SEM Model Medical Solid Waste Hospital Management In Medan City

Verawaty Simarmata¹, Setiay Pandia², Herman Mawengkang³
¹Graduate School, Universitas Sumatera Utara
²Department of Natural Resources Management and Environment, Universitas Sumatera Utara
³Department of Mathematics, Universitas Sumatera Utara

Email: verawatysimarmata@yahoo.co.id

Abstract. In daily activities, hospitals, as one of the important health care unit, generate both medical solid waste and non-medical solid waste. The occurrence of medical solid waste could be from the results of treatment activities, such as, in the treatment room for a hospital inpatient, general clinic, a dental clinic, a mother and child clinic, laboratories and pharmacies. Most of the medical solid waste contains infectious and hazardous materials. Therefore it should be managed properly, otherwise it could be a source of new infectious for the community around the hospital as well as for health workers themselves. Efforts surveillance of various environmental factors need to be applied in accordance with the principles of sanitation focuses on environmental cleanliness. One of the efforts that need to be done in improving the quality of the environment is to undertake waste management activities, because with proper waste management is the most important in order to achieve an optimal degree of human health. Health development in Indonesian aims to achieve a future in which the Indonesian people live in a healthy environment, its people behave clean and healthy, able to reach quality health services, fair and equitable, so as to have optimal health status, health development paradigm anchored to the healthy. The healthy condition of the individual and society can be influenced by the environment. Poor environmental quality is a cause of various health problems. Efforts surveillance of various environmental factors need to be applied in accordance with the principles of sanitation focuses on environmental cleanliness. This paper proposes a model for managing the medical solid waste in hospitals in Medan city, in order to create healthy environment around hospitals.

Keywords: waste, medical solid waste, non-medical solid waste, infectious and health paradigm.

1. Introduction
Hospital activities will generate a number of by-products in the form of waste, both solids, liquids and gases that contain pathogens, chemicals and medical equipment which are generally dangerous and toxic. In order to improve the quality of services, hospitals should be able to cope with such waste in ([6], [7], [13]). As for the waste treatment facilities in the hospital one of them is to use incinerators in ([4], [8]). Characteristics of medical solid waste produced can be distinguished into two parts, namely, domestic waste and waste hazard and toxicity in ([1], [18]). The latter one are infectious in [9]. An incinerator unit is expected to reduce the volume of waste prior to disposal and also can eliminate the hazard and toxicity [5]. Objective the Purpose of the Research is as Follows :

• To determine the performance of machines and tools in the handling of medical solid waste of the hospital.
• To find out how much the rate of availability of medical solid waste in the activities of medical activity.
• Knowing the extent of the amount of the availability of human resources in the environment that the ability of medical solid waste treatment hospital.
• Generating actions and efforts of the hospital's medical waste management by means of overconquering the impact of medical solid waste of the hospital according to the rules in the Decree of the Minister of Health of the Republic of Indonesia Number 12 Year 2004 Solid Waste Management's Medical Hospital, can be used as input to the Government in enforcing supervision and establish how the actions and efforts for the management and control of solid waste pollution hospital medical until declared safe for the environment and living beings.

The problem of waste is a serious concern of the people and government of Indonesia, especially since the last decade, mainly due to the business development activities of the hospital which is the backbone of economic development for Indonesia ([10], [12]). Waste management is a necessity for the preservation of human health and the environment in general. However, the procurement and operation of medical solid waste processing facility hospital was still considered burdensome for the hospital in ([17], [22], [23]).

2. Problem Formulation

Hazardous and toxic waste resulting from activities at most hospitals contain various elements of medical solid waste ranging from heavy metals that have the nature of accumulative toxic which are harmful to human health ([14], [21], [24]).

Medical waste in the form of gas, liquid or solid generally include the category or the nature of the hazard and toxicity waste ([11], [15]). The operational in activities of the hospital aims to improve the health and well-being, but it also produces waste as an environmental pollutant waters, soil and gas.

From the description of the background of the above in mind that the management of solid waste pollution control medical hospital, is one of the fundamental problems in the city of Medan and application supervision is the main business licensing and control alternatives in accordance with applicable regulations ([2], [20], [21]). However, to determine the extent to which technology and applied that can control solid waste pollution medical hospital in Medan, it is necessary to study the issues as follows:

• Anything that affects the performance of machines and tools in the handling of medical solid waste of the hospital?
• What is the pattern to determine how much the rate of availability of medical solid waste in the activities of medical activity?
• It has been the extent of the amount of the availability of human environment play a role in handling the hospital's medical solid waste according to the rules in the Decree of the Minister of Health of the Republic of Indonesia Number 12 of 2004?
• How do the actions and efforts of the hospital's medical waste management by means of overcoming the impact of hospital medical solid waste right? So there is input to the Government's policy in enforcing supervision and sets out how the actions and efforts for the management and control of solid waste pollution hospital medical until declared safe for the environment and living beings.

For the mathematical description of the model, the following notations are defined.

2.1 Sets and indices

Data from this study were analyzed using statistical techniques that use methods of regression and simple correlation, [25]. Test significance and the truth of the correlation between variables purpose is to determine how big the correlation coefficient between these variables by using correlation and regression formulas [3]. Currently, the research will be obtained comparative data with more than two samples of the variables are interconnected, then to test the statistical parametric (n1) and non parametric (n2) can be used one-way ANOVA or two way ANOVA combined using test method variance or the t test [19].
2.2 Variables

- Variable performance of machines and tools (incinerator) in the treatment of hospital medical solid waste (X1).
- Variable availability of medical solid waste from the activities of hospital activities (X2).
- Variable of environment variable availability of human resources according to the rules in the Decree of the Minister of Health of the Republic of Indonesia Number 12 Year 2004 (X3).
- Variable overcome the impact of the hospital's medical solid waste (X4).

2.3 Parameters

- X1.1 = Source hospital medical solid waste.
- X1.2 = Type hospital medical solid waste.
- X1.3 = Number of hospital medical solid waste.
- X1.4 = Production of hospital medical solid waste.
- X2.1 = Number of rooms and patient.
- X2.2 = Facilities or Facility Storage While medical solid waste.
- X2.3 = Physical condition of availability of raw materials activities of hospital activities.
- X2.4 = Medical solid waste collection process hospital.
- X3.1 = Condition Availability HR environment.
- X3.2 = Graduates HR environment.
- X3.3 = Ability or expertise HR environment.
- X3.4 = Training officers in the handling of hospital medical solid waste.
- X4.1 = Condition of society in the hospital environment.
- X4.2 = Attitude of people in a hospital environment.
- X4.3 = The level of awareness of the hospital against medical solid waste treatment.
- X4.4 = Level of medical solid waste pollution hospital.

3. Mathematical Formulation

\[
\text{AVE} = \frac{\sum_{i=1}^{n} L_i^2}{n} \tag{1}
\]

Where : \( L_i = \) standardized loading estimate
\( n = \) value indicator.

While reliability test can be done by calculating construct reliability (CR) with the following formula:

\[
\text{CR} = \frac{\left( \sum_{i=1}^{n} L_i \right)^2}{\left( \sum_{i=1}^{n} L_i \right)^2 + \left( \sum_{i=1}^{n} e_i \right)} \tag{2}
\]

Dimana: CR = construct reliability
\( L_i = \) loading factor or standardized loading estimate
Table 1. Indeks Equilibrium Statistic Equation Models after Modification Model

| Criteria                        | Value Cut-off for n = 89 : df = 168; alpha = 0,05 | Value AMOS | Description |
|--------------------------------|--------------------------------------------------|------------|-------------|
| Freedom Degree (db)            | > 0                                              | 168        | Qualify     |
| Chi – Square                   | < 155.405                                        | 53,058     | Qualify     |
| P-value                        | P value ≤ 0.05                                   | 0,001      | Qualify     |
| CMIN/DF                        | ≤ 2,00                                           | 1,196      | Qualify     |
| Root Mean Square Error of      | < 0.08                                           | 0,022      | Qualify     |
| Approximation (RMSEA)          |                                                  |            |             |
| Goodness of Fit Index (GFI)    | ≥ 0.90                                           | 0,964      | Qualify     |
| Adjusted Goodness of Fit       | ≥ 0.09                                           | 0,941      | Qualify     |
| Index (AGFI)                   |                                                  |            |             |
| Tucker Lewis Index (TLI)       | ≥ 0.95                                           | 0,989      | Qualify     |
| Comparative Fit Index (CFI)    | ≥ 0.94                                           | 0,993      | Qualify     |

When : n = value sampel; df = freedom degree.

Table 2. Model Direct between Variabel Unobserved Variable

| Direct between Variabel Unobserved Variable | Direct Impact | CR | Rob (p) | Description |
|--------------------------------------------|---------------|----|---------|-------------|
| X1 Model_Management                        | 1,025         | 1,02 | 0,15    | Influence   |
| X2 Model_Management                        | 0,927         | 0,93 | 0,86    | Influence   |
| X3 Model_Management                        | 0,939         | 0,94 | 0,88    | Influence   |
| X4 Model_Management                        | 0,586         | 0,59 | 0,34    | Influence   |
4. Conclusions
The conclusions of the model SEM medical solid waste hospital management in Medan can be stated as follows.

- Place or health services or medical care and treatment.
- Results of research for procedures special handling solid waste medical hospital, in this case the standard operating procedures or SOPs (Standard Operating Services) acquired point X1 for 1,025 concluded that the procedures for special handling solid waste medical hospital of highly influenced from the source of solid waste medical hospitals, type of hospital medical solid waste, the number of hospital medical solid waste and solid waste collection processes internally medical hospital. In this highly desirable mutilation waste statement whenever there is addition or medical solid waste storage in the storage room. Recording daily or daily logbook which will be reevaluated every 3 (three) months if there is submission to the collector, transportation, destruction and medical solid waste utilizers of the hospital.
- Training and the provision of non-formal education that support the effectiveness of solid waste management medical hospital room starts from action to action to the activities of a doctor or medical personnel. On the basis of this is necessary to add the medical knowledge regarding the handling of solid waste such as hospital medical known to influence. Data obtained with the results of this SEM model test to information how big the accuracy of the analysis of massive data acquisition to rate the availability of medical solid waste in the activities of medical activities with X2 = 0.927. It is concluded that whenever any activity or activities of the hospital medical solid waste will provide a contribution of X2 per activity.
- The results of multiple linear regression analysis provide important information the extent of the amount of the availability of human surroundings ability in handling the hospital's medical solid waste according to the rules in the Decree of the Minister of Health of the Republic of Indonesia Number 12 Year 2004 with X3 figure of 0.939 per activity for medical solid waste management activities. This applies equally to every hospital in the city of Medan because almost all hospitals that have no HR environment capable of handling serious medical solid waste from hospitals.
• Model suitable measures and efforts to become a model Solid Waste Management Medical Hospital in Medan is 
\[ Y = 1.025 \times X_1 + 0.927 \times X_2 + 0.939 \times X_3 + 0.586 \times X_4. \]

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