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Factors Influencing Healthcare Waste Management Effectiveness: Challenges and Interventions

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Abstract
Healthcare waste (HCW) is considered hazardous as it might contain infectious agents that pose environmental and public health risks. It is vital to ensure all healthcare facilities have a good level of healthcare waste management (HCWM). A focus group discussion (FGD) was conducted involving 10 participants from medical and non-medical personnel of health clinics and concession companies in Perak. Two major themes emerged from the FGD. The first theme focuses on challenges in HCWM practices, highlighting several barriers that hinder effective HCWM. The second theme revolves around interventions that could improve HCWM practices, emphasizing educational and organizational strategies.

Keywords: healthcare waste; awareness; practices; Malaysia

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1.0 Introduction

The World Health Organization (WHO) defines HCW as waste generated by healthcare operations that includes a variety of items, including blood, diagnostic samples, soiled dressings, body parts, chemicals, pharmaceuticals, medical devices, and radioactive materials (WHO, 2018). Infections, radiation, hazardous chemicals or medications, sharp objects, and genotoxicity are all potential hazards of HCW. There are documented risks connected to HCW exposure that could cause disease or injury (Meleko & Adane, 2018). Around 25% of HCW are deemed hazardous, raising various health and environmental issues (WHO, 2014). Untreated HCW buried in or drained into the ground can contaminate underground water sources, affecting the environment and the health of those who handle the waste as well as the general public (Zamparas et al., 2019).

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In addition, a few years ago, the whole world and Malaysia in particular was attacked by the endless outbreak of the disease COVID-19. The increase in HCW occurred suddenly due to the increase in cases of COVID-19. HCWM systems have been overburdened by the pandemic's increased as well as the discarding of contaminated disposable masks and other personal protective equipment (PPE) (Mol & Caldas, 2020). The increase of HCW generated in Malaysia is 18.05% or 39.9 kilotonnes in 2020 when compared to the previous year, which was lower (Department of Statistic, 2021).

This is a concern until today because the country's preparedness in HCWM is still not strong enough. There are still many shortcomings that need to be improved in its management, especially during the pandemic. The waste management-related situation has raised concerns about insufficient knowledge and awareness of HCW, inadequate management of HCW facilities, and inefficient policies (Behnam et al., 2020). Indoubtedly, poor HCW and general waste segregation are major problems in HCWM globally. It is also frequent for HCW bags and containers—particularly those for sharps—to be used improperly. Hence, this study has been conducted as to explore the factors that influence the HCWM effectiveness, challenges, and conflicts within the HCWM systems of the selected health clinics in Perak.

2.0 Literature Review

HCW is defined by the World Health Organization (WHO) as waste created by hospitals, medical centers, healthcare establishments, and research institutes in the diagnosis, treatment, vaccination, and related research (WHO, 2014). HCW is classified into 10 categories by the WHO and the definitions for these waste categories may be found in a variety of research papers and related documents. Hospitals, medical clinics, dispensaries, healthcare camps, medical and biomedical labs, medical research centers, mortuary and autopsy centers, animal research and hospitals, blood banks, and other institutions are among the main sources of HCW. The whole waste stream from a healthcare facility, which includes non-hazardous or general waste as well as hazardous clinical waste, is referred to as HCWM. Principally, HCW has been regulated under the Environmental Quality (Scheduled Wastes) Regulations 2005.

Malaysia is said to have higher healthcare standards and services, as well as lower treatment costs, in compared to other nations, which results in the development of a large volume of healthcare waste (HCW) (Nilashi et al., 2019). Because there are many international patients who travel to Malaysia to be treated, a rise in HCW generation is projected (Ghasemi & Yusuff, 2016). Besides that, the recent COVID-19 crisis in December 2019 also had a major impact on all aspects of society, including HCWM. Malaysia had recorded a 27% rise in HCW generation as a result of the pandemic, with disposal gloves, sharps, needles, face masks, and personal protective equipment seeing the greatest increase (Agamuthu & Barasarathi, 2021). Indirectly, these issues increased the health and environmental risks, especially to the health staff with lack of awareness and knowledge. For example, millions of health staff worldwide are experiencing skin wounds resulted from contaminated sharp instruments, which lead to thousands of reported cases of the hepatitis C virus (HCV), hepatitis B virus (HBV), and human immunodeficiency virus (HIV) infection. These infections also lead to 1100 fatalities and substantial impairments (Lin et al., 2019). The diseases also can be caused by direct or indirect exposure to environmental contamination by pharmaceutical and laboratory waste, both in the human and animal populations (Prüss-Ustün et al., 2017).

3.0 Methodology

3.1 Study area and setting

The cross-sectional study was conducted in Larut, Matang, and Selama (LMS) district, Perak. The district with a total area, 2,112.61 km2 is governed by 2 different councils which are Taiping Municipal Council and Selama Municipal Council. The total population was 365,000 residents in the year 2019, which comprised into men (185,900) and women (179,100) (Department of Statistics, 2020). Currently, there are almost 50 government health facilities in the district, including 2 district hospitals (Hospital Taiping and Hospital Selama) and 14 health clinics, 28 village clinics, and 4 community clinics.

3.2 Sample size and sampling technique

The study population in LMS district is focused only on staff from medical and non-medical department that are working at the health clinics and related concession. For FGD, about 10 participants would be involved. The determination number of participants was based on (Johnson & Christensen, 2014), in which it is ideal to involve between 6-12 participants in a discussion. Each representative was picked randomly from different designations. The stratified random sampling technique would be applied when choosing the participants.

3.3 Eligibility criteria

At least one year of work experience for both health workers and concession supervisors to be chosen. The staff that are commonly involved in most HCWM have been prioritised. Participants in the research who are available throughout the data collecting time and willing to participate were included. Any internship students or clinical students who are undergoing practical at the health clinics or concession company were excluded.

3.4 Data collection procedure

The researcher himself became a moderator who leads the discussion and a documenter had been appointed among staffs to assist and take important field notes and ensure that FGD proceedings will be recorded to capture verbatims. The questions for the discussion were developed based on the data and input gathered from the main questionnaire to ensure all related topics and issues are fully covered. 14 open-ended questions were applied for the FGD that comprised 4 main topics about general knowledge of HCWM (topic 1), risk and impact of current practices (topic 2), role, experience, challenge, and perception (topic 3), and preparedness of HCWM during new emergence or reemergence of pandemic (topic 4). The moderator had been allowed to get a variety of answers from the participants by using these types of questions. The estimated time for conduction of an FGD session would be about 60 minutes.

During the FGD, the researcher was giving short brief to all participants with regards to the fire escape and emergency plan for safety purposes, then also verbally explained the rules of FGD mainly to avoid fights and discrimination on religious, racial, personal, and other related. Besides that, it was a mandatory for the researcher to obtain informed consent that is signed by the participants and their attendance through the google form. A safe, non-threatening, and conducive environment encouraged the participants to share their perceptions and experiences without hesitation, avoid tension, and lead to a smooth discussion.

3.5 Data management and analysis

The thematic analysis would be used in analyzing qualitative data of FGD. When attempting to analyze a set of experiences, thoughts, or behaviours across a data set, thematic analysis is a suitable and useful tool to be applied (Braun & Clarke, 2012). There are six step processes to conduct thematic analysis, including familiarization, coding, generating themes, reviewing themes, defining and naming themes, and producing report (Braun & Clarke, 2006):

i. Becomes familiar with the entire data set, which entails repeated and active reading through of the data.
ii. Coding helps to organize data at a granular, specific level.
iii. Involves examination of the coded and collated data extracts to look for potential themes of broader significance.
iv. Two-level analytical process. In the first level of analysis, the researcher looks at coded data placed within each theme to ensure proper fit. Level two applies a similar set of questions to the themes in relation to the entire data set.
v. Creates a definition and narrative description of each theme, including why it is important to the broader study question.
vi. Involves writing up the final analysis and description of findings.

3.6 Ethical considerations

The research obtained ethical approval from the Research Ethics Committee (REC) UiTM with reference number: REC/11/2022 (PG/MR/281).

4.0 Findings & Discussion

4.1 Theme A-Challenges in HCWM current and future practices

(A) Category i: awareness and perceptions of HCWM.

Basically, most of the staff could define the HCW and describe the types of its well. They also could distinguish each one. Majority of the FGD participants acknowledged that most clinic staff are aware of its meaning and their types. Similarly, the staff was aware about the HCW production and its categories (Joshi et al., 2015). The F7 categorized HCW into,

"…domestic or general waste (black plastic bag), clinical waste or HCW (yellow plastic bag), and sharps (sharp bin)."

The F6 said, "clinics staff are aware about this and they can distinguish it."

The F3 emphasized, "usually, the yellow bin for the HCW will be put at or near to every treatment section and the poster-guidelines regarding to HCW or non-HCW including health education would be provided as well."

Additionally, they admitted that this HCW is dangerous and may have several negative impacts. So, it needs to be managed and handled well in every healthcare institution. The F2 explained,

"HCW is a part of scheduled waste system. Hence, it hazardous, which is it requires proper management process. Otherwise, it will be harmful to environment and human being as well. For instance, human immunodeficiency virus (HIV) and hepatitis B."

"HCW is a hazard at the workplace, which can cause communicable disease." F9

There are some mechanisms for HCW-related hazard risk control that have been taken at the government clinics level.

"Hand hygiene practice is the main mechanism that has been emphasized to all staff." F6

"All support services staff in the clinics have been provided with full-equipped personal protective equipment (PPE)." F5

The F7 emphasized,

"Talking about hand hygiene, we have taught and shown, there are demonstrations and courses for all staff related to hand hygiene. But it is the individual's attitude that I think that individual's attitude is sometimes not aware of the dangers of all that. Although we have taught several times. Overall is satisfactory, from time to time we will do the course twice a year and we will also conduct an audit twice a year as well. We also have a special audit once a year. Actually, one of the main purposes is to maintain skills and so on." In contrast, the nurses in one of the Iran Hospitals did not had chance to attend educational program for infection control and waste disposal (Oroei et al., 2014).

Furthermore, most of the HCWM in the clinics are organized and monitored by the respective supervisors from the waste generated, collected in temporary stores until the waste is all sent to the designated hospitals as the collection points that supervised by the concessionaire and finally sent to the incinerator centre and disposal. Both F1 and F6 were agreed and stated that,

"The generated and collected HCW will be sent to the hospital."

The F5 said,

"…there is a concession company appointed by the government to assist in managing the HCW. The cleaning staff will make a collection from the clinic rooms periodically and would be kept in a designated store."

The F9 emphasized,

"…scheduled and monitored management."

"…clinic support services will be monitored in term of PPE usage with daily routine checklist and they also should be responsible in waste collection. Reprimand related to compliance will be made directly as to make sure the waste collection will be carried out at the stipulated time, including the storage stage." F5

"…each user or staff should know their roles and responsibilities. Since, they will be trained twice yearly in handling HCW." F2

Definitely, there is a committee that functioning as a pillar for HCWM in each clinic in this district. Most of the participants knew about the established HCWM committee in their clinics. The F7 said,

"Every clinic has the supervisors or link personnel, which they will monitor everything that related to HCW periodically. There is also a supervision of HCWM for nursing."

"The HCWM committees are under infection control committees". F6

"Engineering and infection control units are a part of committee that supervising the work process." F2

"…including users and person-in-charge of users. They can complaint through the system when they found a shortfall". F1

(A) Category ii: challenges in HCWM.

The use of resources such as people as a worker, equipment or machine, transportation, and other resources is known to the health sector and other public sectors. It does not matter during a pandemic or not a pandemic, it is very important. However, the use of resources would become extraordinary when there is a pandemic like COVID-19. Not only at the hospital level but also at the clinic level. For instance, the increment of personal protective equipment (PPE) usage. Majority of the participants agreed with the example. Mainly, when the PPE usage is related and contributed to the increment of HCW throughout Malaysia. Based on the F2s' experience,

"...I do not deny, there is indeed an increased in waste involving HCW. Usually, the weight of HCW is in the range of 25 to 30 kg/month in the hospital. However, it increased to 30 to 34 kg/month during the last pandemic."

"...during the pandemic, we were conducting sample collection. We were practicing a drive-thru system. When the case went back and forth from a hotspot area like Kuala Lumpur. The rate of PPE usage has indeed increased. When we are taking specimens, where it is usually like a glove for 1 patient for 1 specimen. Every sample per person that we take, we will change our PPE." F5

"In terms of resources, for example during the pandemic, most of us would wear gloves, aprons, masks, and PPE sets. It had been used a lot during the pandemic. When we were contacting with patient, we would wear overall completely." F8

"There was mixing of HCW with general waste at the beginning of the pandemic..." F3.

Furthermore, there are also issues related to human resources in these clinics. There are only 4 government clinics in this district that have support services or concessions to assist in managing HCW, whereas the other government clinics still need to manage by the staff themselves. Indirectly, these staff had to increase their workload apart from their actual duties. This matter shows the imbalance of staff in doing the assigned works and HCWM works. There is similar issue happened in term of human resources shortage in one of Iran Hospital (Oroei et al., 2014). The F6 stressed,

"We have to use our own staff, our existing resources to manage HCW at work. So, for clinics that did not have support services or concessions, this would be a little bit difficult because the staff have to multitask."

Some participants admitted to feeling burdened with HCWM duties. "Burdening. Even for clinics that have the help of concessionaires. HCW production to HCW delivery needs to be monitored. For example, sharp bins that are sent and given back also need to be supervised." F5

"Burdening. Especially, for the clinics that do not have cleaning services. Due to having to carry out actual duties and HCWM as well. The Ministry of Health (MOH) should privatize this service. The number of cases increased, the workload increased, the facilities still the same, but the staff did not add much. Factors that cause staff to be burdened. The workload compared to the number of staff is not appropriate." F6

In addition, the lack of designated vehicles for HCW. The use of these vehicles is very important for waste management, especially for transporting HCW to hospitals safely. The F2 said,

"Health clinics will deliver HCW to hospitals by using regular vehicles. In the van, there must be secondary containment, if there is a leaking sharp bin and so on. Advice is given. May be danger to operators who handle HCW. The use of storage box is good. But not able to accommodate a lot of waste."

"Indeed, if we follow the guidelines, we have to prepare a designated vehicle to handle HCW. But the same vehicle is used for patients' transportation and HCW, especially in distant health clinics. So, that is one of the constraints at the health clinic." F6

"The transporting management of HCW will be sent by health staff. That transporting does not follow the guidelines. There are constraints in sending regularly, hence, it has to be sent in bulk." F5

4.2 Theme B-Interventions to improve HCWM current and future practices

(B) Category i: Educational interventions.

Most participants believed that raising staff awareness of appropriate HCWM is a necessary first step of mechanisms before implementing any other interventions. A number of strategies that were thought to be suitable, successful, and workable such as training programs, application of the media, and others. For example, there is still a segregation issue where general waste is found that is thrown away and mixed in HCW bins, especially during a pandemic. This shows that there are staff who still lack knowledge and awareness of HCWM in the certain clinics. A syringe and needle after injection to an infectious patient should be disposed in the infectious waste bin. However, instead it will be thrown in general waste bin and it will make infectious the whole non-infectious waste (Joshi et al., 2015). The segregation ought to be the norm rather than the exception. The segregation process at the point of waste generation should be the key to the effective HCWM (Janik-Karpinska et al., 2023). Thus, appropriate education and training systems should be available to all staff responsible and engaged in both segregation and waste collection processes (Anozie et al., 2017).

"...training in stages every year where we hold an infection control course and we will also involve the HCWM method, we will do it twice a year involving all categories of members." F4

"In fact, every year, every clinic staff needs to attend 100% courses and training. However, because we cannot afford to invite everyone, so, at the clinic level there is also a continuing medical education (CME) session for all staff who cannot attend the course." F7

"Health education or training must be continued periodically and monitored through audits or supervisory visits..." F6

"Education is important, hence, that the public and staff are aware. Social media channels can be applied continuously. Later, if the pandemic will suddenly emerge, everyone is ready and knows what should be done, so things have to continue." F2. A low level of knowledge is mostly owing to insufficient training facilities, as well as the health staff's comparably low level of education (S. Joshi et al., 2020). So, providing training for effective HCWM is a very important step (Deress et al., 2018). A good knowledge of waste management will enhance good practices for its management in society (Laor et al., 2018).Training in HCWM can help to improve the handling of hazardous HCW and reduce the negative consequences of hazardous HCW on patients, healthcare workers, and the environment. The adverse consequences of HCW can be reduced by increasing the degree of knowledge and training in HCWM. All healthcare workers, including sanitary staff, must be trained in order to handle HCW effectively and appropriately (Mugivhisa et al., 2020). Lectures, workshops, brochures, and face-to-face training are among training methods offered (Bazrafshan & Kord Mostafapoor, 2011).

(B) Category ii: organisational and policy-related interventions.

In line with the Government's desire to achieve a better level of health and greener future, main focus should be given to improvement healthcare delivery through stronger integration, improved quality service, optimize resource use, and sustainable environment and waste management. The goal can be achieved by improving the weaknesses and deficiencies in the existing system first. Most of the participants believed that greater resources can create better and proper management, including for pandemic preparedness management. These matters are crucial and need to be emphasized for organizations and related policies.

For example, some clinics, they feel burdened due to their responsibility to manage from the stage of generation to the stage of storage and delivery then to designated hospitals. Among the factors that become constraints such as insufficient staff to monitor HCWM and actual duties. Another researcher also emphasized that insufficient human resources is one of the most common issues associated with poor HCWM practice (Gizalew et al., 2021). The clinics are in dire need of an external team or company created specifically for HCWM. It was recommended by Joshi et al. (2015) to create a distinct healthcare-associated infection control department and add more positions to help with the planning and management of such actions. Indirectly, these improvements may reduce their burden.

Furthermore, the problem of transporting HCW that did not follow the proper specifications of guidelines, which only using normal department vehicles that are also used for patient transport. HCW must be transported from a central storage location to an approved facility using suitable and dedicated vehicles (offsite transport). These vehicles must only be used for the transportation of HCW. Following any spills or accidental discharge, they should be carefully cleaned and disinfected. The cleaning should be done on a properly surfaced area, with drainage to the filthy sewer (DOE, 2009).

"...the shortcoming can be overcome if there is a budget. Otherwise, cannot make it proper." F2

"1) financial factors, 2) addition of staff, and 3) existing facilities are not able to accommodate the pandemic, if there is another one. For example, for staff and patient management." F5

This matter also supported by F6

"1) managing member, 2) the vehicle issue should be given attention, and 3) infection control course provision-no course provision. There should be special provisions."

"Sufficient budget to carry out the management." F9

"There is indeed a difference between a hospital and a clinic, the difference is indeed big, if in a hospital the way of HCWM and all the management related to cleanliness is more proper. The clinic side is still new and needs a lot of improvement and also needs financial resources if we want to do like the hospital side..." F4

"Hospitals are better managed under engineering. If there is collaboration between hospitals and clinics, better." F2

Some participants also supported the need of a special or designated team for HCWM. "In my opinion, create an entity that manages the collection, placing, carrying, supply of goods managed by a special team so that HCW can be managed more efficiently and orderly." F5

"HCWM needs to be personalized. There needs to be a team to handle it, a competent team or person and fully trained to manage HCW in all facilities. For the current situation there is no personalized team, theory is given by trained person." F9

"HCWM is important but has to be outsourced, so, as not to be burdened. Maybe it will be better in the future." F3

5.0 Conclusion & Recommendations

5.1 Conclusion

In summary, there are many constraints that exist in the HCWM systems such as lack of staff, insufficient related equipment, transportation, and others that hindering the effectiveness of the management itself. Added to this is the issue of efficiency, awareness, and staff practices in managing waste as well. These matters are the challenges for the country in achieving a sustainable system and need to be resolved well and thoroughly.

5.2 Recommendations

To enhance the awareness and practices of HCWM at the health clinics in LMS, Perak, it is recommended to:

- Offer continuous and comprehensive training to both healthcare and non-healthcare personnel from various departments.
- Other essential requirements must be met to manage the waste effectively during the future pandemics particularly. These include the implementation of a comprehensive waste management strategy, the provision of appropriate equipment, the committed workers, and the establishment of rigorous monitoring and supervision protocols.
- Revision of policy and financial budget allocated for waste management in order to improve the system.

5.3 Limitation

- The researchers were unable to assess HCWM during the real pandemic event such as COVID-19, which could obtain a more details, more accurate, and more specific answers in this study for the data.

5.4 Future research

- The researchers suggest that the future studies to conduct site visits and in-depth interviews, especially when a pandemic occurs.

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Paper Contribution to Related Field of Study

This study explores the influential factors of HCWM effectiveness, challenges, and conflicts. The outcomes of this study may be useful to stakeholders and related responsible parties for their upcoming plans in improvising the HCWM systems and strengthening the laws and regulations. It also can assist the policymakers to review and revise the current policies and guidelines of HCWM to be more sustainable and well-prepared, primarily when facing the future pandemic.

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