

# Medical waste management strategy in the inpatient primary health care center with system approach: a SWOT Analysis

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## Medical waste management strategy in the inpatient primary health care center with system approach: a SWOT Analysis



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### ABSTRACT

**Introduction:** Primary health care center with inpatient services should have a proper management of medical waste. However, this program has not been implemented properly by any inpatient health care centers and, thus, an analysis of waste management starting from the input, process, and output is necessary. The purpose of this study was to evaluate and analyze the strategies of medical waste management in health care centers primarily which have an inpatient service.

**Methods:** A descriptive, explanatory research was conducted by using respondents from all parties who directly involved in the management of medical waste. Observation, questionnaires, and interviews were used to obtain the data and analysis conducted by focus group discussions using Strength Weakness Opportunity Threats (SWOT).

**Results:** The *Strength* we found in this study include implemented medical waste management in health care centers, sufficient funds,

and adequate infrastructures. Identified *weaknesses* including untrained personnel, poor planning, and poor discipline in each unit. *Opportunities* that identified in our study include written regulations on an environmental health program, the institution shaped in Public Service Board, regular training programs by health authorities and the third parties that were available to cooperate in managing medical waste. Several *threats* were identified namely environmental pollution, high demands of the local community and the bottleneck problem in the incinerator operating licenses.

**Conclusion:** It is possible to implement medical waste management primary health care center especially which have inpatient services. However, proper training, good planning, regulation, and supervision are required to ensure its continuation and maintaining the quality.

**Keywords:** medical waste, management, system, inpatient health care center

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### INTRODUCTION

Primary Health Centre (PHC) known as *Puskesmas* is one of the first-tier of health facilities that serve as primary care providers and simultaneously drive the development vision of health. The government has regulated the availability of healthy environment and avoid any of its adverse effects as part of human rights in law number 36, 2009.<sup>1</sup> Thus, regarding health care facilities, efficient medical waste disposal is pre-requisite in every health center including those located in rural area.

Today, several PHC provide inpatient treatment services, especially which located in the rapidly developing area. Basic Health Research Data Ministry of Health RI reported that in Indonesia, there was 9792 health center which consists of 3,378 health centers with 121 996 inpatient beds in 2015.<sup>2</sup> Health centers in Indonesia can be divided into two categories: urban and rural health centers. It could also categorize as inpatient and non-inpatient health center. PH with inpatient care is of particular importance because it produces a large amount of medical waste each year and, thus, need to be disposed of safely.<sup>3</sup>

PHC has its policy to implement environmental health programs to manage the medical waste disposal. Nevertheless, patient-oriented services and service quality management system are needed. A study in Nigeria stated that it is important to prepare medical waste management in every part of the region and ensure its continuity by formulating guidelines, regulatory policy, and governmental supports.<sup>4</sup> Although medical waste management is usually problematic for larger health care institution such as a hospital, the development of the PHC by providing inpatient care also raise concern regarding the amount of medical waste it produced and the method to dispose of it. The condition of PHC in Indonesia and medical waste production is represented in Figure 1.

The negative impact of medical waste in health centers that are not managed appropriately is very detrimental to the environment and the public. It is ranging from simple annoyance from the ash produced by installation to more serious health problem including infection by antibiotic resistant bacteria.<sup>5</sup> The workers of the installation are

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particularly placed at much higher risk without protective devices which was proved with the lower result from Tiffenau Index.<sup>6</sup>

The Policy of Ministry of Health of the Republic of Indonesia No. 1428 / SK / X / 2006 on Environmental Health Requirements Health Center has provided guidance on the standard of medical waste management systems in health centers.<sup>7</sup> Stages of medical waste management in health centers from the sorting, collection, removal, transport and final processing of medical waste. Results and impacts resulting from management standards have also been set explicitly in Health Ministerial Decree No. 876 of 2001 on Technical Guidelines for Environmental Health Impact Assessment.<sup>8</sup> For a suggested process waste medical health centers using a tool called the incinerator. The entire system of medical waste management in Puskesmas Payangan rural health centers belonging to the category identified factors strengths, weaknesses, opportunities and threats owned. Then analyzed to formulate a good strategy for the management of this medical waste.

SWOT is commonly used to analyze the strategy of a new project especially in economy and also started to be introduced in the health sector. In India, for example, SWOT was successfully implemented to formulate the curriculum and strategy to discipline the students. The key point to implement the SWOT is an in-depth analysis of the main problem and, thus, optimizing the benefit of applying it.<sup>9</sup> SWOT could be regarded as the best strategy for analyzing a new strategy since it comparing the strength and opportunity factors against threat and weaknesses. Thus, giving the decision makers a full description of the strategy and also its applicability.

Several studies regarding medical waste production and management had been reported in a hospital setting.<sup>10,11</sup> However, their results were deemed difficult to apply in smaller health unit such as PHC. Thus, this study aimed to bridge the gap and formulate a new medical waste strategy that could be implemented in PHC especially that has inpatient services. This study was conducted and focused in PHC in Payangan because of it fitted the criteria of the targetted PHC.

## METHODS

A descriptive, explanatory research was undertaken in Payangan PHC, Gianyar, Bali in December 2016. Purposive sampling was used to obtain 30 respondents that considered to understand about the system within the PHC and its medical waste management. An in-depth interview by using questionnaire was used to obtained required information. Supporting information like PHC reports documents from previous years or months was also obtained. The amount of medical waste was measured for 30 days and used to estimate its volume in one year. Focus group discussion (FGD) was used to reinforce the information as well as to formulate a strategy using SWOT. Every activity was documented and recorded. The collected data were analyzed using a triangulation technique to estimate the amount of medical waste generated based on the type of services, the level of occupancy or the number of visits/admission. Meanwhile, a qualitative analysis was used to analyze the data obtained from interview and FGD by reviewing, categorizing, tabulating the data and combining them to formulate the strategy.

## RESULTS AND DISCUSSION

From all of the data, we formulated a system based approach to solve the problem comprehensively. The approaches could be described in 3 aspects as follows:

### A. Input:

1. The number of human resources (HR)

The Medical waste management of PHC in Payangan consisted of 5 people in which 2 of them were sanitarian cleaning service. Based on workload analysis using WHO method of Medical waste management employee at the health center Payangan of 5 people consisting of 2 and three people sanitarian cleaning service. Workload analysis conducted by the WHO method of Workload Indicator of Staffing Requirements, it appears that 4.72 or



**Figure 1** Matrix production cycle of medical waste in primary health facilities in Indonesia

5 workers are needed in this sector which was fitted with the actual amount of forces in this field.

## 2. Funding

The funding of waste sector was increased from time to time. Starting from IDR 6,000,000 in 2016 to IDR 22,000,000 in 2017 planning. This number showed that the attention to this field was also increasing and thus enabling an improvement of the strategy of medical waste management.

## 3. Regulation

Health Ministry Policy No. 75, 2014 stated the importance of medical waste management program in every health center in Indonesia.<sup>3</sup> Thus, the legal aspect of this sector had been established. However, not all regional health centers have applied this strategy.

## 4. Infrastructures

The tools and facilities required for medical waste disposal have been built in the PHC in accordance with Health Ministry Policy No. 1428, 2016. However, they were not fully functional or implemented according to a national standard.

## 5. The amount of waste produced at each PHC unit

From the data analysis, we found that the average rate of medical waste generated per patient was 7.68 g/patient/day which was slightly higher compared to national standard of 7.5 grams/patient/day stated in National Basic Healthcare Research 2004.<sup>2</sup> Meanwhile, inpatient unit produced a significantly greater waste, averaging at 850 g / patient/day which is six times greater compared to 140 grams / Beds/day of national standard.<sup>2</sup> The possible cause of this phenomenon is the growth of PHC facilities, increasing number of patient, and other factors that still need to be evaluated.

## B. Processing

In general, waste management processing in health centers could be divided into two categories: medical and non-medical waste. Non-medical trash or regular domestic waste does not receive special treatment and just dumped like usual while medical waste received special treatment which begins with sorting process until the disposal.

Medical waste processing in the PHC of Payangan that we observed includes several stages as follows:

### 1. Sorting and Separation

As we observed, the PHC of Payangan has been doing waste sorting and differentiate between

medical and non-medical. The separation was also considered sufficient. All medical and paramedical staff played a great role in this process since they were the one that generates the medical wastes. However, there were still many of them that collected the waste indifferently which could complicate the process.

### 2. Collection

The initial collection process was conducted using a garbage with a different color plastic bag inside it. Each color determines particular kind of medical wastes as follows: yellow for medical waste and black for non-medical one. However, we observe many trash can with mixed wastes inside it despite the very striking difference in plastic coloration.

### 3. Removal

The cleaning services would remove the collected medical waste. They used a large plastic bag to collect it and transport it using carts. The removal process was not conducted every day, but only if the garbage can was full. Thus, it is not in accordance with a national standard in which the medical waste must be removed every 24 hours. Irregular removal could put both the staff and the patients at risk of contracting nosocomial infections.

### 4. Transportation

As we observed, the transport process was conducted using open pickup trolley that exposed the medical waste to the environment. The distance between the collection site to the incinerator was approximately 200 m, and the waste was moved past the waiting room and the PHC itself. Thus, it was still far from ideal because the trash could be scattered along the way and contaminate the environment.

### 5. Final Disposal

The final disposal was conducted using conventional incinerator owned by the PHC. The installation was built using funding from Special Allocation Fund of the PHC. From our observation, it appeared that the installation did not function properly despite sufficient skill of the operators as described in the quotes of our respondent:

"... The equipment in this facility is functional, but there is always some residual remains. The wastes can not burn completely because the temperature is hardly reached 1100°C which is the standard burning temperature. There have been several repair attempts, but the engineers were always failed to fix it. We almost always find the ash mixed with intact glass ampules or bottles, the needles also can not burn down completely..."



### C. Output Aspect

We observed that the remains of the medical waste burned in the incinerator in PHC of Payangan could reach 18.6% of the initial weight which is much higher than 2-3% stated in the national standard. Some of the ash and gas vapor go through the gas chimney. The other remains such as vials, ampules, bandages, and needle components have potentially contaminated the environment and even harm the local population if disposed of with non-medical waste. We also observed that the officers seldom used protective equipment when operating the installation which could harm them from high temperature.

### STRATEGY OF WASTE MANAGEMENT WITH MEDICAL SYSTEM APPROACH IN PHC OF PAYANGAN

The solution of medical waste management of Payangan PHC was formulated using SWOT. The formulated system then evaluated by IFAS (Internal Strategic Factor Analysis Summary) and EFAS (External Strategic Factor Analysis Summary). The detail of the analysis is presented below:

#### Internal Factor

##### a) Strengths:

The main power of this issue is that the medical waste management already exists and operational in Payangan PHC. The system is already fully functional, operating all necessary process from separation, collection, removal, transportation, and final disposal. The system is supported by funding from PHC intended to provide adequate facilities, infrastructures, human resources and their allocation into appropriate division and tasks, and set the Standard Operational Procedures (SOP). The implementation of this system shows the high level of support from PHC management which provides the advantage for this system. The vital role of the managerial support was described by Dionysius which stated that poor support and funding were the primary factors that cause inoperability of waste management system in most PHCs in Indonesia.<sup>12</sup> In addition, according to Biswas, only 27% of the PHC in Indonesia fully implemented this program (11% with the incinerator and 16% with disinfection), including Payangan PHC. It is also interesting to found that private sector implements this program much better than the government.<sup>13</sup>

##### b) Weaknesses:

The main weakness we found in the PHC is the lack of skill and knowledge of the personnel

about how to operate the facility correctly. All of the personnel never had any training and workshop about medical waste management which should give them enough skill and knowledge to fully operate the installation. The problem is augmented by the fact that there is no detailed planning and adequate operational procedure in the facility. Also, the behavior of the medical and paramedical staff that often disobey the separation process and low level of surveillance by the superiors were also considered as a vital weakness of the waste management in Payangan PHC. However, this weakness is indeed manageable by delivering enough training and workshop for the involved staff as well as formulating efficient protocol to operate the facilities. In Kumar Ramesh's research recommendation, Somrongthong states that the effect of management training interventions on staff related to knowledge, behavior, and practice of managing medical waste is significantly improved after regular training and at least evaluated after 18 months.<sup>14</sup>

#### External Factors

##### a) Opportunities

The primary external opportunity for the establishment of medical waste management in Payangan PHC is the availability of written regulation of waste management from the Ministry of Health. It provides a legal force for the waste management and enabling it to be included in the main program of the PHC, thus, secure its funding and continuity. The policy regarding medical waste management is partly described in the regulation of Ministry of Health No. 1428, 2006 about the requirement of Environmental Management of PHC and refined in the Regulation of Ministry of Health No.13, 2013. The importance of governmental legal policy is well described by Hassan et.al which stated that the lack of adequate law and regulation was negatively influenced the attitude of the staff which results in a lack of awareness and low discipline which adversely affect the quality of waste disposal<sup>15</sup>. Kumar et.al also found the similar result and stated that the capacity building of the personnel must be reinforced with written legal regulation especially in developing countries<sup>16</sup>. The acknowledgment of the PHC either legally and by local community also provide some opportunities for the PHC in the form of easiness to create a cooperation with the third parties to jointly manage the medical waste and providing adequate training to the personnel.

**Table 1** Matrix of SWOT analysis of Puskesmas Medical Waste Management

<p><b>Internal</b></p> <p><b>External</b></p>	<p><b>Strength (S)</b></p> <ol style="list-style-type: none"> <li>1. Implementation of operational activities of medical waste management in Inpatient Public Health Center service</li> <li>2. Fund / budget for medical waste management</li> <li>3. Medical waste management facilities and infrastructure</li> <li>4. Number of personnel (HR) management of medical waste</li> <li>5. The division of basic tasks and functions are clear (according to Ministry of Health Regulation)</li> <li>6. Standard Operating Procedures (SOP) of medical waste management</li> </ol>	<p><b>Weakness (W)</b></p> <ol style="list-style-type: none"> <li>1. A specially trained medical waste management officer</li> <li>2. Specific and detailed planning according to stages</li> <li>3. Behavior of medical waste generating officer in related unit</li> <li>4. Medical waste management standard</li> <li>5. Supervision of the final product</li> </ol>
	<p><b>Opportunity (O)</b></p> <ol style="list-style-type: none"> <li>1. Written regulation / regulation on health of puskesmas environment</li> <li>2. Forms of Regional Public Service Agency open cooperation opportunities</li> <li>3. Regular training programs by the health department</li> <li>4. There are third parties who are willing to cooperate</li> </ol>	<p><b>Strategi Strength and Opportunity (S-O)</b></p> <p>Establish strong networks and synergies from every component of medical waste management to ensure the process goes well</p>
<p><b>Threat (T)</b></p> <ol style="list-style-type: none"> <li>1. Environmental pollution due to result is not standardized either</li> <li>2. High demands from the surrounding community</li> <li>3. Operational Permits of the facilities do not yet exist</li> </ol>	<p><b>Strategi Strength and Threat (S-T)</b></p> <p>Mainstreaming the overall quality of the medical waste management system to avoid adverse effects</p>	<p><b>Strategi Weakness and Threat (W-T)</b></p> <p>Implement Basic Management of Puskesmas (P-D-C-A) Planning, Implementation and Supervision of Environmental Health Program</p>

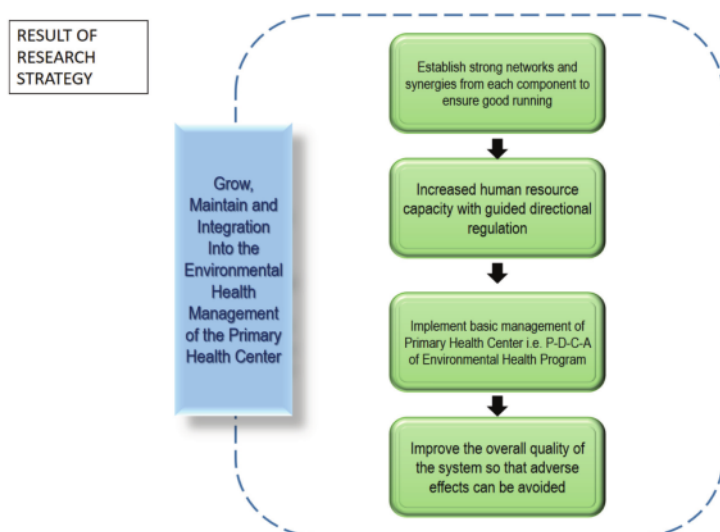
In our view, it will be the most viable option to enhance medical waste management system in Payangan PHC.

b) Threat:

The greatest threat factor in the implementation of medical waste management in Payangan PHC is environmental pollution due to the remains of the incinerated waste. The remains could be hazardous due to the infectious nature of the waste and, thus, its incomplete disposal has a potential to harm the population around the PHC. However, those who exposed directly to the potential hazard are the workers within the facility. Vimercati et.al stated the vulnerability of the workers in medical waste disposal facility to the adverse effect of the pollution generated by incinerating process of the medical waste. Respiratory diseases and

dysfunctions were the most reported problem among the staff especially for those who did not wear the protective device.<sup>6</sup> A similar report also stated by Kuchibanda et.al which reported higher health risk among the facilities staff. The primary cause of this phenomenon is the substandard skill of the staff which caused by lack of training. Ironically, this problem rarely got the attention from the superiors.

From our point of view, this problem requires immediate attention and solution because of the potentially harmful effects posed by the pollution. The other issues that also need to be solved are the public notice regarding the pollution effects and the absence of the legal, operational license of the facility which could threat the operational continuity of the installation and the system.



**Figure 3** Flow of Medical Waste Management Strategy at Puskesmas

The systematic presentation of all of the factors above is presented in [Table 1](#).

According to the analysis of the IFAS and EFAS evaluation, we found that the internal factors had greater influence (total score 3,651) compared with the external ones (total score 3.301) which mean that this sector needs to be prioritized. The calculation is necessary to determine the coordinate point of the problems in the SWOT which we found to be in quadrant I. This position is deemed strategic because it contains power/strength as the main capital which could be used to exploit as many opportunities as possible. The required strategies need to optimize it are as follows:

- a. SO (Strength- Opportunity) Strategy  
SO strategy focused on using the power to exploit the opportunities through establishing strong network and synergy of every component of medical waste management. The important point of this approach is the fact that every related sector in medical waste management can not operate by itself and, thus, synergy held significant role to ensure appropriate operation. The regulation as mentioned above could give enough advantage for the PHC to provide legal standing as the basis of the cooperation with a professional third party in the field of medical waste management.
- b. ST (Strength- Threat) Strategy  
The operational principle of this strategy is to focus on using the power to overcome the threat through regulating and regular monitoring and evaluating the quality of the system and thus

ensuring its maintenance. Good quality control of all stages is necessary to avoid the adverse effects posed by the pollution generated by the byproduct of the disposal process.

c. WO (Weakness- Opportunity) Strategy

This system focused on minimizing the weakness to exploit the opportunities, through improving human resources capacity related to medical waste management with regulatory support and proper training. This means that any effort to improve capacity such as regular training and specializing on behalf of the relevant parties should be implemented. The focused aspect of this strategy is to provide reliable human resources to optimally seized the opportunities.

d. WT (Weakness- Threat) Strategy

The principle of this approach is to minimize the weakness to avoid the threats by implementing basic management of PHC (P1-P2-P3) planning, implementation, and supervision of environmental health program. Proper planning and process monitoring of the process will minimize the effect of the pollution on the environment and society. Furthermore, by establishing the legal permission of the facilities will ensure its operational continuity and also help to avoid the public protest.

All of this strategies must be implemented comprehensively to stimulate the growth, development, and integration of the system involving all of the related components. The overall approach is summarized in the following flowchart ([Figure 3](#)).

## CONCLUSIONS

From all of our observation and analysis, we conclude that medical waste management is already established and operational in Payangan PHC. However, it still not functioning according to the national standard and many improvements are needed. Internal factors were the one that needs to be prioritized because of its urgency and development strategy based on SWOT is the best solution to solve this problem based on our point of view. Empowerment of all related components, as well as full implementation of our recommendations, are necessary to initiate and maintain the improvement program in the Payangan PHC.

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