

KNOWLEDGE AND PRACTICE OF UNUSED  
MEDICATION DISPOSAL AMONG PATIENTS IN  
HOSPITAL UNIVERSITI SAINS MALAYSIA  
(HOSPITAL USM)

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by  
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## **LIST OF ABBREVIATIONS**

<b>HREC</b>	- Human Research Ethical Committee
<b>SPSS</b>	- Statistical Package Social Sciences
<b>OTC</b>	- Over-the-Counter
<b>USM</b>	- Universiti Sains Malaysia
<b>HBM</b>	- Health Believe Model



## **Pengetahuan dan Amalan Pembuangan Ubat yang Tidak Digunakan di Kalangan**

### **Pesakit di Hospital Universiti Sains Malaysia (Hospital USM)**

#### **ABSTRAK**

Cara pelupusan ubat yang tidak digunakan dengan betul adalah sangat penting kerana cara pelupusan yang tidak betul akan memberi kesan negatif kepada alam sekitar dan akan menyumbang kepada pembaziran perubatan yang lebih banyak. Kempen berkaitan isu ini adalah sangat penting untuk mendidik dan menggalakkan pengguna tentang cara membuang ubat yang tidak digunakan dengan betul, justeru kajian keratan rentas telah dijalankan untuk menentukan tahap pengetahuan dan amalan sebenar pelupusan ubat yang tidak digunakan di kalangan pesakit di Hospital Universiti Sains Malaysia. (Hospital USM). Data dikumpulkan menggunakan soal selidik yang digunakan daripada kajian lepas. Seramai 146 pesakit dari Hospital Universiti Sains Malaysia yang memenuhi kriteria terlibat untuk menyertai kajian ini. Kaedah persampelan rawak mudah digunakan untuk memilih peserta. Data yang dikumpul dianalisis secara statistik menggunakan perisian “Statistical Package Social Sciences” (SPSS) versi 27. Kajian ini menunjukkan 70.5% responden mempunyai tahap pengetahuan yang rendah tentang pelupusan ubat yang tidak digunakan. Keputusan juga menunjukkan terdapat hubungan yang signifikan antara pengetahuan dan amalan sebenar pembuangan ubat yang tidak digunakan ( $p < 0.05$ ). Keputusan juga menunjukkan 4 faktor yang mempengaruhi amalan sebenar melupuskan ubat yang tidak digunakan mempunyai hubungan yang signifikan ( $p < 0.05$ ). Kesimpulannya, pesakit di Hospital Universiti Sains Malaysia (Hospital USM) mempunyai pengetahuan yang tidak mencukupi tentang pembuangan betul ubat yang tidak digunakan dan pihak berkuasa harus mengambil tindakan untuk mempromosi dan mendidik pesakit berhubung isu ini untuk mendapatkan hasil yang lebih baik.

## **Knowledge and Practice of Unused Medication Disposal Among patients in Hospital**

### **Universiti Sains Malaysia (Hospital USM)**

#### **ABSTRACT**

Proper way of disposing unused medication is really important as improper way of disposing it will give negative impact to the environment and will contribute to more medical wastage. A campaign regarding this issue is really important to educate and encourage users on how to properly dispose those unused medication, hence a cross-sectional study was carried out to determine the level of knowledge and practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM). Data was collected using an adopted questionnaire from previous study. A total of 146 patients from Hospital Universiti Sains Malaysia who fulfilled the inclusion and exclusion criteria were involved to participate in this study. A convenient sampling method was used to choose the participants. Data collected were statistically analysed using Statistical Package Social Sciences (SPSS) software version of 27. This study shows that 70.5% of the respondents have low level of knowledge of unused medication disposal. Finding also shows there's a significant relationship between the knowledge and the actual practice of unused medication disposal ( $p > 0.05$ ). Result also shows some of the 4 factors influenced actual practice of unused medication has a significant relationship ( $p < 0.05$ ). In conclusion, patients in Hospital Universiti Sains Malaysia (Hospital USM) have insufficient knowledge of unused medication disposal and the authorities should take an action to promote and educate patients regarding this issue to get a better outcome.

# CHAPTER 1: INTRODUCTION

## 1.1 Background of the study

Medications represent as the major and a complex segment of medical waste. According to World Health Organization, medical waste is characterized as ‘waste generated in the diagnosis, treatment or immunization of humans or animals’. Medication are now a common occurrence that happen in our daily live. The prevalence of both acute and chronic medical conditions has increased medicine usage has increased. The improper disposal of unused medication is currently being a worldwide challenge including Malaysia that has caught attention on health policymakers, pharmaceutical organizations, healthcare professionals and the wider community. Medication wastage has been broadly studied in recent years and it showed that the annual overall medication utilization has surpasses 1,000,000 tons and is consistently expanding equally for both prescription and over-the-counter (OTC) medications.

However, patients may not use or consume all of the medications prescribed to them for due to some reasons which lead to medical wastage(Kahsay et al., 2020; Yang et al., 2018). Hence, the pharmaceutical products will remain unused, not consumed or become expired. Medication wastage can be avoided if the authorities can ensure that the medications are properly utilized and prescribed just when required and are used as recommended. More unused medication receiving stations need to be built up in Malaysia, medications return policies needs to be properly planned and the unrestricted disposal practice of unused medication by people should be avoided. Inappropriate disposal of medication poses a substantial risk to the ecosystem and repeated exposure to the environment can have dangerous effects. Even though this is becoming a worldwide concern but there are many

people who are not aware of the proper way to dispose unused medication(Ayele & Mamu, 2018; Murugiah et al., 2019).

Medication should only be bought when you need them and we shouldn't keep the medication just for in case. Unused medications need to be disposed properly or else it will cause harm to the environment. A literature search (2005-2015) was performed to identify reports with quantitative data on disposal practices and it's reported that in Kuwait, United Kingdom, Lithuania, Qatar, Serbia, Ghana, Bangladesh, Malta and Saudi Arabia, the most common method for disposal unused medications in households is by disposing it into a normal waste garbage. While in New Zealand and Bangladesh the practice of flushing drugs into sewage system still take place. Sweden and Germany are the only country that practice returning unused medication to the pharmacy into the greater extent(Paut Kusturica et al., 2017). Inappropriate dispose of unused medication will raise environmental concern as they will ending up being dumped in soil and later they will reach the water supplies and the decomposition will give impact to the natural life. For example, the continuing exposure to specific oestrogen in contraceptive pills has directed the feminization of male rats and antibiotics present in the environment can cause antibiotic resistance.

Inappropriate medication can cause economic burden to the country and can lead to the healthcare resource depletion. Unused medications are claimed to be wasted around billions of dollars annually. Moreover, keeping medications at home encourage self-medication which can give negative effects for abuse or misuse of medication if it's mistakenly consumed. Medical wastage could be avoided by ensuring that medications are properly prescribed, used as recommended and properly utilized(Hassali & Shakeel, 2020). Many developed countries have programs aimed at disposal of unused medicines. There has been

the National Return and Disposal of Unwanted Medicines Project which is fully supported by the government and pharmaceutical industry. In 2010, Malaysia has introduced the Medicine Return Programme (MRP) and a national guideline on handling returned medicines for safely dispose of unused medicines has been develop in the government healthcare facilities(Debra Sim Si Mui et al., 2017).

## **1.2 Problem Statement**

As stated above, improper disposal of unused, unwanted and expired medication gives bad effects to the economy, health and environment. According to this one research done in 2021 around Kuala Lumpur and Selangor, 84% of the respondents reported to have unused medicines and only 27% of them returned the unused medicines under the “Medicine Return Programme (MRP)” and most of the unused medicines will be discard in household waste which will end up in the landfill and contaminate the water surface. In Malaysia, even though MRP has been established since 2010 but some of studies reported that only less than a quarter of the population returned unused medicines to the facilities. According to this one study in Selangor, it showed that more than 80% of the study population are aware of the medication wastage issue in Malaysia and its bad impact to the economy and environment(Hassali & Shakeel, 2020).

Thus, the prevalence of proper disposal of unused, unwanted and expired medications in Malaysia is still low in Malaysia. Lack of adequate information and clear instructions regarding a proper disposal of unused medication was reported in many surveyed. According to this one research in Adigrat City, almost half of the respondents have good knowledge concerning the disposal of unused medication but around 75.2% of them disposed those unused medications to the normal garbage bins which indicate that they were unaware of a proper disposal practice(Kahsay et al., 2020b). Several studies showed that we were not well

expose of the appropriate way to dispose unused medication thus they just keep the medications at home because they are unsure what do to with it. Studies also showed that Ministry of Health, pharmaceutical organizations and pharmacist are those who are responsible person or organization that need to work hard in creating awareness toward this issue(Hassali & Shakeel, 2020). It is also significant for the government to invent a guideline regarding the disposal of medication to the public. Those drug experts should be aware of their community's medication disposal activities and be capable to help the consumers in giving them health education about the appropriate practice of unused medication disposal(Azad et al., 2012; Kumar S et al., 2019).

Hence, this study is really important to measure the level of knowledge of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM). This can help every healthcare workers especially those drug experts in pharmaceutical department in Hospital Universiti Sains Malaysia to start creating awareness regarding this issue to the patients so that we can help in decreasing the medical wastage and also help to get a better outcome to the economy, ecosystem, health and environment.

### **1.3 Research Question**

1. What is the level of knowledge of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).
2. What is the practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).
3. Is there any relationship between knowledge and the actual practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).
4. What are the other factors that influence the actual of practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

### **1.4 Research Objective**

Objectives are divided into two which are general objectives and specific objectives.

#### **1.4.1 General Objective:**

To determine level of knowledge and practice of unused medication disposal and factors associated with practice among patients in Hospital Universiti Sains Malaysia (Hospital USM).

#### **1.4.2 Specific Objective:**

- i. To determine the level of knowledge of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).
- ii. To determine the practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

iii. To determine the relationship between the knowledge and the actual practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

iv. To identify other factors about exposure, health advice, family members as healthcare workers and distance which influence the actual practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

## **1.5 Research Hypothesis**

### **Hypothesis 1:**

$H_0$ : There is no significant relationship between the level of knowledge and the practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

$H_A$  : There is a significant relationship between the knowledge and the practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

### **Hypothesis 2:**

$H_0$ : There is no significant relationship between the related factors and the actual practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

$H_A$ : There is a significant relationship between the related factors and the actual practice of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).



## 1.6 Conceptual and Operational Definitions

Terms	Conceptual	Operational
Unused medication	Medication that was out-of-date or expired, contaminated and deemed harmful to use or is no longer needed by the patients(Debra Sim Si Mui et al., 2017).	In this study, it refers to the unused medication that patient have.
Knowledge	Understanding or awareness of information that you get by experience or study and it is either in a person's mind or it's possessed by people generally( <i>KNOWLEDGE  Meaning, Definition in Cambridge English Dictionary, 2022</i> ).	In this study, it refers to the patient that receive treatment and medication in Hospital Universiti Sains Malaysia (Hospital USM) knowledge about the disposal of unused medication. In this study there is 10 question about knowledge.
Disposal	An action of getting rid of something( <i>DISPOSAL  English Meaning- Cambridge Dictionary, 2022</i> ).	In this study, it's an action of getting rid of unused medication.
Practice	Is an action rather than thoughts or ideas( <i>PRACTICE  English Meaning - Cambridge Dictionary, 2022</i> ).	In this study, it's an action of getting rid of unused medication. In this study, there is 17 question about practice.

<p>Patient</p>	<p>Is a person who is receiving medical care or treatment at any healthcare facilities(<i>PATIENT</i>   <i>English Meaning</i> - <i>Cambridge Dictionary</i>, 2022).</p>	<p>In this study, patient from Hospital Universiti Sains Malaysia (Hospital USM) will be the target population.</p>
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## 1.7 Significance of The Study

Proper disposal of medication and waste management is a crucial subject as inappropriate disposal could give impact to the surrounding, economy and ecosystem. Appropriate collection and disposal of unused medication by some well-planned programs have ensure community safety and protect the natural environment. In that case, many studied has been done to find strategic solutions for this matter(Hassali & Shakeel, 2020). In Malaysia, most of the research reported that study population are aware of the medication wastage issue, its negative effects to the environment, economy, environment and the harmful consequences. But most of them are not practicing the proper way to dispose unused medication because of the lack of information regarding the proper practice(Hassali & Shakeel, 2020). Studied showed that Germany and Sweden have a better success population where 50% of unused medication being returned to the facilities(Hassali & Shakeel, 2020). The success of these countries is because they have increased the public awareness regarding the impact of improper disposal of unused medication.

According to the statistic in Hospital USM from 2014-2021, the number of patients keep on increasing which indicate that more pharmaceutical has been use and it keeps on increasing which led to more medical wastage and usage. In 2021 the number of patients daily increased from 201,235 to 206,467(*Statistik Hospital*, 2021). Since is no study has been done regarding this topic in Hospital USM, I believe that this study can be very helpful to spread more awareness regarding the proper disposal of unused medication not only to the patient but also to all healthcare workers in HUSM. This study will also open more eyes to start practicing the proper disposal of unused medication. Last but not least, this study will trigger the hospital management or authority to start spreading awareness by doing a proper

campaign to promote a proper dispose of unused medication not only among the community in HUSM but also among the society in Kelantan. This can even be a benchmark to the government to start doing something to make sure information regarding the proper dispose of unused medication is well practice in Malaysia and start developing a proper dispose planned for the public.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter will be presented about the knowledge and practice of unused medication disposal. Knowledge and practice on previous study will also be presented. At the end of this chapter, the chosen theoretical and conceptual framework of the study will also be presented.

### **2.2 Unused medication**

Unused medication is defined as the medication that has passed its expiry date, contaminated and that is not safe to use or no longer needed or consume by the patients(Makki et al., 2021).There is many reasons why patients have unused medication. Changes in treatment will lead to disuse of prescribed medications because they will follow the new prescription to the more effective one or to the one with fewer side effects. Many studies reported that treatment changing is the second highest cause of unused medication. Patient death, resolution of patient's condition and oversupplied of medications from multiple centres are also the reason why patient has unused medication(Makki et al., 2021).Patient's adherence also cause patient to have unused medications because they don't take or forgot to take their medication according to the prescription(Makki et al., 2021).

People with acute illness had unused medication because their health condition get improved so they did not need all the amount prescribed. The World Health Organization also revealed that as patients do not use their medicines regularly. Proper disposal of unused medication is really important because improper way will lead to environmental contamination and aquatic to have medication component in it. This is very dangerous for accidental poisoning and abuse, wasted resources, and can kill aquatic or wildlife and antibiotic resistance(Raja et al., 2018; Wang et al., 2021).

According to this study in Gondar Town, it showed that more than half (55.9%) of the respondents had unused medicine at home(Woldeyohanins et al., 2021). One study in Malaysia, 84% of the participants reported having unused medication and the main reason for having unused medicines among those who used medication in this study for chronic illness was non-adherence which is 69%(Wang et al., 2021). Thus, the prevalence of having unused medication in Malaysia is high.

In Malaysia, Ministry of Health Malaysia (MOH) has introduced the Return Your Medicines Program in 2010. Patients can return their unused medication for safe disposal by MOH through this program. In this program, criteria for acceptable medications are expired or with an unclear expiry date, spoilt or contaminated, content cannot be identified, in tablet or capsule form, liquid such as syrup or semi-solid form such as cream. Non acceptable criteria are herbal product, vitamin and mineral, needle, syringe or sharp container, aerosol can or metered dose inhaler and plastic bag, empty box and other packaging material which is not contaminated with medicine(*The Proper Practice of Medicine Disposal - CARiNG Pharmacy*, 2022). Make sure to always check medication stock at home for every 6 months so that can identify which medication should be dispose or keep(*Where and How to Dispose of Unused Medicines | FDA*, 2021).

### **2.3 Knowledge of unused medication disposal**

Disposing unused medication in the right and safe method is really important. The first reason is to avoid the exposure of medication to the environment and water supply. If people dispose the medication by flushing it down to the toilet, the leftover will be part of the community's water supply that is use for drinking, cleaning, bathing and cooking every day. This cause harmful to humans, animal and aquatic lives(*The Dangers of Improper Drug Disposal - Waste Today*, 2018). Some ingredients may give harm to our body such as antibiotics can lead to antibiotic resistance, hormone replacement or pills can lead to the

feminization in male rats. Disposing medication into the garbage, it will end up in the landfill and will eventually contaminate the water.

Next is to prevent the medication from being at the wrong hands. For example, if the unused medication is not disposed correctly and let it be anywhere such as in the garbage bin, some random people may take the medication and sells or use those medication without prescription. Taking medication may give bad effects or addictive effects to that person who take the medication wrongly. Can lead to misuse of medication by unintended users and can cause accidental childhood poisoning(*The Dangers of Improper Drug Disposal - Waste Today*, 2018).

Last is to reduce the risk of taking the wrong medication. Usually, patient will be prescribed with more than one type of medications. For example, if an elderly who has poor vision and unable to read well, he will have trouble in differentiating which medication they should take. Taking the wrong medication can cause in worsening condition and causing more medical problems(*The Proper Practice of Medicine Disposal - CARiNG Pharmacy*, 2022).

The best way to dispose unused medications is by returning them to a drug take-back location because all types of medications such as in form of capsules, syrups, creams or ointments, injection, eye or nasal drop, suppository, patch, prefilled injection with or without needle or ampoule, non-metered dose inhaler or nasal spray and implant should be dispose using incineration method. The only medication that can be dispose in normal waste into the garbage is metered dose inhaler or nasal spray because it can't be incinerated(Debra Sim Si Mui et al., n.d.).

#### **2.4 Practice of unused medication disposal**

The best way to dispose most types of unused medications is y dropping off the medications back to the pharmacy or location where drug is supplied immediately. If the location is far or there's no available location near, according to FDA flush list would be the

next best option to immediately discard the unused medication. If it's not in the FDA flush list, those medications need to be discarded immediately by following the FDA instruction for disposing medicines in the household trash(FDA, 2020). In Malaysia, the most common method for unused medication disposal is by throwing them in the garbage which may not be appropriate all the time. According to this study in Lusaka City by Martin in 2020, it showed that 97% of the participants threw away the expired drugs while 95% kept them unused at home. Only 2% and 1% of the participants returned expired and unused medication to the pharmacies respectively(Martin et al., 2020). In a survey conducted in United States, more than half of the participants reported that they kept their unused medications at home and more than half of them had flushed the medications down to the toilet(Seehusen & Edwards, 2006).

In Qatar, an exploratory study conducted showed that majority of the participants disposed unused medications in the garbage(Kheir et al., 2011). Some studies in Malaysia reported that less than a quarter of the population returned their unused medications to the facilities(Hassali & Shakeel, 2020). It showed that safe and proper disposal of unused medication is poorly practice in the society.

Thus, according to various studies that is done showed that most of the respondents dispose their unused medications with improper way.

## **2.5 Factors influence practice of unused medication disposal**

There are many factors influence practice of unused medication disposal. Lack of information of medication disposal will lead consumers to dispose the medication in any way they want without knowing that medications should be dispose in a proper way and the bad impact of improper way of disposal(Angi'enda & Bukachi, 2016). Healthcare workers especially pharmacist should pay attention to this problem as they are the one who always encounter the patient so that they can provide health education and counselling regarding this.



Lack of campaign and awareness from the authorities to the society is one of the big reasons why the component is not fully delivered to the society(Shoaib et al., 2022).

One research in Malaysia has stated that lack of knowledge is a major factor of the improper disposal of unused medication. There is a study in Malaysia where one of the participants which is a workers female, Indian, 55 years old, asthma patient stated that usually there will be no information given to us about disposing unused medication by health care. Another participant which is a female Malay, 50 years old, hypertension patient agreed that doctor has to tell the patients on how to dispose the unused medication properly because the patient doesn't know. It stated that only 1% of the participants said that they received health education regarding the proper way to dispose unused medication from their physician. An urgent need to increase public awareness through educational campaigns and Medication Return Programme should be promoted more effectively by the authorities(Al- Naggar et al., 2010).

People with a higher educational level will most likely to understand why it's really important to properly dispose unused medications and they also tend to read more about their disease thus this will lead them to read on how to store and deal with unused medications too(Wang et al., 2021).

## **2.6 Theoretical and Conceptual Framework of The Study**

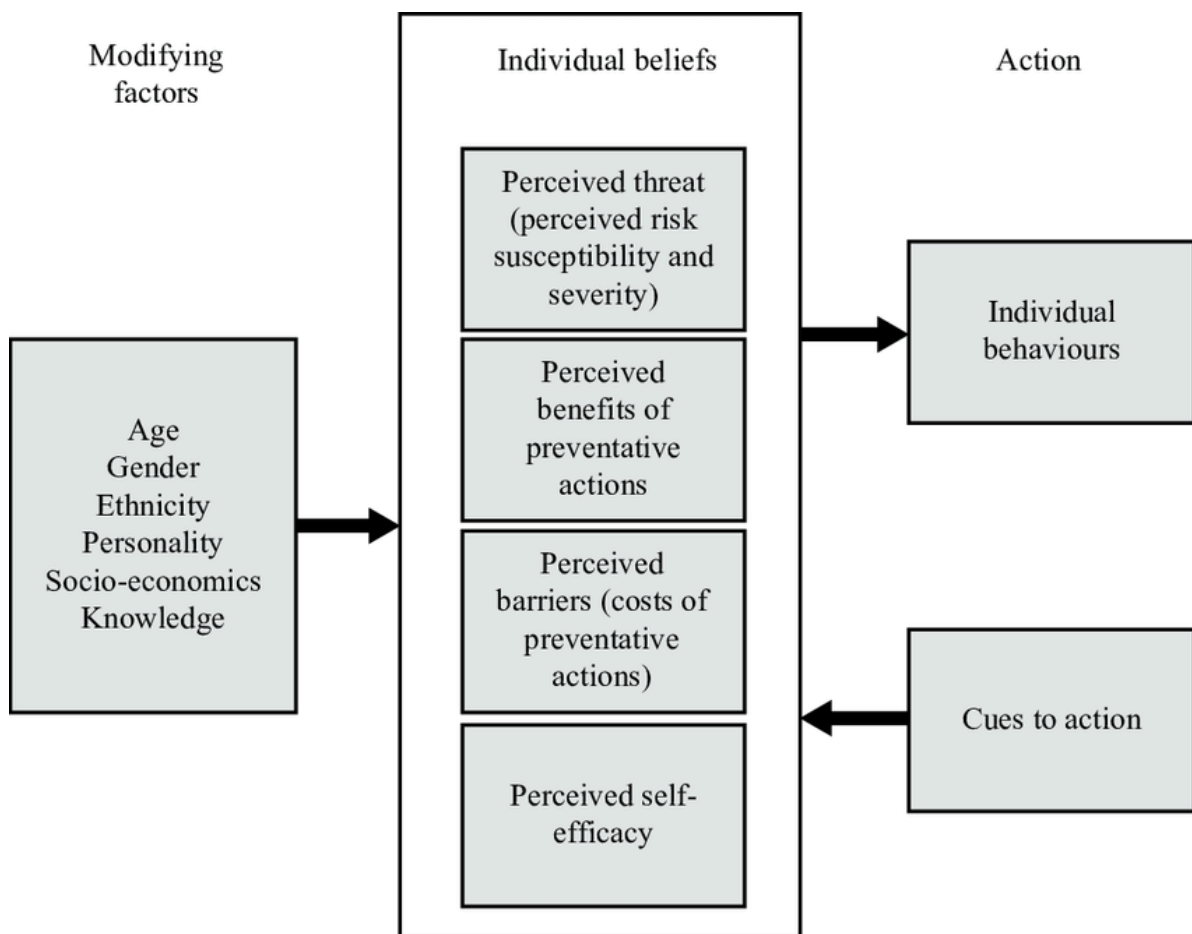
In this study, health belief model (HBM) will be used as conceptual framework in guiding the study (Figure 2.1). In the early 1950s at the U.S Public Health Service HBM was developed by social scientists in order to understand the failure of people to adopt disease prevention strategies or screening test for early detection of the disease. Then, HBM were used for patient's responses to symptoms and compliance with medical treatment. HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in effectiveness of the recommended health behaviour or action will predict

the likelihood the person will adopt the behaviour. HBM is derived from psychological and behavioral theory with the foundation that two components of health-related behaviour which are the desire to avoid illness or conversely get well of already ill and the belief that a specific health action will prevent or cure illness. Someone's course of action is often depending on the person's perceptions of the benefits and barriers related to health behaviour(*The Health Belief Model, 2022*).

There are six components in HBM. The first four components were developed as the original tenets of HBM and the last two components were added as research about HBM evolved. Those components are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action and self-efficacy. Perceived susceptibility is referring to individual's subjective perception of the risk of acquiring an illness or disease which a wide variation in someone's feelings of personal vulnerability to an illness or disease. Perceived severity refer to someone's feelings on the seriousness of contracting an illness or disease which a wide variation in someone's feelings of severity and often a person considers the medical consequences (eg: death, disability) and social consequences (eg: family life, social relationship) when evaluating the severity. Perceived benefits is someone's perception of the effectiveness of various actions available to reduce the threat of illness or disease. The course of action that someone do in preventing illness or disease relies on consideration and evaluation of both perceived susceptibility and perceived benefit such that person would accept the recommended health action if it was perceived beneficial.

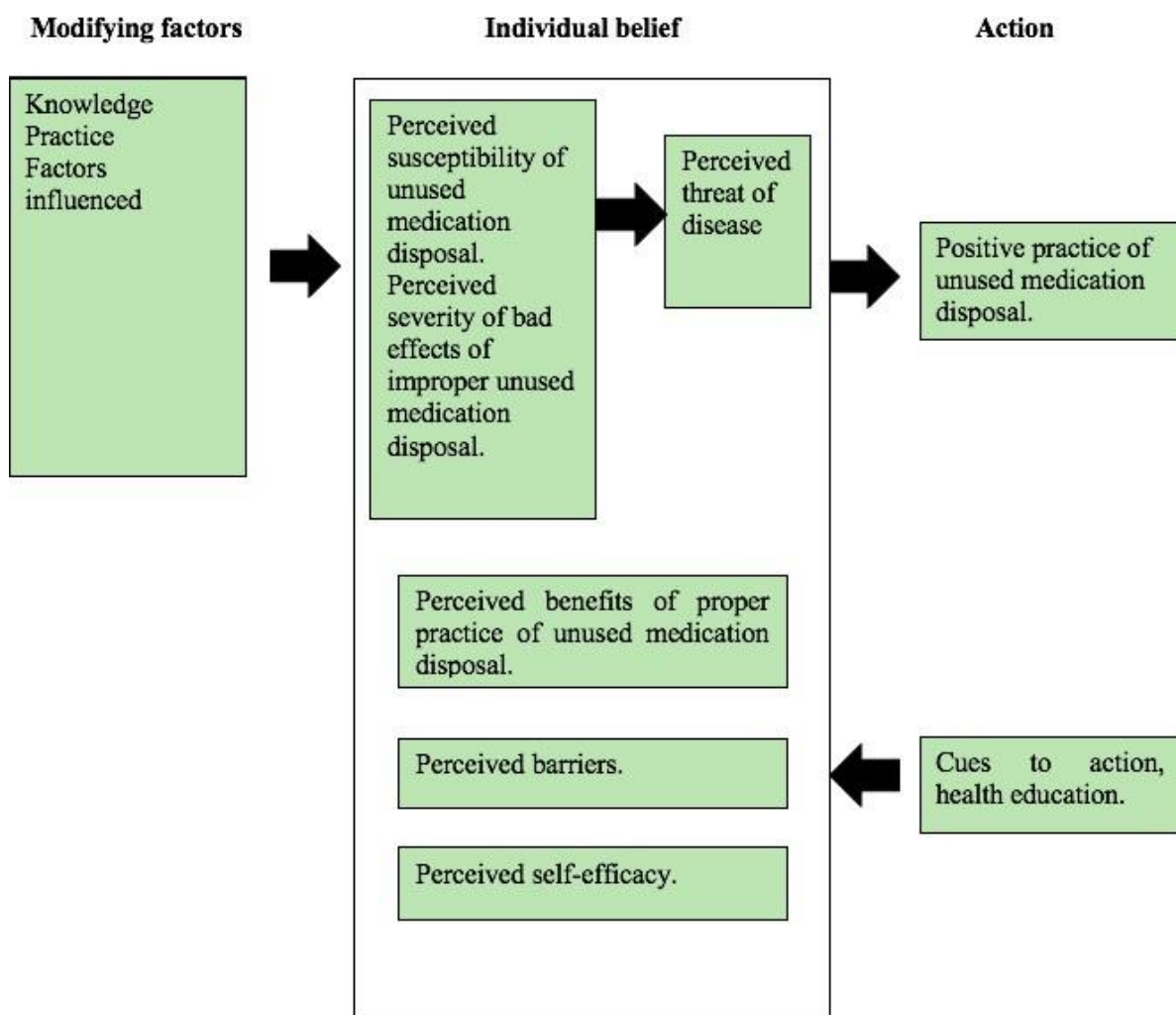
Perceived barriers refer to someone's feelings on the obstacles of performing a recommended health action which wide variation in someone's feelings of barriers or impediments that lead to cost or benefit analysis. Cue to action is the stimulus needed to trigger the decision-making process in order to accept a recommended health action. Last is self-efficacy which refer to

the level of someone's confidence in his or her ability to successfully perform a behaviour(*The Health Belief Model*, 2022).



**Figure 2.1** Figure of adopted Health Belief Model (Glanz et Al.,2015)

HBM explained the knowledge of unused medication disposal among patients in HUSM to change their practice of unused medication disposal about the bad effects of improper dispose. Figure 2.2 show the adopted theory of HBM in this study(*Diagram of Health Belief Model Adapted from Glanz et Al. (2015). | Download Scientific Diagram, 2015*).



*Figure 2.2 Adopted theory of Health Belief Model (HBM) in this study*

## **CHAPTER 3: METHODOLOGY**

### **3.1 Introduction**

In this chapter, research methodology such as research design, research location, research duration, research population, subject criteria (inclusion and exclusion criteria), sampling plan, research instrument, variables, data collection plan, data analysis, expected outcome of the study and ethical consideration was discussed.

### **3.2 Research design**

In this study, cross-sectional study design was used to collect data from patients in Hospital Universiti Sains Malaysia.

### **3.3 Research location**

This study was conducted at Hospital Universiti Sains Malaysia (Hospital USM) which are at wards, daily clinic and out-patient pharmacy (*Laman Web Rasmi Hospital Universiti Sains Malaysia - Senarai Klinik & Pusat Rawatan, 2022; Laman Web Rasmi Hospital Universiti Sains Malaysia - Wards, 2022*).

723 bedded Hospital USM is a referral hospital that provide a high level of medical science, dentistry and general health services to the public especially to East Coast community. Also known as university hospital that provide learning and research facilities in 3 field which are medical science, dentistry and health science. Hospital USM has been providing many services which are out-patient services that varies from many specialist clinics services such as medicine, surgery, pediatrics, obstetrics and gynecology, orthopedic, psychiatry, ophthalmology and otolaryngology.

Next is in-patient services that also varies in many departments. Hospital USM also provide clinical support services which are radiology, diagnostic lab, pharmacy, blood bank, clinical, medical record, therapy, medical social worker, nuclear medicine, nursing, dietetics

and hemodialysis. Last is consultant services at district hospital in medical, surgery, psychiatry, pediatrics, community medicine and surgery. The average admission to clinics in Hospital USM is 190,000 per year. The average in-patient admission is 28,000 per year (Kamari et al., 2009).

### 3.4 Research duration

This study was conducted from October 2022 to August 2023. Gantt chart and planned research milestone is showed in Appendix D.

### 3.5 Research population

The population for this study was the patients of Hospital Universiti Sains Malaysia (Hospital USM). From the population, this study involved patients who receive treatment and medications from Hospital Universiti Sains Malaysia.

### 3.6 Subject criteria

#### 3.6.1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>- Patients who receive treatment and medication from Hospital Universiti Sains Malaysia (Hospital USM) for both in-patient and out-patient.</li> <li>- Patient should at least has been prescribed the medication before.</li> <li>- Patient should be more than 18 years old.</li> <li>- Patient are able to read and write,</li> <li>- understand and speak Malay or English.</li> </ul>	<ul style="list-style-type: none"> <li>- Mentally unstable patient.</li> <li>- Have intellectual disability (mental retardation).</li> </ul>



### 3.7 Sampling plan

#### 3.7.1 Sample size estimation

For the first and second objective, single proportion formula is used in sample size estimation.

$$n = \left[ \frac{Z}{\Delta} \right]^2 p(1 - p)$$

Whereby,

n = required sample size

z = value representing the desired confidence level

$\Delta$  = precision

p = anticipated population proportion

For the first objective which is to determine the level of knowledge of unused medication disposal among patients in Hospital Universiti Sains Malaysia (Hospital USM).

**Calculation:**

Based on previous research with title “Knowledge, attitude and disposing practice of unused expired medicines among the general public in Malaysia”(Ong et al., 2020).

$$z = 1.96 \text{ (95\%)}$$

$$\Delta = 0.050$$

$$p = 0.24$$

$$n = \left( \frac{1.96}{0.050} \right)^2 0.24 (1 - 0.24)$$

$$n = 280.28$$

$$n = 281$$

After considering 10% drop out,

$$= 281 \times 10\% : 28$$

$$n = 281 + 28$$

$$n = 309$$

Therefore, total sample size is 309 samples.