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Evaluation Study of Medical Solid Waste Management in Syekh Yusuf Gowa Hospital

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ABSTRACT

Syekh Yusuf Gowa Hospital is one of the hospitals which implemented medical waste management. This hospital is a public hospital and included in class B category according to PERMEN 340/MenKes/PER/III/2010. This category is based on quality, human resources, equipment, facilities and infrastructure, administration and management, and service capability of this hospital. Moreover, this hospital is adjacent with residential and office complex in Sungguminasa City. Therefore, the medical waste management in the hospital should be monitored and evaluated comparing with the government rules (Permenkes). The objectives of this research are to find out the quantity of medical solid waste generation and its characteristics, to ascertain the system of medical waste management, and to evaluate the system of medical solid waste management in Syekh Yusuf Gowa Hospital in accordance with the Indonesian Ministry of Health Regulation. The results of this research are: (1) The generation of medical solid waste in this hospital is 1,228 kg/month or 40.93 kg/day. There are five categories of medical solid waste generated in this hospital: infectious, sharp, anatomical, chemical, and pharmaceutical waste. The most waste generated in this hospital is the infectious waste that is equal to 70%. While the least amount of waste generated is pharmaceutical waste that is equal to 2%; (2) Medical solid waste management system is conducted by sorting the waste which generated in each room/unit. Furthermore, these wastes are transported to the temporary dumpsite in hospital area. Then, these wastes are packaged and transported to the third party and/or processed in incinerator. The residual ash from incinerator was brought to temporary dumpsite of toxic and hazardous waste and third party; (3) The results of the evaluation of medical solid waste management system in Syekh Yusuf Gowa Hospital has been done well, in accordance with the Ministry of Health Regulation.

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Keywords: Waste, medical solid waste management, medical solid waste generation, Syekh Yusuf Gowa Hospital

⁴ 1. INTRODUCTION

A hospital is a health care institution providing patient treatment with specialized medical and nursing staff and medical equipment. The need for quality hospital services is increasing. The existence of this hospital aims to fulfill health efforts. Health efforts are activities to maintain and improve

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health, to realize the optimal health for the community. Health efforts are carried out with maintenance approach, health promotion, prevention of disease, healing of disease, and restoration of health (rehabilitation), which is implemented thoroughly, integrated and sustainable [1].

These activities will generate

positive and negative impacts. Positive impact is the increasing of public health degree, while the negative impact is the increasing of non-medical and medical waste. Therefore, special efforts are needed to handle and manage the hospital waste, especially the medical waste. Medical waste can also be toxic, infectious and radioactive, if not handled and managed properly. These will have an impact on humans, other organisms, and the environment around the hospital. According to the Environmental Protection Agency, 2011 [2], medical waste is a waste generated from medical or healthcare activities, such as hospitals, clinics, blood banks, dental practice, and veterinary hospitals and laboratories. Medical waste is included in the category of hazardous and toxic waste (B3) by code D227, as mentioned in Appendix I of Government Regulation No. 18/999 jo PP 85/1999 [3].

The aim of waste management is basically to control the pollution caused by industrial activities. The success of hospital waste management is related with the behavior of nurses, midwives, doctors and all health workers in the hospital. The management of medical waste, according to Kepmenkes No. 1204/2004 [4], is an activity that includes segregation, collection, transportation, processing, and accumulation of medical waste. Proper medical waste management, it is important to minimize health risks.

Ahmad Yunizar on Solid Waste

Management System ¹⁷ [5] at Dr. H. Moch. Ansari Saleh Hospital in Banjarmasin, 2014 obtained that the solid waste generation in this hospital is 6.06 m³/day or 127 kg/day (31.68% of medical waste and 68.32% of non-medical waste). Solid waste management has not been in accordance with Kepmenkes No. 1204/2004 on Requirements of Health Environment in Hospital, this is indicated by no separation of medical solid waste, lack of waste bins, and transportation equipment does not meet the standards. Rahmi N.A. and Lilis S, 2007 [6], on Number of Patients and Production of Solid Medical Waste, concluded that the average number of patients in the Siti Khodijah Sepanjang Sidoarjo Hospital wards is 90 people/day and in Emergency Room (ER) is 63 people/day. Solid waste generation in this hospital ward is 57.02 liters/day or 0.51 liters/bed/day and in Emergency Room is 10.18 liters/day. There is a significant correlation between the numbers of patients per day with the medical solid waste generation per day in the Emergency Room.

Syekh Yusuf Gowa Hospital is one of the hospitals which implemented medical waste management. This hospital is a public hospital and included in class B category according to PERMEN 340/MenKes/PER/III/2010 [7]. This category was based on quality, human resources, equipment, facilities and infrastructure, administration and management, and service capability of this hospital. Moreover, this hospital is adjacent with residential and

office complex in Gowa city. Therefore, the medical waste management in this hospital should be monitored and evaluated comparing with the government rules (Permenkes).

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The aims of this research are to find out the quantity of medical solid waste generation and its characteristics in Syekh Yusuf Gowa Hospital, to ascertain the system of medical waste management in Syekh Yusuf Gowa Hospital, and to evaluate the system of medical solid waste management in Syekh Yusuf Gowa Hospital. Moreover, the boundary of this research is as follows: this study compares the management of medical solid waste in Syekh Yusuf Gowa hospital with standard reference from Ministry of Health Regulation No.1204/Menkes/SK/X/2004.

2. METHODOLOGY

This research was conducted in the Syekh Yusuf Gowa Hospital, with 4.62 h.a of area, located in Gowa city, South Sulawesi. This research was conducted on November 28, 2016 to January 18, 2017. Data of medical solid waste in this hospital was collected at working hours from 8 AM to 4 PM. The materials used are as follows: research questionnaire and camera to record activities during the survey.

Data collection in this research was done by survey in Syekh Yusuf Gowa Hospital, divided into: primary and secondary data. Primary data was obtained by direct observation in hospital, includes the

following activities: sorting, collection, transportation, shelter, and destruction of medical solid waste, and conducting the interview with hospital officer to find out about the source, type, and management of medical waste in the hospital. In addition, interview was also conducted to the employee of cleaning service in the hospital regarding the process of collecting, transporting, and storing of medical waste. Secondary data was obtained from Maintenance Installation of Hospital Facilities, which is included, the Profile Data, Report of Medical Waste Disposal, Result of Incinerator Emission Test, and literatures as references to analyze the medical waste management in hospital. There were three analyses conducted in this research: (1) Analysis of the medical waste generation in Syekh Yusuf Gowa Hospital, (2) Analysis of medical waste management system in Syekh Yusuf Gowa Hospital, and (3) Analysis of conformity of medical waste management system in Syekh Yusuf Gowa Hospital with the regulation from Ministry of Health, Indonesia.

3. RESULTS AND DISCUSSION

Syekh Yusuf Gowa Hospital was established since 1981 and operated starts from April 1, 1982. This hospital is a B type hospital which the main activity is to provide health services to society. Moreover, this hospital has 399 employees, which is divided in to medical and non-medical employee. Service facilities in this hospital are

emergency, outpatient, inpatient, laboratory, pharmacy, radiology, surgery room, physiotherapy, nutrition, and laundry installation. Other support facilities are bank, Automatic Teller Money (ATM), ambulance, incinerator, waste water treatment facility, etc.

A. Analysis of the Medical Waste Generation in Syekh Yusuf Hospital

Sources of medical waste in Syekh Yusuf Gowa Hospital comes from eight units of medical service: outpatient/polyclinic installation, inpatient installation (Asoka, Melati, Mawar, Cambodia, and Tulip), Intensive Care Unit (ICU), Emergency Installation (IGD), Surgery Room, laboratory, pharmacy, and Blood Bank in Hospital.

There are four types of medical solid waste in this hospital: infectious waste, sharps waste, anatomical waste, and pharmaceutical waste. Infectious waste are waste containing large quantities of material, substances or cultures entailing the risk of propagating infectious agents (cultures of infectious agents, waste from infectious patients placed in isolation wards), sharps

waste are waste entailing risk of injury, anatomical waste are body parts, tissue entailing risk of contamination, and pharmaceutical waste are spilled/unused medicines, expired drugs, and used medication receptacles. In other side, chemical waste and waste water are processed in wastewater processing installation in this hospital. The generation of medical solid waste per month in this hospital could be seen in Figure 1, where the total generation is 1,228 kg/month. The highest medical solid waste generation is infectious waste with 860 kg/month or 70% from the total generation. In table 1 show type of medical waste each unit the hospital. These infectious wastes come from used bandage, used infusion bottle, syringe, catheter, used gauze, disposable glove, disposable mask, lancet, blood transfusion hose, pasteur pipette and stick, sputum pot, specimen pot, inoculum, and others. These wastes come from eight units (rooms) of medical service in this hospital.

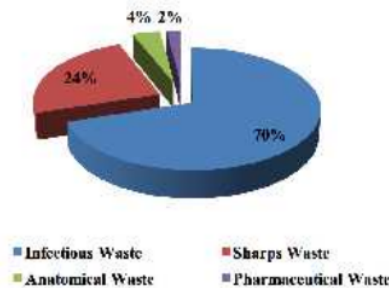


Fig 1. Medical solid waste generation in Syekh Yusuf Gowa Hospital

Table 1. Type of medical waste based on source

No.	Units	Type of Medical Waste
1	Surgery Room (SR)	Syringe with needle, catheter hose and urine bag, bandage, infusion bottle, ex-injection bottle, body tissue, blood or body fluids, disposable mask, disposable glove, chemicals (formalin), infusion hose, surgical thread, head cover, broken scalpel
2	Intensive Care Unit (ICU)	Syringe with needle, catheter hose and urine bag, bandage, infusion bottle, ex-injection bottle, infusion hose, disposable mask, disposable glove
3	Pharmacy	Expired drugs (tablets, syrups, capsules, injections, ointments, creams) that cannot be returned to the producer, remnants of medicinal ingredients, creams/ointments in unsealed tubes.
4	Blood Bank in Hospital	Syringe, gauze, chemicals, blood or body fluids, blood bottle, cotton, urine bottle
5	Laboratory	Syringe, urine bottle, bandage, cotton, slide glass, reagent, blood bottle, chemicals, serum, disposable glove, disposable mask, serum cup, inoculum, yellow tip, disposable bag autoclave, filter paper, container of specimen from pathology activity, anatomy
6	Inpatient Installation (II) and Delivery Room (DR)	Syringe, catheter hose and urine bag, bandage, infusion bottle, ex-injection bottle, medicine bottle, infusion hose, blood or body fluids, placenta, used napkins, disposable mask, disposable glove, blood transfusion hose, disposable lancet, alcohol bottle
7	Emergency Room (ER)	Syringe, infusion bottle, infusion hose, used gauze, blood or body fluids, catheter hose and urine bag
8	Outpatient Installation/Polyclinic	Syringe with needle, injection bottle, catheter hose and urine bag, bandage, infusion bottle, ex-injection bottle, body tissue, blood or body fluids, disposable mask, disposable glove, used cotton, used gauze, Pasteur pipette, saliva

B. Comparative Analysis of Medical Solid Waste Generation of Previous and Present Research in Syekh Yusuf Gowa Hospital

Medical solid waste generation in some hospitals was obtained from previous research, and then compared with the medical solid waste generation in Syekh Yusuf Gowa Hospital as present research. The results of this comparison were used to determine the level and number of generation in each hospital, which could be seen in Table 2.

Based on Table 2, it can be seen that the hospital that produces the smallest medical solid waste is from Siti Khodijah Hospital with 0.00051 m³/hospital bed.day.

While the hospital that produces the largest medical solid waste is Syekh Yusuf Gowa Hospital with 0.0094 m³/hospital bed day. Thus, it can be concluded that the number of hospital beds has no effect on the amount of medical solid waste generation in the hospital. The factors that influence the amount of medical waste per day is the level of medical service, the average number of visits per day, the type of disease and the number of patients admitted to hospital [8].

C. Analysis of the Medical Solid Waste Management System in Syekh Yusuf Gowa Hospital

Based on observations and interviews, management system of medical

solid waste was conducted in each unit/room source in Syekh Yusuf Gowa Hospital. The way of management system in each unit/room as a source of medical solid waste in this hospital could be seen in Figure 2. Moreover, reduction of medical solid waste was conducted in each source by sorting non-sharps medical waste, non-medical waste, and sharps medical waste. Medical solid waste management in Syekh Yusuf Gowa Hospital is conducted in five ways: (1) sorting, (2) collection, (3) transportation, (4)

storage, and (5) destruction of medical waste. However, these efforts have not run optimally due to the unavailability of standard operational procedure (SOP) regarding minimization of medical waste. Therefore, it can be seen that from the comparison scheme between medical solid waste management in Syekh Yusuf Gowa Hospital not in accordance with regulation of Kepmenkes RI No.1204/Menkes/SK/X/2004 (Figure 3) especially in pharmaceutical waste management.

Table 2. Comparison of medical solid waste generation from previous and present research

Component	Previous Research		Present Research
	Dr. H. Moch. Ansari Saleh Hospital, Banjarmasin	Siti Khodijah Hospital, Sidoarjo	Syekh Yusuf Hospital, Gowa
A. Waste Generation	1. Volume (m ³) 1,919*	0,057	1,953
	2. Mass (kg)	1.195	40.933
B. Number of hospital bed	217	113	209
Ratio (A1/B)	0,0089	0,00051	0,0094

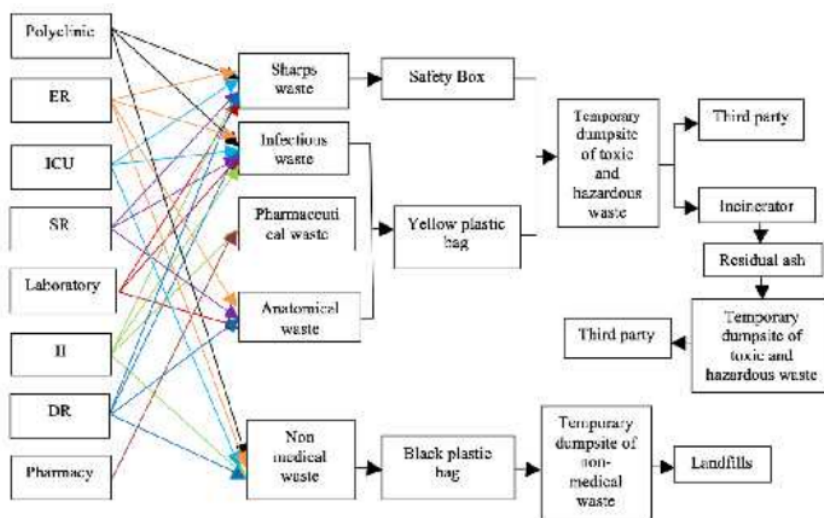


Fig 2. Medical solid waste management system in Syekh Yusuf Gowa Hospital

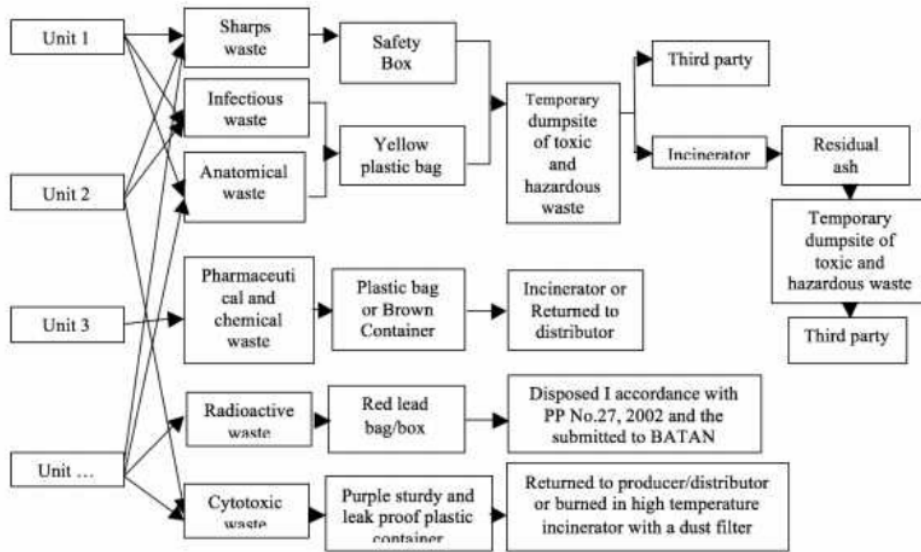


Fig 3. Medical solid waste management system in Kepmenkes RI No. 1204/Menkes/SK/X/2004

D. Analysis of the Conformity (Evaluation) of Medical Waste Management System in Syekh Yusuf Gowa Hospital with the Health Ministry Regulation

Evaluation of medical waste management in Syekh Yusuf Gowa Hospital, in this research, was conducted by using questionnaires. The aim of this evaluation is to know the suitability of medical waste management in accordance with the Ministry of Health Regulation. The category statement is divided into two, namely (1) requirements of medical solid waste management and (2) implementation. There are 43 total statements in questionnaire and Likert scale was used to reach the total score with five choices of answer. The lowest score is obtained from the lowest score multiplied by the number of statements, while for the highest score obtained from the highest score multiplied by the number of statements, and the total score

obtained from the total number of answers multiplied by the number of statements.

Based on Table 3, total score has been obtained data on evaluation of requirements and implementation of management medical solid waste in Syekh Yusuf Gowa Hospital using radar chart. The category in this chart is divided into two categories: (1) category A for requirements of medical solid waste management, while (2) category B for the implementation of medical solid waste management in Syekh Yusuf Gowa Hospital.

Based on Figure 4, it can be seen that the highest evaluation score is in category A5 (category of medical waste management requirements on the processing and destruction), while the lowest evaluation score is in category B5 (category of implementation of medical solid waste management on destruction and final disposal

of medical solid waste).

From Figure 5, it can be seen that the total score obtained from the proposed statement is 160 and adjusted to the calculated score scale. It can be categorized that the total score is within scale 146.2 -

180.6. Therefore, these results are in accordance with the evaluation. Proper management of medical solid waste has been done by Syekh Yusuf Gowa Hospital in requirements and implementation of medical solid waste management.

Table 3. Evaluation score

Evaluation	Lowest Score	Highest Score	Score
A. REQUIREMENTS OF MEDICAL SOLID WASTE MANAGEMENT			
1. Waste minimization	4	20	15
2. Sorting, put in container, reuse, and recycle	6	30	22
3. Collection, transportation, and storage	2	10	8
4. Collection, packaging, and transportation out of the hospital	2	10	8
5. Processing and destruction	2	10	10
B. IMPLEMENTATION OF MEDICAL SOLID WASTE MANAGEMENT			
1. Waste minimization	9	45	31
2. Sorting, put in container, reuse, and recycle	6	30	28
3. Temporary dumpsite	2	10	6
4. Transportation	3	15	13
5. Management, destruction, and disposal of medical solid waste	7	35	19
Total of Evaluation	43	215	160

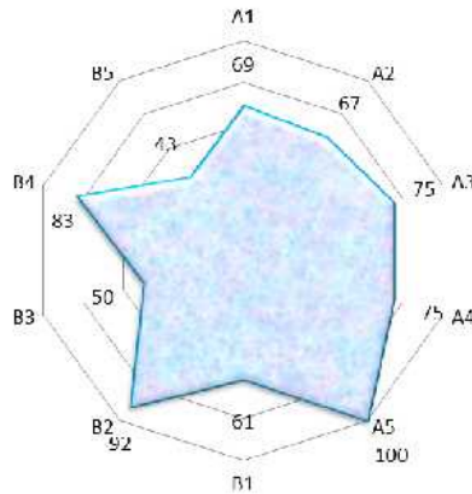


Fig 4. Radar chart of evaluation score

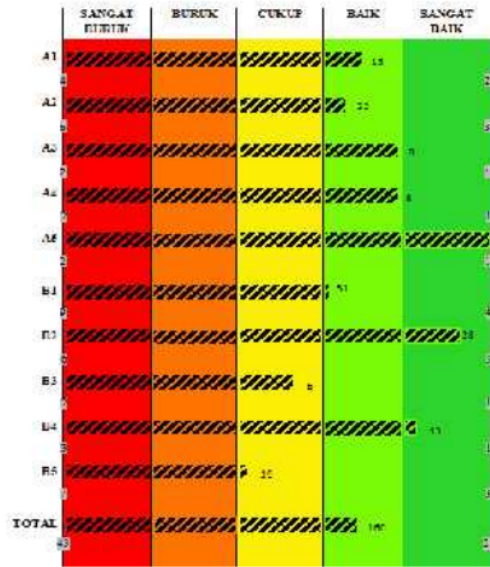


Fig 5. Result of evaluation score

4. CONCLUSIONS

From the research result on evaluation study of medical solid waste management in Syekh Yusuf Gowa Hospital, the conclusion is denoted as follows:

1. The generation of medical solid waste in Syekh Yusuf Gowa Hospital is 1,228 kg/month or 40.93 kg/day. There are five categories of medical solid waste generated by Syekh Yusuf Gowa Hospital: infectious waste, sharp waste, anatomical waste, chemical waste, and pharmaceutical waste. The most waste generated in Syekh Yusuf Gowa Hospital is the infectious waste that is equal to 70%. While the least amount of waste generated is pharmaceutical waste that is equal to 2%.
2. Medical solid waste management system in Syekh Yusuf Gowa Hospital is

conducted by sorting the waste which generated in each room/unit. Furthermore, these wastes are transported to the temporary dumpsite in hospital area. Then, these wastes are packaged and transported to the third party and/or processed in incinerator. The residual ash from incinerator was brought to temporary dumpsite of toxic and hazardous waste and third party.

3. The results of the evaluation of medical solid waste management system in Syekh Yusuf Gowa Hospital has been done well, in accordance with the Ministry of Health Regulation. The evaluation score is 160 from scale 43-215. The total evaluation result is obtained from two large groups: (1) requirements and (2) implementation of medical solid waste management.

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