

Epidemiological surveillance system of an hospital biohazard level III Cartagena, Colombia

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Abstract— The purpose of this text is describe the general health condition of a lending organization of health services for the epidemiological surveillance system for biohazards that allows control and monitor the working conditions of health care personnel exposed to risks of biological type in an institution providing health services third level of complexity. The study applied was mixed approach and developed with 130 workers belonging to different areas with more exposure to biohazards among which stand: surgery, hospitalization, clinical and laboratory priority. He was executed in the city of Cartagena during the first half of 2017. This was achieved by inspecting areas of the company and the comprehensive diagnosis of health conditions and work according to norm GTC 045 version 2008 and Decree 351 2014 on biological risk management, manual management of hospital waste ministry of environment and social protection in 2002. the aforementioned care processes were characterized and risks of these were assessed stating that the process of surgery is the most capable of generating accidents involving biological risks, ending these with the development of an action plan consisting of inspections training to exposed personnel training, and also concluded that it is necessary eliminate sharps and sharps in rigid containers biosafety and practice of recapping needles is the chief cause of accidents work of biological origin found in the institution.

Index Terms— surveillance, epidemiological, biological risk.

I. INTRODUCTION

Understood as Biosafety practices aimed eliminating or minimizing the risk factor that could potentially affect the health or life of people or pollute the environment [1].

By treating the term Biosecurity refers to set of rules and procedures ensuring control of risk factors, prevention of harmful impacts and respect the permissible limits, without adversely affecting the health of people who work and / or manipulate biological, biochemical and genetic techniques and also ensures that the product thereof not harm the health of the community, or against the environment [2].

When referring to term use is understood as the use of waste through activities such as source separation, recovery, processing and reusing the same, allowing the return in economic and productive cycle in order to generate economic and social benefit and reduce environmental impacts and risks to human health associated with the production, handling and disposal of waste [3].

Identifying the term microorganism as any living organism

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of microscopic size, including bacteria, viruses, yeasts, fungi, actinomycetes, some algae and protozoa. The concepts previously treated with respect in order to identify, control and reduce biological risk factors, environment and health, which may occur as result of waste management, this function is identified as prevention, either the provision of health services or any other activity involving the generation, handling or disposal of such waste, to prevent the risk or disease appear and spread or cause further damage or generate avoidable squeal [1].

Epidemiological Surveillance as basic discipline of public health is defined as the systematic collection of information about specific health problems in populations, processing and analysis, and timely use by those who must make decisions intervention for the prevention and control of risks or corresponding [4] damage.

Another concept of Epidemiological Surveillance is related to a logical and practical process of systematic, active and prolonged observation and ongoing assessment, trend and distribution of cases and deaths and health status of the population [5]. Allows information to make decisions intervention by tracking those events or determinants or factors that may modify the risk of occurrence, in order to initiate and timely complete the necessary control measures [6].

Biohazards are those living agents microscopic (microbes and germs) are present in the work environment capable of producing certain infections, allergic or toxic reactions in workers exposed thereto while performing its task [7]).

Features Epidemiological Surveillance

For the initial establishment of epidemiological surveillance existing data as morbidity, mortality, demographics of the study population and where necessary, other sources are used are determined.

They are features to consider for epidemiological surveillance information:

Validity: extent to which a condition observed reflects the actual situation. Its components are:

Sensitivity: probability of correctly identifying those subjects who have had a certain disease specificity: probability to correctly identify those subjects who have not undergone a specific or study pathology opportunity: to be useful information should be available at the right time, since the action steps must be taken on updated, data integrity: must contain all the data necessary to fulfil the purpose of epidemiological surveillance, comparability variables should allow the current confrontation, past and its projection future. It should be comparable with similar both at national, regional, local and international [6] level data.

Methods of analysis: There several methods for qualitative and quantitative analysis, suggesting two simple techniques of analysis and evaluation:

Problem analysis: methodology why? And how? Study and

analysis of cases or processes: using the deductive method, where from a problem its causes, effects and solutions, analysis of the epidemiological situation defined: Construction of trends such as the graphical representation of the presentation of an event over a period of time, in order to evaluate its performance in terms of frequency [7]. The unit of time varies with the event to monitor or objectives of monitoring, mapping risk: allow quick viewing through, evaluate and compare the spatial distribution of the event to monitor [8]. The space can range from delimited territories to countries, continents, records of health services:

They are useful to help determine morbidity and mortality and are obtained from records of activities carried by the programs. In many cases, it is incomplete and its use is very poor because the volume of data is large, the staff is small and is poorly trained and no quality control, surveys by sampling or community surveys (sentinel sites): They are used to supplement information health services especially in the community who do not access services. The home is usually the observation unit and can be performed by members of the same community, disease registries: used to estimate the prevalence and incidence of major diseases concern and study their evolution, Data collection: this involves a notification process the existence of communication channels and a registration system for information, to the different operative levels of health system. Should be considered not only the information of the health system itself but from other sources or institutions that contribute to their comprehensiveness [6].

Hospital waste characterization

WHO documents dumpsites divide above which it possible some concern especially in the following categories:

Infectious waste: contaminated blood or blood, cultures or strains of infectious agents derived wastes; Waste patients in isolation wards; discarded diagnostic samples, with blood or body fluids; infected laboratory animals; and equipment (swabs, bandages) or equipment (such as disposable medical instruments) contaminated [3]. Waste pathology and laboratory body parts and animal carcasses, which may be contaminated. Sharps: syringes, needles, scalpels and disposable blades [2]. Chemicals (mercury, solvents, disinfectants, and pharmaceuticals: expired drugs, unused or contaminated, vaccines and serums) [7].

Genotoxic waste: waste dangerous carcinogens, mutagens, or teratogenos1 as cytotoxic drugs used to treat cancer and their metabolites. Radioactive waste: glassware contaminated with radioactive diagnostic material or material radiotherapy. Wastes by heavy metals such as mercury thermometers broken [9].

Finally, the health system waste can also be divided into nonmedical "medical or clinical waste" and waste, with the former resulting from the process of prevention, diagnosis or treatment of diseases in humans [10].

II. METHODS

The project was based on a study of quantitative and descriptive approach whose objective was to get to know the situations prevailing customs and attitudes through the exact description of activities, objects, processes and people. Their goal not limited to data collection, but the prevention and identification of relationships between two or more variables. The steps used are hierarchically organized and dependent of the other.

A. Population and sample

This project was developed with 130 workers belonging to different areas with more exposure to biohazards among which stand: surgery, hospitalization, clinical and laboratory priority.

B. Data Collection Instrument

This research project was conducted through data collection tools such as checklists for the characterization of working conditions and health. The kind of interview that the interview focused employment which was characterized by treating a core or specifically addressed to individual related to the situation under focus of interest (epidemiological surveillance system biohazard). This type of interview was applied to the person responsible for safety and health area, which handles all information necessary for the proper development of the project.

Comprehensive diagnosis of the conditions of working environment [11]. Surgery processes, priority, clinical laboratory and Hospital Company, according the 2008 version GTC 45 [12] which allowed evaluate the various risks and dangers to which workers are exposed Institution [13]. The inspections were conducted to the conditions under which the institution providing health services [14], [15] and then analyse, evaluate and acquire information and contact with workers who can obtain important information, then make the relevant recommendations and conclusions.

III. RESULTS

Characterization of environmental conditions work processes surgery, priority, clinical laboratory and hospitalization of IPS III level in Cartagena.

EXPOSED 2017	
AREA	EXPOSED
HOSPITALIZACION	14
PRIORITY	8
CIRUGIA	15
INTERMEDIATE CARE	3
UCI	41
GENERAL SERVICE	12
MENSAJERIA	1
BILLING	5
ADMISSION	6
ADMINISTRATIVE	22
ambulance driver	1
MAINTENANCE	2
TOTAL EXPOSED	130

AREA	EXPOSED	DETAIL	GENERATING SOURCESRISK	PROBABLE EFFECT
PRIORITY	6	Biologic: Exposure to virus, bacteria and other microorganisms, sick people	seeking sick and / or patients, handling of contaminated elements.	Accidents biowaste (pang, cut, splash) infectious diseases, respiratory, skin and other, Viral diseases.
SURGERY	12	Biologic Exposure to virus, bacteria and other microorganisms, sick, fluids, blood	contacts with patients, contact with body fluids, pathological Handling and sharps.	
HOSPITALIZACION	16	Biologic Exposure to virus, bacteria and other microorganisms	persons seeking patients body fluids: blood, urine, secretions, biowaste.	
Laboratory	8	Biologic Exposure to virus, bacteria, fungi, parasites and other microorganisms	contacts with body fluids and biological waste, contaminated items and sharps	
UCI-CUIDADADOS INTERMEDIATE	44	Biologic: exposure to virus, bacteria, fungi, parasites and other microorganisms	patient contacts, contact with body fluids, biological waste.	
GENERAL AND MAINTENANCE SERVICES	14	Biologic: exposure to virus, bacteria, parasites and other microorganisms	contact with body fluids, biological waste, sharps	

Among the areas evaluated exposure situations biological substances specifically contaminated body fluids, and contaminated sharps bio sanitary found. The above described activities were developed with the support of the administering of occupational hazards to which is attached the health institution third level under study. Activities included workshops, demonstrations meetings where biological risk was the subject of discussion training centre.

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It highlights the main findings resulting from previous studies on the characteristics, management, treatment and environmental implications of hospital effluents. It is possible to suggest as a specific study that they are suitable for the effluents of new hospital facilities or the improvement of the plants where there is care of patients with generation of hospital waste where it is required that these be eliminated from specific pollutants that occur at extremely low concentrations. The different strategies in the management (a separate or combined treatment) have been discussed and the debate on the best current technologies (conventional technologies + end treatments or advanced biological and chemical processes to avoid the propagation of biological risks that affect the surveillance system. it is described through the presentation and improvement of biological risk confusions to prevent infestation and accidents of this type. The new treatment measures seek to improve the treatment of nosocomial hospital risks that effectively avoid the contamination of areas and problems with the exposed personnel.

AREA	AT BIOLOGICAL 2015	AT BIOLOGICAL 2015
HOSPITALIZATION	2	0
PRIORITY SURGERY	0	0
Intermediate Care	4	4
UCI	0	0
GENERAL SERVICE	6	5
MENSAJERIA	0	1
BILLING	0	0
ADMISSION	0	0
ADMINISTRATIVE	0	0
ambulance driver	0	0
MAINTENANCE	0	0
TOTAL EXPOSED	87	123
Total AT FAILURE WITH	0	0
TOTAL AT FAILURE NO	12	10
disability days	0	0
TOTAL AT	12	10
K	100000	100000
HHT	214980.48	303937.92
IFAT	5.581.902.134	3.290.145.567
ISAT	0	0
IG	0	0
II	1.379.310.345	8.130.081.301
IN	no data	no data

A. Indicators 2015:

In 2015 the company reported no days lost (disability) for an accident at biological risk, although in that year 12 accidents were presented by biohazards with a frequency rate of occupational accidents indicating that for every 100,000 hours worked men 5.6 accidents were generated, excelling UCI area as the most eventful in biohazard. During the same year 10 accidents were generated by general causes, of which 5 were in the area of general services, no lost days were reported, resulting rate of frequency of accidents shows that for every 100,000 man hours worked 8.37 accidents for various reasons were presented. Making the greatest possible emphasis on the conditions generated in critical areas such as surgery, it can be inferred that this is critical and directly necessary to manage with high care in order to diminish and positively impact the general safety of workers and patients, Just as in biosecurity when they present potential risks, in addition to these magnitudes and the obligatory primary and secondary barriers, it will also depend on the infectious agent in question and the manipulations carried out with it. Therefore, the security officer will have to anticipate by evaluating the respective risks (GTC 045, for this case).

B. Indicators 2016:

During 2016 the company reported no days lost (disability) for an accident for biohazards, presenting 10 accidents because of biohazard, having areas of ICU and surgery with 5 and 4 accidents respectively, listed as the roughest areas, obtaining an accident frequency rate of work shows that for every 100 men worked 000 hours 3,29 accidents occurred during the same year 18 accidents were generated by general causes, where also the areas of ICU and surgery were the roughest. 13 days lost were reported disability, obtaining an accident frequency rate of work it indicates that for every 100,000 hours worked men had 5.9 accidents. Severity index shows that accident for every 100,000 hours worked men lost 0.98 days per accident.

AREA	AT BIOLOGICAL I SEM 2017	AT nonbiological I SEM 2017
HOSPITALIZATIO N	0	0
PRIORITY SURGERY	1	3
Intermediate Care	5	1
UCI	0	0
GENERAL SERVICE	1	2
MENSAJERIA	0	0
BILLING	0	0
ADMISSION	0	0
ADMINISTRATIVE	0	0
ambulance driver	0	0
MAINTENANCE	0	0
TOTAL EXPOSED	130	130
Total AT FAILURE WITH	0	1
TOTAL AT FAILURE NO	0	5
disability days	0	2
TOTAL AT		June 7
K	100000	100000
HHT	172972.8	172972.8
IFAT	4.046.879.047	3.468.753.469
ISAT	0	0.578125578
IG	0	0.001156251
II	5.384.615.385	4.615.384.615
IN	no data	no data

C. Indicators 2017:

In 2017 the company reported no days lost (disability) for an accident at biological risk, although there have been seven accidents because of biohazard, of which 5 occurred in the area of surgery so far a rate of frequency of accidents at work which indicates that for every 100,000 man hours worked 4.04 accidents were generated is obtained, also presented six accident cause, were reported 2 days lost due inability to obtain a accident frequency rate of work that showed that for every 100,000 hours worked 3.46 accidents occurred men. Severity index of occupational accidents indicates that for every 100,000 hours worked 0.57 days lost men by accident.

IV. CONCLUSIONS

Within the characterization of environmental conditions work processes surgery, priority, clinical laboratory and hospitalization of the IPS, it was found that the processes of intensive care, surgery and hospitalization are the most dangerous in the risk biological terms, when counting the highest number of exposed and for that reason require greater care and vigilance of adverse events (accidents and incidents involving hazardous biological substances).

In assessing biological risks in the processes of surgery, priority, clinical laboratory and hospital enterprise by applying the GTC 045/2008, it was the processes of surgery and clinical laboratory the highest prevalence of risk, being qualified with a risk ≥ 1080 , thus requiring greater control and preventive measures in the epidemiological surveillance system for these processes specifically without neglecting other activities where it is continuous with high exposure to biological hazards.

They are fundamentals of intervention plan of priority risks in the processes of surgery, priority, clinical laboratory and hospitalization of the IPS application of passive immunization for major causes of disease related biological risk (tetanus, hepatitis B, hepatitis A, influenza, anti-chicken pox, measles, etc.), well as permanent training sessions on specific issues of biosafety and bio containment with medical periodic reviews with emphasis on the specific risk which in turn foster self-care behaviours of health workers exposed through training on issues related to the factor of biological risks, standard biosafety, legal, organization of epidemiological surveillance program it will depend largely on the proper organization and focus on particular risks for the population studied in this chance.

In measuring the impact of epidemiological surveillance system that this time lay in the use of indicators that showed the accident year 2011 as the most rugged with biological with 12 accidents of this nature reflecting a rate of 5.6 accidents biological work per 100,000 hours worked and 2013 men as less committed in these circumstances with only 3.46 accidents per 100,000 man hours worked.

V. RECOMMENDATIONS

Adopt universal precautions.

All patients should be considered potentially infectious.

Those responsible for safety and health at work of the company stated:

Identify and assess risks, maintain adequate reception, handling and transport of biological agents and their residues also applying collective and individual protection.

Establish hygienic measures (adequate toilets, fountains,

first aid kit storage protective equipment, provide work clothes and washing and disinfection, discounting working hours' time for grooming, etc.).

Monitor the health of workers by performing specific medical examinations prior to exposure and newspapers run such information by appropriate means.

Educate and inform all employees about the risks to which they are exposed and their preventive measures.

Apply anti hepatitis B, measles, anti-chickenpox, hepatitis B vaccination all health workers.

Perform hand washing to control infections in the healthcare environment.

Protect against skin lesions, cuts and wounds.

Implement and disseminate adequate waste management policy.

Eliminate sharp and sharps in rigid containers biosafety.

Ban the practice of recapping needles.

Using a biohazard sign.

Ensure indoor air quality and the good condition of the water by reviewing and preventive maintenance of facilities.

REFERENCES

[1] Presidency of the Republic (February 19, 2014) Decree 351 Whereby the integrated management of waste generated in health care and other activities are regulated. BOGOTA, Cundinamarca, Colombia: Official Journal. No. 49069.

[2] WHO. (2007 October 2007). Technical document for health workers. Biosecurity Standards Manual. Geneva, Switzerland.

[3] Bedoya Elias A, Sierra, Dario D, Severiche, Carlos A, & Meza, Maria J. (2017). Biosafety Diagnostic Health Sector Bolívar Department, northern Colombia. Information Technology, 28 (5), 225-232.

[4] Castilla-La Mancha. (3 March 2004). Tenth Modular Unit: epidemiological surveillance - CENDEISS. CENDEISS obtained: <http://pagina.jccm.es/sanidad/salud/epidemiologia>

[5] Bedoya Marrugo, E., & Torres Vergara, J. (2015). Risk matrix and comprehensive management plan for hospital waste in neuroradiológico center in Cartagena. Aglala, 6 (1), 142-163.

[6] Lemus Jorge. (Nineteen ninety six). Epidemiological Surveillance Manual: CEPIS-OPS. Retrieved on February 25, 2013, CEPIS-OPS: www.bvsde.paho.org/bvsea/e/fulltext/manual/manual.html

[7] Veiga-Alvarez, Alvaro Sanchez-de-Alcázar, Daniel, Martinez black, Mary, Barbu, Ana Gonzalez-Diaz, Juan B., & Maquea-Blasco, Jerome. (2015). Health risks and recommendations in handling nanoparticles in work environments. Medical and Safety, 61 (239), 143-161.

[8] Restrepo Ospina, DP, & Ardila Medina, CM (2010). Adverse reactions caused by biomaterials used in prosthodontics. Advances in dentistry, 26 (1), 19-30.

[9] World Health Organization. (November 2011). Waste from health care activities: who.int. Retrieved on March 24, 2013, of who.int: <http://www.who.int/mediacentre/factsheets/fs253/es/index.html>.

[10] Araujo, MD (August 2001). Hospital waste: Biological Hazards and general recommendations on management. Retrieved from Ministry of Health: www.minsal.gov

[11]. Congress of Colombia. (17 December 2002). 776. By law establishing rules on the organization, management and performance of the General System of Occupational Hazards are issued. BOGOTA, Cundinamarca, Colombia: Official Journal No.45037.

[12] ICONTEC. (2012). GTC 45 - Updated. <http://www.slideshare.net/nacho25/actualizacion-guia-gtc-45-icontec-nueva-3729549> obtained.

[13] Machado, AI (October 6, 2009). Integrated management of hospital solid waste at the university hospital in Sincelejo, maternal child sectional unit. Retrieved on February 22, 2013, of biblioteca.unisucre: biblioteca.unisucre.edu.co

[14] SENA. (21 October 2009). Locative risk. Retrieved from locative Risk: www.slideshare.net/yury19/riesgo-locativo

[15] Ministry of Labour and Social Security. (22 May 1979). Resolution 2400. By which some provisions on housing, Health and safety are set in establishments working. BOGOTA, Cundinamarca, Colombia.