents which regulate aspects of the procedure in the event of a major accident, disaster or unwanted event and can serve as part of the input data for the creation of the Emergency Preparedness Plan:

1. Evacuation and rescue plan (based on Law on Occupational Safety)

- description of the facility where the work is performed;
- activities performed in the facility, on individual floors/rooms;
- a list of dangerous working substances used with their dangerous properties;
- description of the fire extinguishing system/equipment;
- the number of workers employed in the facility, by individual rooms, workplaces;
- assessment of the possible occurrence of an extraordinary event;
- assessment of possible adverse effects on workers, buildings, plants, and the environment;
- the obligations of workers and their actions in the event of a certain extraordinary event;
- persons responsible for the implementation of evacuation and rescue, their responsibilities and procedures;
- the course and manner of reporting on an extraordinary event;
- list of equipment required for evacuation and rescue, including personal protective equipment per building/floor/room;
- way of educating and familiarizing workers and persons responsible for the implementation of evacuation and rescue with the plan and their obligations/responsibilities;
- graphic presentation of the floor plan of the working premises and directions for evacuation and rescue by floor;
- display of meeting places outside the facility.

2. Rulebook on fire protection (based on Law on Fire Protection):

- overview of obligations and responsibilities related to the implementation of fire protection measures;
- the method of performing internal supervision over the implementation of protection measures from of fires and authorizations, obligations and responsibilities for performing internal supervision;
- methods to familiarize workers with dangers and general protection measures from fire at the workplace when starting work or changing workplace, that is, before the performance of certain works and actions by other persons and keeping records about it;
- method of training workers to handle hand-held equipment and means for extinguishing initial fires, periodic knowledge and guidance checks records about it;

- overview of responsibilities regarding equipment and method of maintenance in proper condition of equipment and funds for alarm and fire extinguishing;
- description of workers actions in case of fire;
- other fire protection measures description according to own plans and needs.

3. Risk assessment of legal entities that perform activities using dangerous substances (if they use dangerous substances above the amount prescribed by a special regulation[4], (based on the Law on the Civil Protection System)):

   - general information about HCF;
   - identification of types of risks and calculation of hazards with limit quantities of hazardous substances for which operational protection and rescue plans are created;
   - assessment of the consequences of an extraordinary event;
   - overview of location and environmental data;
   - data on types, quantity and method of storage, or storage of hazardous substances;
   - information on the identified possible influence of natural disasters on the location and possibility of the accident occurring and assessment of the consequences of the influence of hazardous substances on people, material goods and the environment;
   - the size of the danger zone and the maximum reach of the causes of the accident;
   - data on own rescue forces and means and assessment of their operational capabilities and (sufficient) capacity for the implementation of civil protection measures.

4. Operational plans of legal entities that perform activities using dangerous substances (if they use dangerous substances above the amount prescribed by a special regulation[4] (based on the Law on the Civil Protection System):

   - list of hazardous substances on site, maximum expected quantity of hazardous substances on site, list of possible sources of danger, assessment of possible causes and dangers from an emergency event, and qualitative and quantitative risk assessments;
   - preventive measures to prevent an emergency event, including mandatory notification;
   - organization of the implementation of operational measures in the case of an emergency event based on risk assessment;
   - overview of responsible persons and necessary experts for the implementation of the necessary civil protection operational measures with brief instructions to the responsible persons on employing their own capacities, how to achieve cooperation with the civil protection headquarters and other participants in the unified civil protection system;
   - methods of disposal of hazardous substances from the media and environmental remediation;
   - assessment of ability to apply the operational plan;
   - practice plan according to the exercise program;
   - procedures for informing the responsible leaders of the city and the public about cases of extraordinary events where the consequences go outside the boundaries of HCF;

[4] Regulation on preventing major accidents involving dangerous substances (OG 44/14, 31/17, 45/17)

- preparation plan for acting on warning information.

5. Operational plan of measures in case of extraordinary and sudden water pollution (based on Water act):

- description of places of possible pollution;
- maintenance and control in regular work with determination of preventive measures;
- water hazard assessment;
- procedures in emergency situations;
- organization of procedure and scope of implementation of measures in case of water pollution;
- list of equipment and means required for the implementation of measures;
- persons responsible and experts required in the implementation of measures;
- obtained equipment and means for the implementation of measures.

4 INFECTION CONTROL

4.1 Institutional and regulatory framework

In the Republic of Croatia, hospital infection control is regulated by Ordinance on conditions and methods of carrying out measures for the prevention and control of hospital infections (OG 85/12, 129/13) which derives from Act on the Protection of the Population from Infectious Diseases (OG 79/07, 113/08, 43/09, 130/17, 114/18, 47720, 134/20, 143/21).

The work of the laboratory is defined by the following regulation: Law on medical-biochemical activity (OG 121/03, 117/08), Rulebook on norms and standards for the performance of healthcare activities (OG 52/22) and Rulebook on professional supervision over the work of medical-biochemical laboratories and medical biochemists (NN 8/04). While each operating laboratory must be registered and licensed by MoH, laboratory accreditation is not mandatory in Croatia, and a list of accredited laboratories is available at the link: https://akreditacija.hr/registar/.

The following measures are prescribed to prevent and suppress the spread of hospital infections:

- examination and sanitary treatment of the patient upon admission to hospital treatment, and according to clinical indications, microbiological and epidemiological treatment of the patient;
- the implementation of sanitary and hygienic procedures at work and the behavior of employees, patients/users and visitors within the health institution;
- cleaning, washing and ventilation of work rooms and related equipment;
- hygiene of hands, skin and mucous membranes;
- disinfection of instruments, medical equipment and the environment;
- sterilization of equipment and accessories for medical procedures;
- aseptic, antiseptic and hygienic procedures at work;
- collection, sorting, washing, sterilization and transport of laundry;
- ensuring the healthiness of foodstuffs, including drinking water and sanitary-technical and hygienic conditions for the preparation, storage and distribution of food;
- ensuring the health and quality of water for the needs of hemodialysis, in accordance with special regulations;
- air quality assurance in accordance with special regulations (Regulation on air quality monitoring OG 72/20);
- disinsection and pest control in accordance with special regulations (Regulation on the method of implementation of mandatory disinfection, disinsection and deratization – OG 35/07 and OG 76/12);
- disposal of infectious waste, in accordance with special regulations (Ordinance on medical waste management - OG 50/15, 59/19);
- early detection, isolation and treatment of persons with healthcare-associated infections;
- monitoring of healthcare-related infections in relation to the type of infection, causative agents, patient population, application of diagnostic or therapeutic procedures;
- monitoring the resistance of certain types of microorganisms, monitoring the consumption of antibiotics and creating a list of reserve antibiotics;

- implementation of preventive and specific measures (immunization, chemoprophylaxis, seroprophylaxis) and microbiological control of living and non-living environment according to epidemiological indication;
- ensuring the hygienic and technical correctness of the building, equipment and installations, as well as participation in building and architectural reconstructions or construction;
- education of the entire staff (medical and non-medical) when starting work and continuous education on the prevention of infections related to health care;
- basic education and continuous education of members of the Hospital Infection Control Team;
- care of health and non-health workers who are professionally exposed to potentially infectious material.

4.2 Infection Control Requirements (including national and ESS, WB EHSG, GIIP)

4.2.1 Management of healthcare personnel

In order to prevent the occurrence and spread of hospital-acquired infections as successfully as possible, healthcare institutions appoint the Committee for the Prevention and Suppression of Healthcare Infections in Healthcare Institutions (Hospital Committee) and the Hospital Infection Control Team (based on Rulebook on conditions and methods of carrying out measures for the prevention and control of hospital infections OG 85/12 and OG 129/13)).

Hospital Committee

The Administrative Council of the health institution appoints the president, deputy president and members of the Hospital Committee on the proposal of the director of the health institution.

Members of the hospital committee are:

- the director or his assistant for medical affairs;
- head nurse of the institution;
- doctor of medicine for hospital infection control;
- doctor of medicine specialist microbiologist (if he is not also a doctor for hospital infection control);
- doctor of medicine and infectious disease specialist (if he is not also a hospital infection control doctor);
- doctor of medicine specialist epidemiologist (if he is not also a doctor for hospital infection control);
- nurse-medical technician for hospital infection control;

and if necessary, also:

- chairman of the hospital quality committee;
- the president of the hospital's committee for drugs or the subcommittee for antibiotics;
- representatives of hospital departments and institutes (surgery, gynecology, internal medicine, pediatrics and others as needed);
- data scientists analyze new data on infections;

- a specialist in anesthesiology and intensive care, i.e. specialists in other specialties and other health workers.

The hospital committee is obliged to perform the following activities:

- adopts a program for the prevention and control of healthcare-related infections, an annual prevention and control plan and determines measures for the prevention and control of healthcare-related infections;
- makes recommendations for certain procedures in the diagnosis, care and treatment of the patient and care of health workers after professional exposure to the patient's blood and periodically revises the written recommendations;
- determines professional priorities in the fight against health care-related infections according to the epidemiological situation and procedures within the framework of measures to prevent and control health care-related infections;
- determines priorities in the monitoring of healthcare-associated infections and analyzes the movement of healthcare-associated infections;
- organizes a meeting at least once a year with employees with the aim of conveying information about the conclusions of their meetings;
- submits an annual report on the monitoring, prevention and control of healthcare-related infections to the institution's Administrative Council and the Ministry's Commission.

The director of the institution submits a report on the yearly bases on the epidemic of infection related to health care to the Minister responsible for health and the Minister responsible for social welfare (part of the quality assurance by CHIF) and to the Commission of the Ministry. Depending on the type of epidemic, the Reference Center for Epidemiology and the Reference Center for Nosocomial Infections of the Ministry of Health are also reported and notified.

The hospital committee is under obligation to cooperate with the Medicines Committee of the health institution, the Epidemiological Service of the competent Institute for Public Health, the Sanitary Inspection, the Ministry's Committee, the Reference Center for Hospital Infections of the Ministry of Health and other professional services.

Hospital Committee must adopt:

- written recommendations (procedures) for certain procedures in the diagnosis, treatment and care of patients, including recommendations for accommodation and isolation of patients, which reduce the risk of transmission of infectious agents;
- recommendations for the prevention and control of healthcare-associated infections in healthcare and non-healthcare workers;
- the costs of all procedures and measures carried out with the aim of preventing and suppressing hospital infections, with the exception of specific preventive activities for workers and patients in the event of an indication (vaccination), are borne by the health institution, and the director is responsible.

Hospital Infection Control Team

Hospital Infection Control Team is under obligation to implement, monitor and supervise the prevention, control and suppression of infections in healthcare on daily basis.

Hospital Infection Control Team is to be appointed by the Hospital Committee on the proposal of the president, and is to be composed of:

- medical doctor in charge of hospital infection control;
- nurse-medical technician in charge of hospital infection control;
- doctor of medicine specialist microbiologist, if the doctor of medicine in charge of infection control does not have that specialty.

The hospital Infection Control Team performs the following activities:

- monitoring the implementation of recommendations, procedures and measures for the prevention and suppression of hospital infections, as well as the monitoring and evaluation of individual measures;
- monitoring of health care-related infections according to established priorities and isolates of special significance;
- provision of advisory and professional assistance in daily work, as well as in the event of clustering of infections;
- care of healthcare workers after occupational exposure to infectious diseases, including those transmitted by blood;
- epidemiological reconnaissance in case of an epidemic, collection and analysis of data, determination of recommendations and measures to suppress the epidemic;
- organizing continuous education of healthcare and non-healthcare employees, persons in training, patients/users and visitors;
- secure data storage.

4.2.2 Capacity building (education and training)

All healthcare and non-healthcare workers who may come into contact with patients/users or medical equipment must be trained in the principles and practices of healthcare-associated infection prevention. Education is conducted for newly hired employees, and then periodically according to the annual plan and risk assessment of the institution's committee.

Healthcare-associated infection control employee training includes (according to Article 20. Rulebook on conditions and methods of carrying out measures for the prevention and control of hospital infections OG 85/12 and OG 129/13):

- basic education of doctors of medicine and nurse-technicians who will professionally deal with infections related to health care in the form of theoretical or practical work lasting at least 300 hours of classes, whereby the practical work must be done in a hospital with high-risk departments and developed practice in prevention and control of hospital infections;
- continuing education of doctors of medicine who professionally deal with the prevention and control of infections related to health care is carried out in postgraduate courses, continuing

education courses, in the form of theoretical and practical work that must be done in a hospital with high-risk departments and developed practice in the prevention and control of infections related to health care;

- continuing education of nurses-medical technicians who are professionally engaged in the prevention and control of healthcare-related infections on continuing education courses in the form of theoretical and practical work that must be done in a hospital with high-risk departments and developed practice in the prevention and control of healthcare-related infections care;
- the basic education of doctors of medicine and nurses-medical technicians who are professionally engaged in the prevention and control of infections related to health care should be in accordance with the competencies proposed by the ECDC, and it is carried out by the Faculties of Medicine and Colleges of Health.

Trainig of non-helath workers on prevention and control of infections must also be planned.

Training of educators of health and non-health workers on the prevention and control of infections related to health care in health institutions and social care service providers is carried out by the Referent Center for Hospital Infections.

4.2.3 Management of supplies, equipment and facilities

4.2.3.1 Procurement and delivery of supplies

Recommendations for procurement and delivery of supplies (The National Institutes of Health USA):

- purchasing and supplying materials which are less wasteful and/or generate less medical waste;
- centralized purchasing, supply of medical goods to ensure the selection of less wasteful materials;
- source suppliers who may deliver chemicals and pharmaceuticals in small quantities, this will encourage the hospital administration to make purchase in small manageable quantities;
- ensure good management and control practices especially in the purchase and use of pharmaceuticals;
- ensure effective supply chain management;
- ensure adequate supply of safety boxes, bins, bin liners, and PPE;
- monitoring and timely report on fuel use and supply status.

4.2.3.2 Collecting and handling laboratory specimens

All clinical specimens are considered potentially infectious and must be handled carefully to prevent contamination. The accuracy of the results depends on care in collecting and transporting the specimen to the lab. The quality of the results influences the diagnosis and treatment and therefore the clinical outcome. The risk of the health care worker being exposed to an infectious agent or contaminating the health care environment depends on maintaining continuous infection control practices.

Requirements for collecting specimens (The National Institutes of Health USA):

- gather personal protective equipment, depending on symptoms and history of the patient:
    - gloves- when handling any body fluids or risk of contaminating hands;
    - masks/respirators- if respiratory symptoms or initiating a cough from the patient with specimen collection, aerosolized excretions, risk of splash or spray;
    - goggles- if risk of splash or spray to eyes;
- care should be taken when collecting and handling specimens to avoid contamination of the outside of the container;
- secure lids tightly to prevent leakage;
- place the specimen(s) into a plastic, zip-lock type bag. Requisition should be outside the pouch that the specimen is shipped in;
- hand hygiene must be performed following any direct contact with blood or body fluids, after the handling or transporting of laboratory specimens and after glove removal.

If airborne spread disease is suspected specimens shall be collected in a negative pressure room, if available (e.g. TB). If there is no negative pressure room, then a room with good air circulation or outdoors may be the best alternative. The collector of sputum for TB testing should wear an N95 respirator or separate themselves from the area where the person is providing the sputum specimen.

Even if the patient has a controlled or non-productive cough, the irritation of having a nasopharyngeal swab done could bring on a deeper, productive cough, increasing the risk of contamination of the person taking the swab. Respiratory protection shall be worn. The person collecting/taking a sample must make sure to be aware of correct collection method, container (with or without stabilizing solution), storage and transportation so that the specimen will provide the most accurate results in which to base diagnosis and treatment decisions.

Requirements on handling specimens: (The National Institutes of Health USA):

- wearing gloves and any other indicated barrier protection when collecting and handling laboratory specimens is obligated;
- peach laboratory specimen shall be places in an appropriate leak-proof primary container (e.g. vacutainer tube, specimen cup, etc.);
- care should be taken when collecting and handling specimens to avoid contamination of the outside of the container;
- requisition slip(s) shall be inserted into the outside pocket of the bag;
- bag shall be sealed the before transporting it to the laboratory;
- if specimens require refrigeration, they should be stored in a separate fridge from vaccines, medication and food items.

4.2.3.3 Blood collection, storage and transmission; overview of nat. regulation and WHO recommendations if different)

Procedures for the safe storage and transport of blood and blood components must be directed at the storage and transport of blood and blood components that have been collected or prepared in plastic blood collection bags containing anti-clotting solution and preservatives to ensure safe blood in

accordance with WHO Guidelines for safe blood transfusion and Rulebook on quality assurance of blood and blood products in healthcare institutions (OG 91/19).

The essential parts of the blood cold chain are:

- trained staff;
- standard operating procedures;
- suitable equipment for the safe storage and transportation of blood and blood products;
- controlled environment;
- monitoring of processes, equipment and the quality of the products;
- regular feedback to the personnel of the safety measures and on the safety threatening incidents;
- lessons learned and actions taken to avoid them in the future.

Whole blood and red cells should be stored in a blood bank refrigerator: that is, one that is specifically designed for the storage of blood. Blood bank refrigerators have inbuilt temperature monitoring and alarm devices and a cooling fan to ensure the even distribution of cold air throughout the equipment. The whole blood and red cells must be stored at a temperature of +2°C to +6°C and must never be allowed to freeze. An efficient system shall be adopted to ensure that all blood and blood components are maintained in the correct storage conditions whenever they are moved from one location to another, including: from mobile collection sites to the processing laboratory, from the blood bank to a different facility (to a hospital, blood bank or clinic), from the hospital blood bank to wards and operating rooms. The maximum transit time for blood and blood components is 24 hours. Blood Time Temperature Indicator (BTTI) should be adopted to monitor the temperature of whole blood and red cells in the following situations:

- storage in cold boxes in the case of a power failure;
- transportation in blood transport boxes from one blood bank to another;
- movement of blood from the blood bank to the patient's bed side;
- return of unused blood from the point of potential use to the hospital blood bank.

Further information on the Safe Blood and blood Product and management, maintenance and use of blood cold chain equipment is available on WHO Guidelines and Principles for Safe Blood Transfusion Practice and WHO Manual on the management, maintenance and use of blood cold chain equipment respectively and Rulebook on quality assurance of blood and blood products in healthcare institutions (OG 91/19).

4.2.3.4 Biosafety (short overview of regulation requirements and procedures)

A wide spectrum of microorganisms today represents a serious health risk for humans and animals, which has become an important topic for the health community, but also for governments and responsible state bodies. This resulted in the implementation of various bioprotection measures, aimed at preventing the spread of potentially harmful biological agents in the environment, as well as in healthcare institutions.

The Republic of Croatia, addressing this issue important for national security established the Croatian Society for Biosafety and Bioprotection (HDBIB). It is a non-profit, governmental organization whose

main objective is to provide a platform for its membership to consider and resolve issues related to biosecurity and biosafety at the national and international level. In addition to doctors of various professions, and primarily a community of infectious disease specialists, microbiologists, epidemiologists and public health experts, the society gathers multidisciplinary scientific, health and academic, including the pharmaceutical and biotechnological industry, veterinarians, biologists, forensic scientists, experts in technical professions who work on designing laboratories for dangerous infectious diseases, agents and experts in the field of regulatory affairs, national security affairs and all other related professions aimed at improving national and international biosafety and bioprotection.

With the establishment of HDBIB, Croatian experts in the field of biosafety and bioprotection are able to participate actively in the work of the European Biosafety Association (EBSA) and the International Federation of Biosafety Associations (International Federation of Biosafety) through the membership of their national society (HDBIB). Associations - IFBA through international projects, conferences and various forms of international cooperation.

One part of the causative agents of infectious diseases are dangerous pathogens that are detected and inactivated in laboratories of the third biosafety level (BSL-3). Biosafety level 3 includes a combination of standard and special microbiology laboratory practices and techniques, safety equipment, and purpose-built laboratory facilities.

The WHO Laboratory Biosafety Manual (LBM) fourth edition is a global standard that presents best practices and sets trends in biosafety. However, its application is not mandatory in Croatia. The Manual encouraged countries to accept and implement basic concepts in biological safety and to develop national codes of practice for the safe handling of pathogenic biological agents in laboratories within their geographical borders. A thorough, evidence-based and transparent assessment of the risks allows safety measures to be balanced with the actual risk of working with biological agents on a case-by-case basis. This enables countries to implement economically feasible and sustainable laboratory biosafety and biosecurity policies and practices that are relevant to their individual circumstances and priorities.

The strategic geographical position of Croatia and the growth of international trade and travel increase the possibility of importing some new microorganisms or even the occurrence of an epidemic of completely unknown infectious origin. The fundamental goal of the BSL-3 laboratory for work with dangerous pathogens is surveillance and rapid response, as key elements in controlling the spread of dangerous infections.

For this purpose, in the Clinic for Infectious Diseases "Dr. Fran Mihaljević" operates a Level 3 Biosafety Laboratory, where the diagnosis of dangerous agents is carried out. For now, this level is not intended for work with the new coronavirus (2019-nCoV) according to international recommendations, but the samples will be tested in a slightly lower safety level (BSL2+ laboratory). If new knowledge shows that there have been changes in the new coronavirus, which require a higher level of protection, such as BSL-3, our capacities allow us to work at that level.

4.2.4 OHS procedures and patients related procedures

To prevent and suppress the spread of hospital infections among hospital staff and patients, the following measures are implemented (in accordance with Article 3. Rulebook on conditions and methods of carrying out measures for the prevention and control of hospital infections OG 85/12 and OG 129/13):

- examination and sanitary treatment of the patient upon admission to hospital treatment, and according to clinical indications, microbiological and epidemiological treatment of the patient;
- implementation of sanitary and hygienic procedures at work and the behavior of employees, patients/users and visitors within the health institution;
- cleaning, washing and ventilation of work rooms and related equipment;
- hygiene of hands, skin and mucous membranes;
- disinfection of instruments, medical equipment and the environment;
- sterilization of equipment and accessories for medical procedures;
- aseptic, antiseptic and hygienic procedures at work;
- collection, sorting, washing, sterilization and transport of laundry;
- ensuring the healthiness of foodstuffs, including drinking water and sanitary-technical and hygienic conditions for the preparation, storage and distribution of food;
- ensuring the health and quality of water for the needs of hemodialysis, in accordance with special regulations;
- air quality assurance in accordance with special regulations;
- disinsection and pest control in accordance with special regulations;
- disposal of infectious waste, in accordance with special regulations;
- early detection, isolation and treatment of persons with healthcare-associated infections;
- monitoring of healthcare-related infections in relation to the type of infection, causative agents, patient population, application of diagnostic or therapeutic procedures;
- monitoring the resistance of certain types of microorganisms, monitoring the consumption of antibiotics and creating a list of reserve antibiotics;
- implementation of preventive and specific measures (immunization, chemoprophylaxis, seroprophylaxis) and microbiological control of living and non-living environment according to epidemiological indication;
- ensuring the hygienic and technical correctness of the building, equipment and installations, as well as participation in building and architectural reconstructions or construction;
- education of the entire staff (medical and non-medical) when starting work and continuous education on the prevention of infections related to health care;
- basic education and continuous education of members of the Hospital Infection Control Team;
- care of health and non-health workers who are professionally exposed to potentially infectious material.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Waste Management

- National regulations are compliant to EU, WHO and WB EHSG requirements in waste management. No significant incompliances in medical waste management in Croatia was recorded in the analysis.
- Ministry of Economy and Sustainable Development in its 2012 report on medical waste5 concluded that the existing system of medical waste management cannot be assessed as high-quality or satisfactory. For further improvement of the system, the Report recommended necessary improvements in the way certain types of medical waste, especially infectious waste, are managed.
- There is a lack of capacities for permanent disposal of hazardous waste on the national level.
- Most medical waste is incinerated or autoclaved and then disposed as non-hazardous solid waste.
- Liquid infectious or hazardous waste is treated before disposal in sewerage system or exported.
- Radioactive waste is managed and stored under strict control of the Ministry of Interior and in specialized facilities.
- While there are waste management issues in other sectors (e.g., construction waste management), there are none recorded in medical waste management (in the normal circumstances) which is well regulated, and regulation diligently implemented and controlled. Though there were some backlogs in temporarily storing and processing waste during COVID19 breakout, no illegal dumping took place, and all waste was adequately processed and disposed.
- Recommendations go in line with the governmental efforts to increase capacities for management of infectious waste (with more incinerators and autoclaving systems available to hospitals).

5.2 Infection control and management

- Infection control in Croatia is well regulated and in line with WHO guidelines and WB EHSG requirements.
- Laboratories operate under license and supervision of MoH.
- All participating medical facilities have developed Infection Control Plan as well as Evacuation and Rescue Plan and Fire Safety Plan, but no Emergency Preparedness Plan as such.
- It is recommended for all medical facilities to prepare an Emergency Preparedness Plan.

[5] MoESD: Overview of management data medical waste for 2021

6 OVERVIEW OF REQUIREMENTS AND MITIGATION MEASURES

Table 1. ICWMP – Environmental and Social Risks and Mitigation Measures (Operational phase)

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
GENERAL HCF OPERATION – ENVIRONMENT ISSUES	• General waste generation	• Special attention should be given to the identification, classification and quantification of the waste • Generated non-risk waste, which is mostly similar to the household waste, should be managed as household and similar waste • General waste in the case of handling COVID-19 patients should be treated as infectious waste	HCFs	At all times within HCFs	HCFs Operational budget
	• Wastewater	• Installation of a disinfection system and connection to the public network if there is one • Regularly maintain the thermal power production unit for space (and water) heating, incinerators, and other installations to ensure high efficiency and efficacy • According to the corresponding legislation periodically carry out measurements of			

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
		wastewater and air emissions			
	• Air emissions	-			
GENERAL HCF OPERATION – OHS ISSUES	• Physical hazards • Electrical and explosive hazards • Fire • Chemical use • Ergonomic hazard	• Ensure equipotential and ground all conductive elements • Use inductive or electric eliminators • Use anti-static material or equipment • Arrange firewalls in intensive care rooms • Ensure that evacuation plan in case of fire is developed • Provide fire extinguishers and train health workers to handle them • Presence of a trained expert responsible for ensuring compliance with protective measures, participating in worker training, and carrying out analyses • Information and training of workers on the risks involved • Appropriate signage and marking of areas and risks of exposure	HCFs	At all times within HCFs	HCFs Operational budget

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
		• Monitoring of the radiological exposure by the occupational physician • Hazardous materials should be handled in accordance with the accepted practices/protocols for hazardous materials • Only trained personnel should handle the materials and precautions taken when handling materials by using required protection equipment such as ventilation hoods and personal protective equipment • Develop guidelines for oxygen tanks use and management • Develop Emergency Preparedness and Response Plan			
	• Radioactive hazard	• Implement the prescribed radiological safety measures and nuclear security measures and prevent unauthorized removal (e.g. theft), loss, sabotage, unauthorized access, damage, unauthorized	HCFs	At all times within HCFs	HCFs Operational budget

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
		transfer or other malicious acts, all for the purpose of enabling adequate protection of individuals, society and the environment from the harmful consequences of ionizing radiation and preventing the misuse of radioactive waste and spent sources			
	• Infection spread risk	• Implementation of infection control and prevention measures • Mandatory wearing of PPE • In addition to the World Bank Group EHS Guidelines[6], take into account WHO guidelines on *Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages* and ensure that healthcare workers involved in the critical care of COVID-19	HCFs	At all times within HCFs	HCFs Operational budget

[6] https://www.ifc.org/wps/wcm/connect/960ef524-1fa5-4696-8db3-82c60edf5367/Final%2B-%2BHealth%2BCare%2BFacilities.pdf?MOD=AJPERES&CVID=jqeCW2Q&id=1323161961169; https://www.ifc.org/wps/wcm/connect/1d19c1ab-3ef8-42d4-bd6b-cb79648af3fe/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES&CVID=ls62x8l

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
		patients have the necessary protection and that patients, particularly those who do not require hospitalization, understand their responsibilities for obtaining and wearing PPEs when around others			
DELIVERY AND STORAGE OF SAMPLES, REAGENTS, PHARMACEUTICALS AND MEDICAL SUPPLIES	• Contamination • Infectious	• In addition to the World Bank Group EHS Guidelines , follow internal protocols for proper handling and storage of samples, reagents, pharmaceuticals and medical supplies	HCFs	At all times within HCFs	HCFs Operational budget
WASTE MANAGEMENT	• Odor nuisance • Contamination • Infectious risk • Radioactive risk	• Ensure waste management in line with Croatian waste legislation (Act on Waste Management and applicable sub-laws), and management of radioactive waste in line with radiological and nuclear safety legislation (Act on Radiological and Nuclear Safety and applicable sub-laws). • Prepare Plan for disposal of radioactive waste • While managing radioactive waste, act in accordance	HCFs	At all times within HCFs	HCFs Operational budget

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
		with own Plan for disposal of radioactive waste. • In addition to the national legislation, WBG EHS Guidelines for Healthcare Facilities and pertaining GIIP, during waste handling next measures should be applied			
Waste prevention, minimization and re-use		• HCF must ensure that all types of waste including radioactive waste are generated in the smallest possible quantities • Make purchasing restrictions to ensure the selection of less wasteful materials • Ensure good management and control practices in use of pharmaceutical • For all types of waste which do not pose infectious/hazardous risk priority must be given to reuse/ recycling / recovery process • If it is not applicable, disposal operation is unavoidable			

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
Waste treatment in offsite treatment and disposal facilities		• It is preferably to provide health facilities with medical waste sterilizers			
Handling waste arising from COVID-19 measures and waste from curing COVID infected patients		• The reuse of waste infected or potentially infected by COVID-19 is prohibit • Waste arising from COVID-19 measures (protective gloves, masks, etc.) from waiting rooms is considered to be municipal waste and in that manner should be handed over to the authorized municipal company • Handling medical waste infected or potentially infected with COVID-19 should be in accordance with the provisions of Ordinance on medical waste management related to infectious waste handling			
EMERGENCY EVENTS	• Spillage • Occupational exposure to infectious • Exposure to radiation • Accidental releases of infectious or hazardous substances to the environment • Medical equipment failure	Implement: • Emergency Preparedness Plan	HCFs	At all times within HCFs	HCFs Operational budget

Activity	Potential E&S Issues and Risks	Proposed Mitigation Measures	Implementation responsibilities	Timeline	Cost
	• Failure of solid waste and wastewater treatment facilities • Fire • Other emergent events				
OPERATION OF ACQUIRED ASSETS FOR HOLDING POTENTIAL COVID-19 PATIENTS	• Risk of resurgence of the virus	• Ensure protocols for regular disinfection of rooms, wards, equipment and tools, are in place and followed • Ensure handwashing and other sanitary stations are always supplied with clean water, soap, and disinfectant • Parietal decontamination including door and window frame for the floor and vertical surfaces • Decontamination of beds and other furniture • MoH - input	HCFs	At all times within HCFs	HCFs Operational budget

7 OVERVIEW OF MONITORING MEASURES

Individual HCFs beneficiaries of the project will have to prepare a site-specific ICWMP and will be responsible for day-to-day monitoring of the implementation of mitigation measures.

HCFs established an internal information management system to track and record the waste streams from the point of generation, segregation, packaging, temporary storage, transport carts/vehicles, to treatment facilities.

Environmental Information System in the Republic of Croatia (record keeping) is regulated by:

Ordinance on waste management (OG 81/20), Ordinance on medical waste management (OG 50/15, 56/19), Ordinance on the environmental pollution registry (OG 87/15) ; Ordinance on disposal of radioactive waste and used sources (OG 12/18)); Ordinance on limit values of wastewater emissions (OG 26/20); Regulation on limit values of emissions of pollutants into the air from immovable sources (OG 81/17).

Table 2. ICWMP Type of infectious waste expected to be generated from HCFs/Labs and Treatment methods

Waste category	Type of waste and source	Source Facility / Laboratory
Waste cultures and stocks of microorganisms or etiologic agents	• Cultures and stocks of infectious agents or microorganisms • Cultures of specimens from medical and pathological laboratories. • Disposable containers, materials, and supplies that may have been contaminated during the manipulation of microbial cultures and stocks	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Human pathological wastes including human blood and blood products and their containers Waste	• Pathological waste consists of human tissues; organs; body parts; dialysate; cerebrospinal, synovial, pleural, peritoneal, and pericardial fluids; and their respective containers. • Human blood and blood product wastes (e.g. blood plasma, platelets, red or white corpuscles, and other derived licensed products such as interferon, etc.) Items saturated or dripping with human blood or blood products • Items caked with dried human blood or blood products	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Used sharps waste	Used hypodermic needles, syringes (with or without the attached needles), Pasteur pipettes, disposable plastic pipettes, scalpel blades, blood vials, test tubes, needles with attached tubing, broken plastic culture dishes, unbroken glass culture dishes, and other types of broken and unbroken glassware that was in contact with infectious material including microscope slides and covers lips.	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Chemical waste	Laboratory reagents; disinfectants (such as formaldehyde, chloroform, phenol, ethyl alcohol, isopropyl alcohol, amyl alcohol, and sodium hypochlorite) that are expired or no longer needed; and contaminated chemicals	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Liquid waste	Chemicals used in the production of biological, laboratory reagents; disinfectants, alcohol, amyl alcohol, and sodium hypochlorite, expired drugs	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
	Sanitary liquid waste	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Hazardous waste	Contaminated face masks, wipes, tissues	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas
Non-hazardous waste	Paper, cardboard, medical supplies packaging and other noncontaminated materials from other HCFs, isolation and quarantine centers	• Labs • Blood Bank Center • PoE • Isolation & Quarantine Areas