Infectious Waste Management by Private Clinics in Maha Sarakham City Municipality
การจัดการมูลฝอยติดเชื้อจากสถานพยาบาลเอกชนภายในเขตเทศบาลเมืองมหาสารคาม

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Abstract

This research study aim to investigate management from 78 private clinics in Maha Sarakham City Municipality. Questionnaire was a tool for data collection from samples who were personnel responsible for handling infectious wastes in private clinics, one sample for a clinic. The statistical values for analyzing the data were including mean, percentage and standard deviation. The results were as follows: (1) Overview of collecting infectious waste, was managed at a high level ($\overline{X}$ = 2.81) which most of collecting have prepared the container for disposal of infected waste, and tied it tightly. (2) Overview of transporting infectious waste, was managed at a high level ($\overline{X}$ = 2.43) by moving most of capture neck of bag, lift slightly away, did not drag or carrier bags. (3) Overview of infectious waste disposal, was managed at moderate level ($\overline{X}$ = 2.00). Recommendations from this study, the infectious waste management by private clinics have conveniently conducted of each private clinic. Therefore, Maha Sarakham City Municipality should be a service center for the infectious waste management as a whole in order to prevent the danger that might occur due to inappropriate management.

Keywords: waste management, infectious waste, disposal of infectious waste, private clinics

บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาการจัดการมูลฝอยติดเชื้อ จำนวน 78 แห่ง ภายในเขตเทศบาลเมืองมหาสารคาม โดยใช้แบบสอบถามเป็นเครื่องมือในการรวบรวมข้อมูลจากกลุ่มตัวอย่างซึ่งเป็นบุคลากรที่มีหน้าที่ในการจัดการมูลฝอยติดเชื้อในสถานพยาบาลเอกชนแห่งละ 1 คน ทำการวิเคราะห์ข้อมูลโดยใช้สถิติ ค่าเฉลี่ย ร้อยละ และส่วนเบี่ยงเบนมาตรฐาน ผลการศึกษา พบว่า (1) ภาพรวมด้านการเก็บรวบรวมมูลฝอยติดเชื้อมีการจัดการอยู่ในระดับสูง ($\overline{X}$ = 2.81) โดยการเก็บรวบรวมส่วนใหญ่มีการจัดเตรียมภาชนะสำหรับทิ้งมูลฝอยติดเชื้อและมัดปากถุงให้แน่นเสมอ (2) ภาพรวมของด้านการขนย้ายมูลฝอยติดเชื้อมีการจัดการอยู่ในระดับสูง ($\overline{X}$ = 2.43) โดยการขนย้ายส่วนใหญ่ใช้วิธีการจับบริเวณคอถุงยกห่างจากตัวเล็กน้อย ไม่ลากอุ้มถุงและ (3) ภาพรวมของด้านการกำจัดมูลฝอยติดเชื้อมีการจัดการอยู่ในระดับปานกลาง ($\overline{X}$ = 2.00) ข้อเสนอแนะจากการวิจัยครั้งนี้ การจัดการมูลฝอยติดเชื้อเป็นไปตามความสะดวกของสถานพยาบาลเอกชนแต่ละแห่ง ดังนั้นของเทศบาลเมืองมหาสารคามจึงควรเป็นศูนย์การใบการบริการการจัดเก็บมูลฝอยติดเชื้อแบบระบบรวมเพื่อป้องกันการป้องกันอันตรายที่อาจจะเกิดขึ้นจากการจัดเก็บที่ไม่เหมาะสม

คำสำคัญ: การจัดการขยะ, ขยะติดเชื้อ, การกำจัดมูลฝอยติดเชื้อ, สถานพยาบาลเอกชน

Introduction

Currently, a large number of public as well as privately-own health facilities can be found throughout Thailand. These include hospitals, health centers, Subdistrict health promotion hospitals and local clinics. Private clinics are among major providers of services such as check-up, diagnosis and treatment of diseases, and immunization. More specifically, their services range from treatment of general as well as specialized diseases, dental care, animal care and treatment, nursing and midwifery, medical technology-based services such as blood test and also physical therapy. Their operations, however, produce both general and infectious waste as by-products on a daily basis. Examples of the latter include blood-smeared items, puss, cotton, gauze, sharp-edged waste and pieces of human fleshes etc. These are the kind of waste that, if not carefully managed, people who happen to touch them may get infected with diseases through such contact.

Nowadays a growing number of infectious waste from private clinics are being released into the environment where they naturally mix with general waste that are produced by surrounding communities. This sharply increases the risk of infectious diseases getting spread communitywide, thus putting the health of relevant people at jeopardy. It is not only community people whose lives will be adversely affected should infectious diseases get spread in their community and their natural environment, but the health personnel who are working as infectious waste carriers at the clinics or at disposal service facilities are under threat as well for they are exposed to these waste on a daily basis, hence risk getting infected by serious diseases such as types of hepatitis, respiratory infections, parasites and even HIV/AIDS. In urban areas, the risk of disease outbreak is even more serious. This fact highlights the importance of good management of infectious waste in order to keep the risk at minimum level. At present, however, management of infectious waste by private clinics is found to be both inadequate (i.e. using unhealthy methods) and insufficient (i.e. due to lack of standards and guidelines for directing the whole process, from collection, to transport and disposal). Moreover, the current practice is offset by lack of oversight and proper regulations by relevant agencies and the budget constraints facing many private clinics.

Private clinics in Maha Sarakham City Municipality comprise general clinics, specialized clinics, dental clinics, animal hospitals, nursing and midwifery clinics, medical technology-based and physical therapy clinics. These clinics totally number 78, and can be broken down into 7 categories on the basis of different kinds of medical services they provide. This makes them the producers of a large number as well as a garden variety of waste, including infectious waste, which are essentially the by-products of their medical operations. Types and quantity of waste produced vary with types of services that clinics in each category provide. In 2013, the total amount of combined waste from all related clinics equal 170.156 kg. Generally, private clinics manage their infectious waste by sending them off to Maha Sarakham Hospital, Borabue Hospital, Sutthavej Hospital, Maha Sarakham Hospital's faculty of medicine, where they are gathered into big lots and sent off again in aggregate to a private disposal service provider called Sor Roongruerng Company to take care of. The general waste, on the other hand, is carried off by trucks to Maha Sarakham City Municipality where they will be disposed. (Maha Sarakham Public Health Office, 2015).

The mismanagement of medical waste in developing countries may be a significant risk factor for disease transmission. Therefore, the quantitative estimation of medical waste generation is needed to estimate the potential risk and as a basis for any waste management plan for Maha Sarakham City Municipality as well (Patwary, et al., 2009). Moreover, lack of knowledge has resulted in mismanagement of medical waste and misunderstanding of the composition of medical waste creates occupational and environmental problems (Patwary, O'Harea & Sarker, 2011). Particularly infectious waste management in Thailand, There are still facing different challenges if there is .inappropriate managed, this might be a thoughtful public health threat and cause outbreaks of diseases with adverse impact human health and the environment since the waste generated by the public health service sector needs specific treatment and prevention the environmental and health impacts for all stages of the waste management lifecycle (Hansakul, et al., 2010; Pharino, 2017).

In view of the above-mentioned data, the author of this research is interested in investigating more deeply into the extent and the manner in which infectious waste from private clinics in Maha Sarakham City Municipality are being managed. This study is therefore launched to collect data concerning the ongoing management of infectious waste in this area by existing private clinics, and to identify what constitute major challenges offsetting management of infectious waste by these clinics. The findings, it is hoped, will serve as basic data regarding the management of infectious waste by private clinics within Maha Sarakham municipality and provide a useful guide for the development of infectious waste management in this area towards greater efficiency and better standards.

Research Objective

1. To investigate management of infectious waste from private clinics within Maha Sarakham City Municipality.

2. To study challenges facing private clinics within Maha Sarakham City Municipality and offsetting their management of infectious waste.

Methodology

Area of Study

Areas used for the study are private clinics that are located within Maha Sarakham city municipality. According to data from Maha Sarakham Provincial Office of Public Health as of 2016, there are 78 such clinics, namely, (1) 16 general clinics, (2) 28 specialized clinics, (3) 14 dental clinics, (4) 4 nursing and midwifery clinics, (5) 3 physical therapy clinics, (6) 3 medical technology clinics and (7) 10 animal hospitals.

Population and Sample

1. Population

Population for this study consists of personnel who work in 78 infectious waste-producing private clinics in Maha Sarakham city municipality who handle infectious waste on a regular basis. There is only one in each private clinic, therefore the total population are 78 people.

2. Samples

The population of 78 of personnel who take responsibility for handling infectious waste of each clinic are used as sample group.

Research Tool

The tool used for this research is questionnaires.

1. Duration this study is conducted during January-February 2017.

2. Development of research tools

Development of research tools proceeds in the following steps; (1) Conduct literature review, e.g. textbooks and researches that are relevant to this topic of management of infectious waste from private clinics and from hospitals in order to obtain necessary knowledge for developing appropriate questionnaires for collecting the necessary data (2) Use knowledge obtained from literature review to develop questionnaires that have the specified structure for collecting field data. (3) Seek advice from advisors and specialists in the field to obtain ideas on how to improve upon the questionnaires and make the necessary revisions (4) Apply the questionnaires for collecting the necessary data at private clinics.

The questionnaire is divided into 2 parts of general information and infectious waste management. The infectious waste management consists of 3 sections covering infectious waste collection with 11 items, infectious waste transportation with 5 items, and infectious waste disposal with 5 items. There are 3 rating scales of practice every time, sometime and never.

Data Collection

1. Procure official letters as needed to obtain cooperation from relevant private clinics in the process of data collection

2. Conduct field data-gathering by using the questionnaires developed at the earlier stage

3. Conduct statistical analyses on field data collected

Data Analysis

Data collected will be analyzed using the following methods:

Part 1: General data of private clinics that are collected using a questionnaire set of 9 smaller questions are analyzed by the statistic value of percentage.

Part 2: Data on management of infectious waste from private clinics within Maha Sarakham city municipality that are collected using a rating scale questionnaire (the scale being 3 levels: always, sometimes and never) are analyzed by adding up the scores received by each level.

Part 3: Recommendations on challenges facing private clinics in their management of infectious waste are put together based on the narrative descriptions collected from private clinics in Maha Sarakham city municipality.

Statistical values used for data analysis are (1) Percentage (2) Mean (3) Standard Deviation.

Results

This research investigates management of infectious waste from private clinics in Maha Sarakham city municipality. It collects data, using questionnaires, from samples who are made up of personnel or staffers responsible for handling infectious waste in 78 private clinics in Maha Sarakham city municipality. Its results and findings are presented below:

1. General data of private clinics in Maha Sarakham city municipality

The study of general data of private clinics in Maha Sarakham city municipality shows that 78 persons belong to the following categories. In terms of type of clinics, 28 clinics involved in this research (35.90%) are specialized clinics, 16 are general purpose clinics

(20.51%), 14 are dental clinics (17.95%), 10 are animal hospitals (12.82%), 3 are medical technology clinics (3.85%), 3 are physical therapy clinics (3.85%) and 4 are nursing and midwifery clinics (5.13%).

In terms of opening and closing hours, the majority of private clinics are opened from 07.00 am. to 08.30 am.; 22 clinics (28.21%) from 18.00-20.00 pm.; 20 clinics (25.64%) from 17.00 am.-20.00 pm.; 10 clinics (12.82%) from 9.00 am.-20.00 pm.; 8 clinics (10.26%) from 07.00-12.00 am.; 6 clinics (7.69%) from 10.00 am.-21.00 pm.; 5 clinics (6.41%) between 07.30-08.30 and 17.00-22.00 pm. And 7 clinics (8.97%) are opened for 24 hours.

In terms of personnel training in infectious waste management, personnel in 50 private clinics (64.10%) have received training in infectious waste management while personnel in 28 clinics (35.90%) have not received any such training.

In terms of the frequency of infectious waste collection per day; 46 clinics (58.97%) collect infectious waste one time a day, 24 clinics (30.77%) collected the waste every three days, and 8 clinics (10.26%) collected the waste every two days.

In terms of the amount of infectious waste produced per day, 46 clinics (58.97%) produced less than 0.5 kg per day, 12 clinics (15.38%) produce between 1.01-1.50 kg per day, 10 clinics (12.82%) produce between 1.51-2.00 kg per day and 10 clinics (12.82%) produce more than 2.5 kg per day.

In terms of disposal of infectious management, 68 clinics (87.18%) send off the waste to be disposed by outside disposal service providers and 10 clinics (12.82%) have in-house disposal.

In terms of the awareness of outside infectious waste disposal facilities, 52 clinics (66.67%) are aware that the infectious waste are sent off to be disposed at Maha Sarakham Hospital, Borabue Hospital, Sutthavej Hospital and Mana Sarakham University's Faculty of medicine as well as the private company named Sor Rung Ruerng Company; 26 clinics (33.33%) are not aware of such facilities.

In terms of the transport of infectious waste to outside disposal facilities, 52 clinics (66.67%) carry out the transport themselves and 26 clinics (33.33%) have the waste picked up by the facility personnel.

In terms of the actual cost of infectious waste disposal, 72 clinics (92.31%) pay less than 3,000 Baht per month, 6 clinics (7.69) pay between 3,000-5,000 Baht per month.

Table 1

Statistical results regarding infectious waste management on the waste collection front

Infectious waste management **Collection of infectious waste**	$\bar{X}$	**SD**	**Level of management**
Collection of infectious waste			
1. Preparation of appropriate containers for infectious waste	2.97	.181	High
2. Segregation of infectious waste from ordinary waste	2.88	.415	High
3. Preparation of boxes or cans for infectious waste with sharp edges	2.98	.129	High

Table 1

Statistical results regarding infectious waste management on the waste collection front (continue)

Infectious waste management **Collection of infectious waste**	$\overline{X}$	**SD**	**Level of management**
4. Preparation of additional space for aggregating infectious waste before sending off for disposal	2.78	.524	High
5. Use of red plastic bags for infectious waste	2.52	.770	High
6. Non sharp-edged infectious waste are loaded into containers (i.e. bags) for not over two-thirds of the space available and the containers are capped or tied up tightly with strings or similar materials	2.87	.389	High
7. Always capping or tying up the loaded containers' lid or opening tightly.	2.97	.181	High
8. Use of containers that are leakage-proof for liquid infectious waste	2.78	.585	High
9. Always putting vaccine bottles in cans or gallons with tightly-closed lids	2.65	.732	High
10. Sharp-edged infectious waste are loaded into containers (i.e. boxes) for not over three-fourths of the space available	2.83	.457	High
11. Containers for infectious waste (red plastic bags and boxes for infectious waste) are used only once and are destroyed along with the waste they contain	2.78	.585	High
Overall Average	**2.81**	**.218**	**High**

2. Findings on management of infectious waste from private clinics within Maha Sarakham City Municipality;

Following are major findings from Table 1. Infections waste from private clinics within Maha Sarakham City Municipality are managed at high level on the waste collection front ($\overline{X}$ = 2.81, SD = .218). When looking closely at each of the 11 items listed, all show high level of management. The results can be ranked as follow, item by item, in a descending order: Preparation of boxes or cans for sharp-edged infectious waste is the highest managed, the mean being 2.8 (SD = .129), preparation of appropriate containers for infectious waste with the mean of 2.97 (SD = .181), always capping or tying up the loaded containers' lid or opening tightly with the mean of 2.97 (SD = .181), segregation of infectious waste from general waste with the mean of 2.88 (SD = .415), non- sharp-edged infectious waste are loaded into containers (i.e. bags) for not over two-thirds of the space available and the containers are capped or tied up tightly with strings or similar materials with the mean of 2.89 (SD = .389), sharp-edged infectious waste are loaded into containers (i.e. boxes) for not over three-fourths of the space available of 2.83 (SD = .457), preparation of additional space for aggregating infectious waste before sending them off for disposal with the mean of 2.78 (SD = .585), use of leakage-proof containers

for liquid infectious waste with the mean of 2.78 (SD = .585), containers for infectious waste (red plastic bags and boxes for infectious waste) are used only once and are destroyed along with the waste they contain with the mean of 2.78 (SD = .585), always putting vaccine bottles in cans or gallons whose lids are tightly tied up with the mean of 2.65 (SD = .732) and use of red plastic bags for infectious waste with the mean of 2.52 (SD = .770)

Table 2

Statistical results of infectious waste management on the waste transport front

Infectious waste management **Transport of infectious waste**	$\overline{X}$	**SD**	**Level of management**
Transport of infectious waste			
1. Personnel responsible for transporting infectious wearing personal protective gears that include thick rubber gloves, apron, visor, and ankle-level-heighted rubber shoes while doing their job	2.33	.705	Medium
2. Personnel watching their hands with water and soap after they are done with transporting infectious waste	2.85	.481	High
3. Infectious waste are carried on a truck from clinic to a waiting facility	2.28	.865	Medium
4. Personnel carrying bags with infectious waste at a small distance from their body and there is no dragging or embracing the bags close to the body	2.90	.354	High
5. All infectious waste are weighed before they are sent off for disposal	1.83	.905	Medium
Overall Average	**2.43**	**.239**	**High**

Following are major findings from Table 2. Infections waste from private clinics within Maha Sarakham City Municipality are managed at high level on the waste transport front ($\overline{X}$ = 2.43, SD = .239). When looking closely at each of the 5 items listed, the results can be ranked as follow, item by item, in a descending order, from one with the highest to the lowest level of management: Personnel carrying bags with infectious waste at a small distance from their body and there is no dragging or embracing the bags close to the body is managed at the highest level, the mean being 2.90 ($\overline{X}$ = 2.90, SD = .354); personnel watching hands with water and soap after they are done with transporting the waste is managed at a high level, with the mean of 2.85 ($\overline{X}$ = 2.85, SD = .481), personnel responsible for transporting infectious waste wearing personal protective gears that include thick rubber gloves, apron, visor and ankle-level-heighted rubber shoes while doing their job is managed at a medium level, with the mean being 2.33 ($\overline{X}$ = 2.33, SD = .705), all infectious waste are carried on a truck from clinic to a waiting facility is managed at a medium level, with the mean being 2.28 ($\overline{X}$ = 2.28, SD = .865), and all infectious waste are weighed before they are sent off for disposal is manage at a medium level, with the mean being 1.83 ($\overline{X}$ = 1.83, SD = .905) respectively.

Table 3

Statistical results of infectious waste management on the waste disposal front

Infectious waste management Disposal of infectious waste	$\overline{X}$	SD	Level of management
Disposal of infectious waste			
1. In case of disposal by incineration, the incinerator has two chambers, one for burning infectious waste and the other for ridding of smoke, as per standard practice	1.90	.994	Medium
2. The chamber for infectious waste has the temperature not below 760 degree Celsius and the camber for ridding of smoke has the temperature not below 1,000 degree Celsius	1.90	.994	Medium
3. In case of disposal by other means, the procedure meets biological standard and requirement of eliminating all infections in the process	2.10	.994	Medium
4. Disposing facility is overseen and supervised by one personnel with a degree in science AND one personal with a degree in engineering	1.90	.994	Medium
5. Personnel operating infectious waste disposal are knowledgeable about infectious waste and methods for preventing and containing the spread of its dangerous contents and always wear personal protective gears.	2.20	1.033	Medium
Overall Average	**2.00**	**.017**	**Medium**

Following are major findings from Table 3. Infections waste from private clinics within Maha Sarakham City Municipality are managed at medium level on the waste disposal front ($\overline{X}$ = 2.00, SD = .017). When looking closely at each of the 5 items listed, there are slight differences in the level of management and the mean. The results can be ranked as follow, item by item, in a descending order, from one with the highest to the lowest level of management: Item 5th: personnel operating infectious waste disposal are knowledgeable about infectious waste and methods for preventing and containing the spread of its dangerous contents and always wear personal protective gears is managed at the medium level, with the mean of 2.20 ($\overline{X}$ = 2.20, SD = 1.033); in case of disposal by other means, the procedure meets the biological standards and requirements of eliminating all infections is managed at the medium level, with the mean of 2.10 ($\overline{X}$ = 2.10, SD = .994); disposal by incinerator uses incinerator that has two chambers, one for burning infectious waste and the other for ridding of smoke as per standard practice is managed at the medium level, with the mean of 1.90

Table 4

Data on infectious waste management from private clinics

Items	$\overline{X}$	SD	Level of management
Collection of infectious waste	2.81	.218	High
Transport of infectious waste	2.43	.239	High
Disposal of infectious waste	2.00	.017	Medium
Overall Average	**2.41**	**.122**	**High**

Following are major findings from Table 4. Private clinics in Maha Sarakham City Municipality, upon whom data are collected regarding infectious waste management have high level of infectious waste management overall ($\overline{X}$ = 2.41, SD = .122). When looking at each specific front, the findings show that collection of infectious waste is managed at a high level, with the mean being the highest ($\overline{X}$ = 2.81, SD = .281), seconded by transport of infectious waste which is managed at a high level as well, ($\overline{X}$ = 2.43, SD = .239) and lastly the disposal of infectious waste which is managed at medium level ($\overline{X}$ = 2.00, SD = .017) respectively.

3. Findings of the study and recommendations on the challenges facing private clinics in their management of infectious waste

The author of this research has come up with the following recommendations concerning what constitute challenges facing by private clinics in Maha Sarkham City Municipality and offsetting their management of infectious waste that need to be addressed. (1) Management of infectious waste from private clinics is offset by lack of standards and guidelines for the whole process, from collection of infectious waste, to the transport and eventually the disposal of these waste. (2) Some private clinics fail to use proper containers specifically for infectious waste and end up mixing infectious waste with ordinary waste. There is no effort at sorting out among types of garbage before collecting infectious waste to be sent off for disposal, thus creating the risk of infectious diseases getting spread, on top of increased amount of the waste and increased cost of disposal. (3) Placement of infectious waste into red plastic bags is not done with enough tidiness. Too much waste is loaded in one bag, causing it to break. Sharp-edge items are put in the bag, cutting it and causing the contents to leak out. Bags are not properly closed off, thus exposing the personnel who are involved in the transport to the risk of contracting diseases through the waste. (4) Infectious waste from private clinics are disposed together with ordinary waste by improper means and not according to acceptable standard of hygiene and sanitation. Personnel working closely with the waste are not equipped with protective gears at all stage of infectious waste management, from collection, to transport and disposal. (5) Some private clinics do not have budget for hiring private company to carry out infectious waste disposal for them. The transport of infectious waste is a challenge since these clinics have to deliver the waste to disposal facilities themselves and their personnel are in the process exposed to getting cut-wounds or getting infected with diseases via too close contact with such waste.

Conclusion

This research is conducted to find out how well private clinics are managing infectious waste they are

producing on a daily basis and to identify what constitute challenges and obstacles to management of infectious waste from these clinics. It employs questionnaires as tools for collecting data from samples who are personnel responsible for handling infectious waste, totally 78 persons, from 78 private clinics, on the basis of one for each clinic. Following are summary of results, discussion and recommendations of this research.

Analysis of data on management of infectious waste collected from 78 private clinics within Maha Sarakham city municipality yielded the following results;

1. General data of private clinics that participate in this research

28 private clinics are specialized clinics (35.90%). The average opening and closing hours are between 07.00-08.30 a.m. and between 18.00-20.00 p.m. respectively. 22 private clinics (28.21%) Of these clinics, 50 (64.10%) have had their personnel trained in infectious waste management. 46 clinics (58.97%) carry out waste collection once a day, with the amount of waste collected being less than 0.5 kilograms per each working day. 68 clinics (87.18%) send off their infectious waste for disposal. 52 clinics (66.67%) are aware of places where they can send infectious waste off for disposal. 52 clinics (66.67%) do transport the infectious waste to disposal facilities themselves and for 72 clinics (92.31%) infectious waste management cost less than 3,000 Baht per month.

2. Management of infectious waste from private clinics

Results show that private clinics in Maha Sarakham city municipality, upon whom data were collected regarding management of infectious waste have high level of infectious waste management overall ($\overline{X}$ = 2.41 , SD = .122). When looking at each specific front, the findings show that collection of infectious waste is managed at a high level, with the meaning being the highest ($\overline{X}$ = 2.81, SD = .281), seconded by transport of infectious waste which is managed at a high level as well, ($\overline{X}$ = 2.43, SD = .239) and lastly the disposal of infectious waste which is managed at the medium level ($\overline{X}$ = 2.00, SD = .017).

3. Recommendations on what constitute challenges and obstacles to infectious waste management

The author of this research comes up with the following recommendations based on the data collected. (1) Management of infectious waste from private clinics is offset by lack of standards and guidelines for operations, from the collection of infectious waste, to the transport and eventually the disposal of these waste. Personnel working closely with the waste are not equipped with protective gears for their operations. There is failure to use proper containers specifically for infectious waste and therefore the mixing of infectious waste with ordinary waste. Placement of infectious waste in red plastic bags is not done with enough carefulness and tidiness. (2) Some private clinics do not have budget for hiring private company to carry out infectious waste disposal for them. The transport of infectious waste is a challenge for these clinics have to deliver the waste to the disposal facilities themselves and their personnel are in the process exposed to getting cut wounds or getting infected with diseases because of too close contact with such waste.

Discussion

It is found that each and every private clinic in Maha Sarakham City Municipality passes muster the standards of infectious waste management and the Ministry of Public Health's regulation concerning management of infectious waste as of Year 2002 on two fronts, namely, the collection and the disposal of infectious waste. However, of 78 clinics that this research covers, only 52 passes muster the infectious waste management

standards on the waste disposal front. Generally their infectious waste are sent off to Maha Sarakham Hospital, Borabue Hospital, Sutthavej hospital, Maha Sarakham University's Faculty of Medicine, where they are further passed on to the private company called Sor RungRuerng Company to be disposed. The remaining 26 clinics have yet to meet the afore-mentioned standards and ministerial regulations for infectious waste management.

This research identifies the following as challenges and obstacles facing private clinics and offsetting their infectious waste management that need to be addressed.

Management of infectious waste from private clinics is offset by lack of standards and guidelines for the whole process, from collection of infectious waste, to the transport and eventually the disposal of these waste. some private clinics fail to use proper containers specifically for infectious waste and end up mixing infectious waste with ordinary waste. There is no effort at sorting out among types of garbage before collecting infectious waste to be sent off for disposal, thus creating the risk of infectious diseases getting spread, on top of increased amount of the waste and increased cost of disposal. Placement of infectious waste into red plastic bags is not done with enough tidiness. Too much waste is loaded in one bag, causing it to break. Sharp-edge items are put in the bag, cutting it and causing the contents to leak out. Bags are not properly closed off, thus exposing the personnel who are involved in the transport to the risk of contracting diseases through the waste.

Infectious waste from private clinics are disposed together with ordinary waste by improper means and not according to acceptable standard of hygiene and sanitation. Personnel working closely with the waste are not equipped with protective gears at all stage of infectious waste management, from collection, to transport and disposal. Finally, some private clinics do not have budget for hiring private company to carry out infectious waste disposal for them. The transport of infectious waste is a challenge since these clinics have to deliver the waste to disposal facilities themselves and their personnel are in the process exposed to getting cut-wounds or getting infected with diseases via too close contact with such waste. This is consistent with Poonpanit O-Iam (2013) which finds that there is a widespread lack of knowledge and correct understanding on how to safely manage infectious waste among personnel and staffers of Samutsakorn Hospital and too low exposure among these people to relevant information of management of infectious waste.

Even though. Most of the private clinic in Maha Sarakham city municipality pass the muster muster the infectious waste management standards on the waste disposal front but there are some of them still have problems in infectious waste management. Nevertheless, this few private clinics might be an origin of public health and environmental problems as a whole.

Suggestion from Research

1. Recommendations for improvement of infectious waste management efficiency (1) There should be a distinct agency that is directly tasked with the disposal of infectious waste. (2) Campaigns should be carried out to raise public awareness on how to safely manage infectious waste in line with the standards of hygiene and sanitation. (3) A universal set of guideline for infectious waste management should be applied at the provincial level. (4) Vehicles should be set aside specifically for transporting infectious waste.

2. Recommendations for further researches (1) it should research about the exact amount of infectious waste that are produced every month for use in a comparative study of the changing rate of infectious waste production at each period of the year in order to come up with appropriate ways for managing infectious waste. (2) A study should be conducted on management

of infectious waste from private clinics on a regular basis, whether that be every 3 years or every 5 years. This is because management of infectious waste from private clinics tends to change over time, in line with changes in the clinics' policies or changes in the wider contexts, i.e. political, administrative, economic, social and technological which keep changing over time. (3) a study should be conducted on the patterns of management of infectious waste from private clinics in order to obtain useful knowledge that can be applied to continually improve on the quality of infectious waste management overall.

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