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Disposal Practices of Unused and Unwanted Medications among Patients in a Tertiary Hospital

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ABSTRACT

Introduction: There is a growing concern of unintended consequences of inappropriate medications disposal on the environment and public health. **Objective:** The aims of this study are to determine patients' medications disposal methods and their awareness of the pharmacy medications take back program. **Method:** A cross sectional survey using a self-administered closed-ended questionnaire on information, medications disposal and views, awareness of medications take back program and reasons for their unwillingness to return the unused and unwanted medication to pharmacy or doctor. A convenient sample of 438 patients at Out Patient Pharmacy and Patient Registration areas in the hospital was collected and completed within three months. **Results:** Only 44.5% had ever received information about medications disposal and were significantly more likely to return to pharmacy or doctor (29.2% versus 6.0%, $p < 0.001$). There were significant differences between tertiary and non-tertiary with regard to not returning to pharmacy or doctor (22.8% versus 42.0 %, $p = 0.004$). Some common medications disposal methods were throwing medications away with household garbage, 38.3% (n = 168), returning to pharmacy or doctor, 35.1% (n = 154) and flushing medications down the toilet or sink 11.0% (n = 48). About 50.2% (n = 220) knew about medications take back program and were significantly more willing to return the medication to the assigned location (34.7 % versus 20.1%, $p < 0.001$). The main reasons for unwillingness were availability of time, not convenient or a bother and out-of-vicinity location. **Conclusion:** There is a clear need to create public awareness about issues on safe medication disposal and medications take back program.

Keywords: *Unused and unwanted medications, Medications disposal, Pharmacy medications take back program, Pharmaceuticals*

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Introduction

It is not unusual for patients to be in possession of unused or unwanted medications. Medications which are dispensed to patients are not always entirely used. Death of the patient, change in prescription, repeat filling of prescriptions without assessing the amount at hand were identified as major reasons why medicines are no longer wanted and expired unused. Furthermore, some patients did not see a need for continuing medication following a therapy change by the doctor or after the subjective perception of an improvement of their conditions (1–6).

There are a wide variety of ways in which the unused and unwanted medications are likely to be managed. Failure to discard

medications properly may pose a risk to public health through poisoning and suicide when allowed to accumulate in the home and to the environment through poor disposal either via trash or sewer system (7–9). Numerous medications have been found in trace amounts of pharmaceuticals in groundwater, surface bodies of water, and drinking water sources (10) since many wastewater and drinking water treatment plants were not designed specifically to completely remove these medications or chemical residue from the waste water. Pharmaceuticals can be introduced to environment by landfill when household medications are thrown to trash as shown in the leachate pumped out of the landfill which ultimately reaches wastewater treatment plants (11–13). Although it is unclear the extent to which these pharmaceutical wastes have on the environment, it is important to limit the amount of pharmaceutical waste that is inappropriately introduced into these areas. There are several studies shown that residues of various types of pharmaceuticals such as hormones in the water may be responsible for effects on wildlife including feminisation of male fish, sluggish activity or reduced appetite (14–16). However, short and long term human health effects are currently unknown. As it is unlikely to completely eliminate medications waste, therefore, establishing a safe and secure medication take back program to minimise unused and unwanted medications should be of high priority. Several states, cities, and countries throughout the United States and worldwide have successfully initiated unwanted medicine collection programs. Some programs have been specifically dedicated to collection of household medicines only, while others have accepted unwanted medicines as part of a larger household hazardous waste collection program. These efforts aim to reduce the human and environmental risks associated with the disposal of unused and unwanted medications. In Malaysia, to facilitate the safe disposal of medicines in the community, Pharmaceutical Services Division, Ministry of Health Malaysia (MOH) has implemented the Return Your Medicines Programme in 2010 which is a drug take-back program. Through this program, patients can return their unused, no longer needed or excess medicines kept at home to pharmacy counter or medicine return box provided at all pharmacy facility in MOH hospitals and health clinics for safe disposal by MOH.

Relatively little is known on the type, quantity and disposal methods of unused and unwanted medications. It is recognised that the returns of unused and unwanted medications to the pharmacy is only a fraction of the true amount wasted. Ever since the initiation of promoting awareness among the public of the possible ecological and public health effects of medication flushing into the environment, it has resulted in a shift in recommendations for medication disposal practices which was previously believed that the best way to prevent accidental consumption of prescription medications was to dispose of any unused or expired medications in the toilet or down the drain as it immediately and permanently remove this risk from homes. These inappropriate methods of disposal may help households get rid of these unwanted medicines quickly but discharge active pharmaceutical ingredients back into environment poses a more undesirable risk as a whole.

The aim of this study is to determine how patients dispose their unused and unwanted medications, as well as their awareness of the medications take back system or program at pharmacy facility in public hospitals.

Methodology

Study Design

A cross sectional survey was carried out on patients at Out Patient Pharmacy and at the Registration area through an interviewer administered questionnaire. This cross-

sectional survey was conducted from 15th January, 2016 to 15th April, 2016.

Study Population

A convenient sampling strategy was employed by the researcher to distribute questionnaire to patients waiting for their medications at Out Patient Pharmacy, and Patient Registration area in Sultanah Aminah Hospital. In this study, the researcher was the interviewer where she introduced the topic as well as informed the patients the purpose of this study. In addition, the researcher assisted patients in completing the questionnaire or to clarify any query items in the questionnaire on the spot. Completed questionnaires were collected back by researcher.

Sample Size

The average number of patients seeking treatment in Sultanah Aminah Hospital is around 1500 per day. The sample size was determined using Raosoft sample size calculator which is available online (http://www.raosoft.com/samplesize.html). Based on a confidence level of 95%, confidence interval of 5%, p-value of < 0.05 and an estimated number of patients for duration of 3 months was 90,000, the sample size of the patients to recruit with these parameters were 385 (using Raosoft sample size calculator). An additional 15% of the calculated sample size was added to cater for non-respondents.

Designing Survey Tool

An interviewer assisted subject administered questionnaire was drafted and used to gather information on disposal practices for unused and unwanted medication. The items in the questionnaire were adapted from relevant publications (17–19). The questionnaire is divided into Section A and Section B. Section A consisted of demographic data including age, gender, ethnic group and educational level. Section B comprised six closed-ended questions with predefined answers. Question 1 to Question 3 dealt with patients' practices and beliefs on how the unused and unwanted medications are disposed off. Question 4 to Question 6 are on patients' awareness of medications take back program and identify the reasons for unwillingness to use the take back system or program at pharmacy facility in public hospital (Table 1). This questionnaire was distributed to a total of 445 patients at Out Patient Pharmacy and Patient Registration area in Sultanah Aminah Hospital.

Data Analysis

The Statistical Package for the Social Sciences version 15 for Window was used to analyse the data collected. A descriptive statistics was used to categorise patients' disposal practices and their beliefs. Chi Square- X^2 analysis was used for comparative statistics. A p-value ≤ 0.05 is considered statistically significant.

Results

A total of 438 out of 445 respondents completed the questionnaires; giving a response rate of 98.4%. Table 2 summarised the demographic profile of the respondents in this study.

As shown in Table 3, the most used method of disposal of unwanted medications reported was throwing away unused and unwanted medications with household garbage, followed by returning to pharmacy or doctor, flushing medications down the toilet or sink and storing the medications in the house. Of the 35.1% (n = 154) of the respondents who reported that they returned the unwanted or unused medications to the pharmacy or doctor, more than 90% (n = 149) of them believed that their disposal practice was acceptable. About 50% of the respondents reported that their methods of disposing either via throwing with household garbage, flushing down the toilet or sink or storing the medications in the house was acceptable. The percentage of the respondents who

Table 1: Questions and response options for disposal practices of unused and unwanted medications questionnaire

Question	Response options
1. Have you ever received any information about how to dispose unused and unwanted medications?	Yes or No
2. How do you get rid of or dispose of unused and unwanted medications?	a. Throw away unused and unwanted medications in household garbage b. Flush unused and unwanted medications down the toilet or sink c. Give unused and unwanted medications to friends or family who would use them d. Return unused and unwanted medications to a pharmacy or doctor e. Burn or bury unused and unwanted medications f. Store the unused and unwanted medications in the house
3. Do you think your method of medications disposal is acceptable?	Yes or No or Unsure
4. Do you know there is a drop-off box for unused and unwanted medications located at pharmacy in every public hospital?	Yes or No
5. How willing would you be to return the unused and unwanted medications to the pharmacy in public hospital for disposal?	a. Very willing b. Somewhat willing c. Neither willing nor unwilling (proceed to Question 6) d. Somewhat unwilling (proceed to Question 6) e. Very unwilling (proceed to Question 6)
6. Can you tell me what is your main reason for your unwillingness to do so?	a. Potential re-use by others b. Not convenient/A bother c. Availability of time d. Transport/Parking e. Location f. No Specific reason

knew and who did not know the existence of the drop-off box located at the pharmacy in public hospital were similar too. Availability of time, which was the most common reason for not being able to return to pharmacy or doctor, followed by being not convenient or a bother, out-of-the-way location and unavailable public or private transport or limited parking are depicted in Figure 1.

Table 4 shows that a significant difference was noted among the respondents with tertiary education not returning the medication to pharmacy or doctor as compared to those respondent without tertiary education (22.8% versus 42.0 %, $p = 0.004$). About 65.6% of the respondent with information on medication disposal were significantly more willing to return the

Table 2: Demographic data of respondents

Variable	Number (%)
Gender	
Male	144 (32.9)
Female	294 (67.1)
Age	
18–39	282 (64.4)
40–49	70 (16.0)
50–59	46 (10.5)
≥ 60	40 (9.1)
Race	
Malay	263 (60.0)
Chinese	100 (22.8)
Indian	61 (14.0)
Others	14 (3.2)
Education Level	
Primary	38 (8.7)
Secondary	224 (51.1)
Tertiary	176 (40.2)

medication to pharmacy or doctor at the assigned location as compared to those who are without knowledge (29.2% versus 6.0%, $p < 0.001$). Similarly, the respondents with information on medication disposal and those who knew the existence of the drop-off box at the pharmacy was significantly more willing to return the medication to the assigned location as compared to those who are without information (34.7 % versus 20.1%, $p < 0.001$).

Discussions

The study showed that less than 50% of the respondents were having information on safe medication disposal. However, 65.6% of them were significantly more willing to return the medication to pharmacy or doctor at the assigned location as compared to those who are without knowledge. This finding indicated that there is a clear need to create public awareness about issues on safe medication disposal

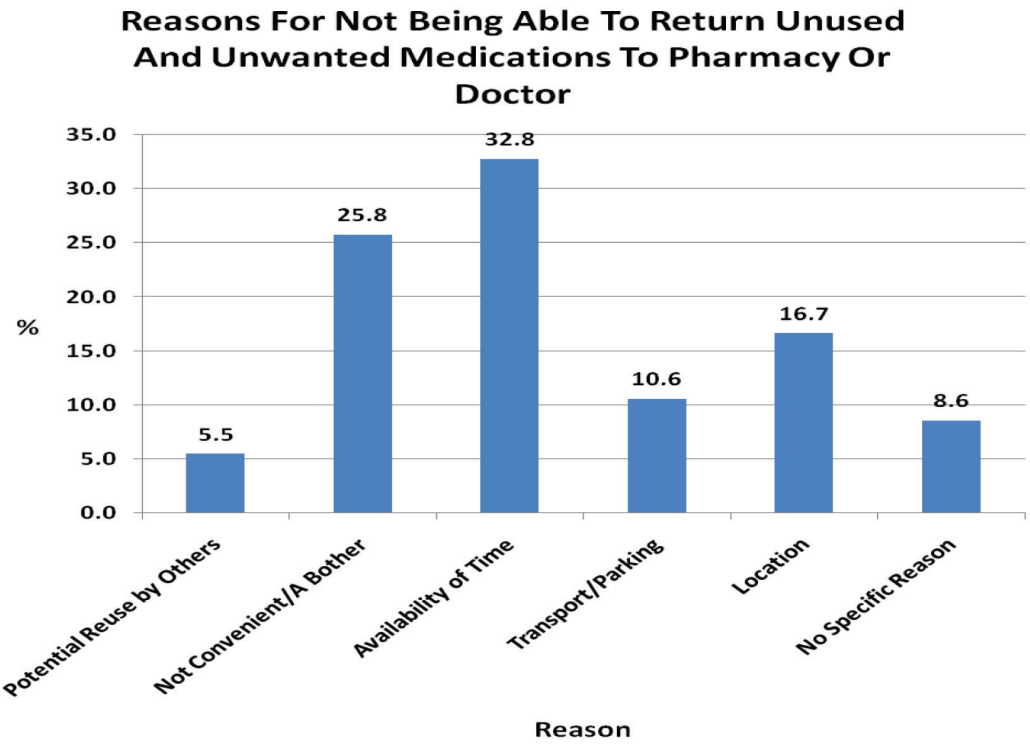

Figure 1: Reasons for being not able to return unused and unwanted medications to pharmacy or doctor.

Table 3: Respondents' feedback on disposal practices of unused and unwanted medications questionnaire

Variable	Number (%)
Had ever received information on disposal of unused and unwanted information (n = 438)	
Yes	195 (44.5)
No	243 (55.5)
Method of disposal (n = 438)	
Throwing in household garbage	168 (38.3)
Flushing down the toilet or sink	48 (11.0)
Giving to friends or family who would use them	16 (3.7)
Returning to a pharmacy or doctor	154 (35.1)
Burning or burying	9 (2.1)
Storing in the house	43 (9.8)
Views on acceptability of medication disposal (n = 438)	
Throwing in household garbage (n = 168)	
Yes	81 (18.5)
No	40 (9.1)
Unsure	47 (10.7)
Flushing down the toilet or sink (n = 48)	
Yes	25 (5.7)
No	16 (3.6)
Unsure	7 (1.6)
Giving to friends or family who would use them (n = 16)	
Yes	8 (1.9)
No	6 (1.4)
Unsure	2 (0.4)
Returning to a pharmacy or doctor (n = 154)	
Yes	149 (34.1)
No	3 (0.7)
Unsure	2 (0.4)
Burning or burying (n = 9)	
Yes	4 (1.0)
No	2 (0.4)
Unsure	3 (0.7)
Storing in the house (n = 43)	
Yes	18 (4.1)
No	18 (4.1)
Unsure	7 (1.6)

(*continued on next page*)

Table 3: (*continued*)

Variable	Number (%)
Awareness of the existence of drop off box for unused and unwanted medications at pharmacy in public hospital (n = 438)	
Yes	220 (50.2)
No	218 (49.8)
Willingness to return unused and unwanted medication at the assigned drop off box at pharmacy in public hospital (n = 438)	
Yes	240 (54.8)
No	116 (26.5)
Unsure	82 (18.7)

Table 4: Respondents' who had returned medications to pharmacy or doctor

Variable	Number (%)		
	Yes	No	*p*-value
Percentage of respondents who had returned medications to pharmacy/doctor (n = 438)			
Gender			
Male	93 (21.2)	51 (11.7)	0.93
Female	191 (43.6)	103 (23.6)	
Age (years)			
< 40	91 (20.8)	191 (43.6)	0.09
≥40	63 (14.4)	93 (21.2)	
Education Level			
Non Tertiary	78 (17.8)	184 (42.0)	0.004
Tertiary	76 (17.4)	100 (22.8)	
Information on medication disposal method (n = 438)			
Yes	128 (29.2)	67 (15.3)	< 0.001
No	26 (6.0)	217 (49.5)	
Willingness to return unused and unwanted medications of respondents who know the existence of drop-off box allocated at public pharmacy			
Willing	152 (34.7)	88 (20.1)	< 0.001
Unwilling & Unsure	68 (15.5)	130 (29.7)	

of unused and unwanted medication. Public education materials consisting of information on disposal options, risks posed by unwanted medicine disposal, studies where pharmaceutical chemicals have been detected in the environment, and the various pathways by which these substances enter the environment should be provided or circulated so as to raise awareness as well as to promote action.

The most common methods of disposal of unwanted medications reported in this study was throwing away unused and

unwanted medications with household garbage followed by returning to pharmacy or doctor, flushing medications down the toilet or sink, storing the medications in the house, giving to friends or family member who would use them and lastly burning or burying them. Majority of the respondents did not practise appropriate medication disposal methods. Most of the unused and unwanted medications were thrown into garbage or flushed down the toilet or rinsed down the sink which seems to be the easiest and most favoured way of disposal. Similar findings were reported by Dr. Linda Owens and Dr. Sowmya Anand (18), and Gupta Dharmender et al. (20), where throwing out in the trash is the most typical disposal method. Likewise, the survey conducted by Seehusen and Edwards (17) revealed that more than 35% of respondents believed that it was acceptable to flush medications down the toilet and 21% thought it acceptable to rinse them down the sink.

In this study, those with tertiary education were found to be more likely to return unwanted medications to the pharmacy or healthcare professional as compared to those with lower education. However, in one of the studies conducted in Kuwait revealed that disposal practice may not be associated with educational status. It was reported that 62% of the study sample were university graduates or had some form of tertiary education but 97% of the study participants stated they would dispose of their unwanted medications in the garbage (21). However, both with and without tertiary education had similar main reasons for their unwillingness for not returning to pharmacy or doctor; time constraint followed by being an inconvenience or a bother. This could be due to the fact that for most people the most straight forward and least time consuming approach is to discard the unused and unwanted medicine either in the trash or sewer system. This finding strongly implied that they might not be aware that these methods of medications disposal could cause much harm to the environment which are preventable source of such pollution.

Another possibility other than the three main reasons identified for unwillingness as mentioned could be linked to the location of the medication drop box at the nearest public pharmacy which may not be the most convenient opportunities for the public to dispose of unused medications. It was found that programs that provide continuous convenient medications drop-off locations at community pharmacies, health department clinics, fire or police departments not only benefit patients who wish to dispose their medications but also allow nursing homes and public health departments to dispose their medications properly (22).

About 50% of the respondents knew about the medication take back program. A very encouraging finding was about 70% of them was found to be significantly more likely to return the medication in the drop-off box allocated at the pharmacy premise. To ensure a successful our pharmacy medication take back program, Return Your Medicines Programme, pharmacists have to play active role to make known or broadcast the importance of this program. Suggestion to enhance this program include other periodic collection program such as periodic drop off days or single day collection day which can be coincided or coordinated with events or occasions like during “Know Your Medication Campaign” or “Earth Day”. Such events can also be held at other convenient locations or sites other than pharmacy in public hospitals which can be made available to the public for household medications too. The primary focus of this program should be on disposing of unused medications rather than addressing the source of accumulation as to further encourage returning them. It should also be provided during hours when people are likely to be able to come such as before or after typical working hours or on weekends. Beside the pharmacy take back program, the efforts of other health care professionals are also essential in helping to reduce water contamination with pharmaceuticals. Physicians, medical officers, nurses and dentists can also educate their patients and

be more mindful about overprescribing medications. Furthermore, reducing the amount of medications that become waste in the first place is an important step in reducing risks to health and environment. Also health care providers can also provide education and assist in developing policies and procedures regarding proper medication disposal (23).

Conclusion

Pharmacists have to be forefront by being proactive in promoting safe medication disposal which can make a difference regarding an issue that affects both public health and the environment. Also, pharmacists need to equip themselves with current, complete, and accurate knowledge of proper medication disposal as counselling patients on the correct ways to dispose of their medications can make a difference in their beliefs and behaviours.

Limitations

In this study, the respondents are required to select only one response from the box of options for each question in the questionnaire which best express their opinions or views even though they might have more than one responses. Another limitation is that this study did not include methods of disposal for medication dosage form. A few studies have reported medication dosage form have an influence on patients' disposal methods where liquids were predominantly poured down the sink or flushed down the toilet while tablet/capsules and ointment/creams via household garbage (19, 24).

Ethical Approval

This study was conducted with approval from the Medical Research and Ethic Committee, Ministry of Health (MOH) of Malaysia and the National Medical Research Register Number is NMRR-15-1659-27878.

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