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Original article

An assessment of the current practice of community pharmacists for the disposal of medication waste in the United Arab Emirates: A deep analysis at a glance



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ABSTRACT

Objective: The study aimed to identify the current practice carried out by community pharmacists to dispose of expired medications in their workplace and assess any practical steps utilized to reduce medication waste.

Method: A cross-sectional study was conducted among community pharmacists in the United Arab Emirates (UAE). The participants were asked about their routine practice in disposing of different expired medications and the current actions taken to reduce the number of disposed medicines.

Results: The study included (n = 418) community pharmacists. More than a third of expired liquid, solid, and semi-solid dosage forms were collected by licensed contractors. In addition, more than a third of the pharmacists disposed of different dosage forms via unauthorized methods (general garbage, sink and toilet). Most expired drugs were skin and hair products, antibiotics and analgesics. The majority of pharmacists (68.4 %, n = 286) agreed that expired pharmaceutical and non-pharmaceutical products, other than those disposed of via contractor, should be done through a specialized centre. This opinion was found to be strongly associated with years of practice as community pharmacists (P < 0.05).

Conclusion: Part of the existing disposal practices for expired pharmaceutical products in the UAE is carried out by contractors licensed by health authorities. However, concern remains regarding some pharmaceutical and non-pharmaceutical products that have not been disposed of correctly. Additionally, there is a need for a specialized center for medication disposal (p < 0.05). A stock limitation is the best practice for managing medication quantities in stock (p < 0.05).

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1. Introduction

Pharmaceutical products are available in abundance and present hazardous to the environment when improperly disposed of, whether by patients at home or sometimes by pharmacists at pharmacies (Ebrahim et al., 2019). Discarding expired medications through general disposing methods such as garbage, through the sink, or toilet causes an imbalance in the ecosystem. In addition, varieties of pharmaceuticals such as antibiotics, analgesics, and hormones are frequently detected in sewerage facility systems,

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which are difficult to remove by the conventional treatment processes (Hochman, 2017), which include mainly biological treatments, oxidation by ozone, and the use of granular activated carbon. (Angeles et al., 2020).

Many pharmacists are unaware of the proper way to dispose of pharmaceutical waste in pharmacies. Pharmacists from Pakistan believe that the standard practice for medication disposal is by flushing them in the toilet or sink (Khan et al., 2020). Thus, disposing them unsatisfactorily contributes to wastewater contamination with non-biodegradable medications (like cytotoxic medications and disinfectants) and can lead to increased resistance to the antibiotics used in sewage treatment. Moreover, studies confirmed that the presence of some medications like analgesics and steroids in water could contribute to causing renal failure in humans. (Michael et al., 2019). Therefore, appropriate disposal and discrimination of pharmaceutical wastes are essential to minimize pollution and harmful effects (Khan et al., 2017).

Few studies discussed community pharmacists' knowledge, attitude, and practice regarding waste management in other countries. For instance, in a study conducted in Iraq, pharmacists had a relatively poor understanding of drug disposal methods, with around two-thirds of respondents agreeing that the sink and trash are appropriate for disposing different types and dosage forms of medication (Albaroodi, 2019). Moreover, in a study among Libyan pharmacists, more than half of the participants reported disposing of expired medications in the trash. In addition, a small percentage of respondents disposed of unused medications in accordance with WHO drug disposal guidelines. Furthermore, the knowledge of approximately two-thirds of the participants was poor related to the Take-Back program (Atia, 2021).

Studies conducted in the Gulf region focused mainly on household medication waste (AlAzmi et al., 2017). Those studies revealed that most people tend to store or throw expired medications in their homes (E. A. Abahussain & Ball, 2006). However, in the community pharmacy setting in Saudi Arabia, most pharmacists reported that the pharmaceutical supplier is the main route of disposing of solid or semi-solid and unused liquid medications. The study also showed high awareness among the participants about the inappropriate disposal of medications, which may negatively influence the environment (Alghadeer & Al-Arifi, 2021a). Furthermore, in a survey study conducted among pharmacists in Kuwait, throwing unwanted medications in the trash was the main method of disposal by majority of the respondents. According to the local guideline in the country, less than a quarter of respondents had disposed of unwanted medications. However, a high percentage of the participants are aware that improper disposal causes damage to the environment, and they agreed that it is their responsibility to protect the environment (E. Abahussain et al., 2012).

It has been estimated that 40.0 % of medication waste could be reduced if pharmacists optimize the dispensing process by issuing opened medication packages and exchanging medications with close expiry dates or those on the shelf for more than six months with other pharmacies (Bekker et al., 2018). The improper discard of medications could be traced back to pharmacists' lack of educational awareness about the optimal disposal protocols in pharmacy schools or community pharmacies. A study proclaimed that 89.0 % of pharmacists in India familiarize themselves with proposed disposal methods by studying literature or attending workshops (Dar et al., 2019).

1.1. Pharmaceutical wastes management in the UAE

There are around 3000 community pharmacies in the UAE, driving the sale of pharmaceutical products in the UAE to reach 3 billion dollars in 2020 (UAE Pharmaceutical Market to Be Valued at \$4.7 Million in Value by 2025).

In the UAE, the health regulation sector states all health facilities should establish a waste management plan to ensure all expired medications, especially narcotics, are disposed of in the most suitable method (Policies, 2021). The first method to dispose of expired pharmaceutical products in the UAE pharmacies is through a contractor. Contractors are specialized companies approved by health authorities to carry out this work and are responsible for regularly collecting expired pharmaceutical products from community pharmacies. However, community pharmacies must pay a fee for these services. The second way to dispose of these pharmaceuticals is by returning them to the distributor's agency, as previously agreed upon between the distributor and community pharmacy management (DHA, 2020).

To the best of our knowledge, this is the first study addressing medication disposal practices among community pharmacists in the UAE. The study aimed to assess community pharmacists' knowledge, attitude, and current practices regarding medication waste in the UAE. It also sought to explore pharmacists' suggestions to limit the medication wastage issue and disclose the most commonly wasted pharmaceutical products.

2. Method

2.1. Study design and sampling technique

The study followed the STROBE Statement for reporting observational cross-sectional studies and was conducted over five months, from October 2019 to the end of February 2020. We used the convenience-sampling technique for community pharmacists across the UAE. A sample size of 384 participants was recommended, according to the RaoSoft® calculator (RaoSoft, Inc 2004, www.raosoft.com/samplesize.html).

2.2. Inclusion and exclusion criteria

The study population included licensed community pharmacists who have been working in the UAE for two or more years and consented to participate in the study. Unlicensed pharmacists, pharmacy technicians, assistants, or trainees were excluded from this study.

2.3. Study questionnaire

The questionnaire was based on a pre-validated instrument formerly used by a similar study conducted in New Zealand (Tong et al., 2011). However, some questions were adjusted according to the UAE population and the aims of this study.

The questionnaire included closed-ended questions divided into five sections: **Section 1:** demographic and working data of the participants: age, gender, years of experience and location of work. **Section 2:** Pharmacists' practice related to the disposal of expired medications. **Section 3:** Pharmacists' knowledge of the distributors' and contractors' destruction methods for waste medications. **Section 4:** Pharmacist's opinion regarding a specialized disposal center and current actions to reduce medication wastage. Finally, the last part of the survey was regarding the most commonly expired medications categories in community pharmacies in the UAE.

2.4. Questionnaire development and validation

The main investigator invited five experts in clinical pharmacy who were professors in clinical pharmacy and pharmacy practice from Sharjah University, Al Ain University and Ajman University in the UAE as well as five experts licensed community pharmacists to

attend a virtual meeting to validate the content of the questionnaire.

During the meeting, the panel members were asked to grade each item in the questionnaire on a scale of 1–10 for clarity, relevance, appropriateness, length of the questions, and the time required to fill them. The overall means of clarity, relevance, appropriateness, questions length, and time to fill them were 8.42 SD \pm 1.67, 8.94 SD \pm 2.07, 8.27 SD \pm 1.41, 9.24 SD \pm 1.67 and 9.31 SD \pm 2.67 respectively.

Additional modifications and amendments recommended by the panel members were also considered. Finally, the research team performed a pilot test using the validated version of the questionnaire to assess reliability and comprehensibility of the study questionnaire. The pilot test included 35 participants who were asked to complete the survey and report any questions or words that might hinder the understandability of the questionnaire. The responses were imported into the SPSS version 26 (IBM Corp, Armonk, NY), and the internal consistency of the questionnaire items, was calculated.

2.5. Data collection

The research team visited each pharmacy and approached eligible pharmacists in different chains and individual community pharmacies in the UAE. The study was conducted before COVID-19 was declared a pandemic, and the associated safety restrictions were issued in the UAE. Participants who met the eligibility criteria were firstly briefed about the study's purposes, and then provided with the consent form of participation. If signed, the pharmacists were then provided with the study questionnaire. The aim of the studies was explained to the participants. Furthermore, if participants asked for time to fill out the survey, the research team re-scheduled another visit to collect the responses. The participants were informed about the anonymity and confidentiality of the policy applied.

2.6. Statistical analysis

Microsoft Excel was used for simple descriptive statistics and application of graphs. The Statistical Package for Social Science (SPSS) version 26 (IBM Corporation, Armonk, NY, USA) was used for data analysis. Chi-square was used to compare categorical variables. A p-value of $<$ 0.05 was considered to be statistically significant.

3. Results

3.1. Characteristics of the participants

The total number of pharmacists approached was 450 participants and the total number of pharmacists that were included in the study was 418, a (92.3 %) response rate. Around 7 % of the pharmacists who did not participate in the study either did not match the inclusion/exclusion criteria, did not want to sign the consent form, or did not complete the questionnaire due to their overloaded work schedule. Table 1 represents the participants' demographic data. Most of the participants 69.4 % aged $<$ 35 years old (n = 290), female 59.8 % (n = 250) and 53.1 % (n = 222) had less than ten years of experience as practicing pharmacists.

3.2. Participants' knowledge about the disposal of expired pharmaceutical products

Table 2 illustrates the routes of medication disposal for different dosage forms. The participants reported that the most common

Table 1
Demographic characteristics of participating pharmacists in the survey (n = 418).

	n	%
Age (years)		
< 24	168	40.2
25–34	122	29.2
35–44	72	17.2
> 45	56	13.4
Gender		
Male	168	40.2
Female	250	59.8
Years of Practice as a pharmacist		
< 10	222	53.1
10–20	90	21.5
> 21	106	25.4

way to discard pharmaceutical wastes was through contractors, with 39.5 % (n = 218) for solid formulations, 37.1 % (n = 206) for semi-solid preparations, and 39.1 % (n = 220) for liquid dosage forms. In addition, more than a quarter of the participants reported returning these drugs to the distributor. The rest of the participants (more than a third) admitted to using unauthorized disposal methods to discard the three dosage forms.

Regarding pharmacists' knowledge of the methods used by contractors and distributors to destroy medications, almost a third of the participants did not know how the expired medications were destroyed. Another third believed these products were incinerated, while the final third thought they were discarded using garbage, toilet and sink premises, as shown in Table 3.

Table 4 presents pharmacists' views on introducing a Specialized Center for Medication Disposal in the UAE and the current actions undertaken to manage medicines' quantities in stock. Many participants (65 %) conveyed a need for a specialized center for medication disposal.

3.3. Disposal practice of expired medications

Majority of the participants 68.4 % (n = 286) agreed that a specialized center for medication disposal is needed. Pharmacists were also asked about the best actions to minimize drug wastage, where more than half the participants (51.7 %) reported that medication stock limitation is the most suitable solution. Almost half of the participants (48.3 %) endorsed pharmacy collaboration to exchange nearly expired medications (Table 4). Furthermore, the same ratio of the pharmacists perceived themselves as responsible for minimizing drug wastage, while 31.6 % and 18.0 % held the prescribers and patients responsible, respectively.

We decided to find out if the year of experience has an association with the disposal practices, Table 5 shows participants' demographic characteristics, knowledge, practice and attitude based on their years of experience. It was demonstrated that pharmacists' years of experience were correlated with pharmacists' knowledge of accurate disposal practices and the route of disposal of liquid, solid, and semi-solid dosage forms. Pharmacists with less than ten years of experience reported returning all expired dosage forms to contractors (p $<$ 0.05). In addition, they believed in a need for a specialized center for medication disposal (p $<$ 0.05) and agreed that stock limitation is the best practice to manage medication quantities in stock (p $<$ 0.05). There was no statistically significant difference in pharmacists' years of experience knowledge and medications' destruction methods by either contractor or distributors.

Concerning existing disposal habits to manage the amount of medication kept in pharmacy inventory and limit the medication

Table 2

Routes of expired medication disposal in the UAE at the community pharmacies for different dosage forms.

	Contractors		Medication disposal route				Toilet		Return to distributor	
	n	%	Rubbish bin		Sink		n	%	n	%
			n	%	n	%				
Solid dosage forms (n = 552)*	218	39.5	82	14.9	56	10.2	50	9.1	146	26.4
Semi-solid dosage forms (n = 556)*	206	37.1	64	11.5	64	11.5	78	14.0	144	25.9
Liquid dosage forms (n = 562)*	220	39.1	50	8.9	52	9.3	84	14.9	156	27.8

* Multiple responses allowed.

Table 3

Pharmacists' knowledge of the ways to destroy collected expired medicines (n = 418).

	Contractors		Distributors	
	n	%	n	%
Incineration	130	31.1	136	32.5
General Garbage	84	20.1	78	18.7
Toilet	42	10	42	10
Sink	30	7.2	28	6.7
Unknown	132	31.6	134	32.1

Table 4

Pharmacists' opinions (n = 418) about having specialized centers for medication disposal in the UAE and actions taken to manage medicines' quantities in stock.

Question asked	N	%
UAE need a specialized center for medication disposal		
Yes	286	68.4
No	128	30.6
Do not know	4	1
If yes, the funding of this center should be by:		
Ministry of Health	185	64.7
Patients	32	11.2
Pharmaceutical companies	38	13.3
Community pharmacists	31	10.8
Actions to manage (reduce) the quantities of expired medications:		
Stock limitation	216	51.7
Collaborations with other pharmacies to exchange the nearly expired drugs	202	48.3

waste, more than half of the pharmacists control medication amounts by primarily limiting the stock, and around 40 % collaborate with other pharmacies to exchange the nearly expired drugs ($p < 0.05$).

3.4. Most expired medication categories in community pharmacies in the UAE

Pharmacists were asked to give their opinions about the most commonly expired medication categories (self-reporting), 12 % of participants (n = 282 pharmacists) agreed that the most discarded medications were skin and hair care products, supplements (including vitamins and minerals) 10.8 % (n = 258), analgesics and antibiotics (6.4 % and 4.7 % respectively). In addition, Nicotine replacement products and anticoagulants accounts for the least commonly expired medications (around 2.4 %). Table 6 reports the 25 most expired medications categories in community pharmacies in the UAE.

4. Discussion

This is the first study in the UAE to report the practice conducted by community pharmacists managing expired pharmaceu-

tical products. The response rate of this study was high at around 93 %, with 418 licensed community pharmacists filling out the questionnaire. Apparently, the dosage form of medication did not significantly influence pharmacists' choice of disposal method. Sending drugs to contractors was the primary approach for all dosage forms, accounting for slightly over a third of total medications disposal. Meanwhile, a lesser ratio of the waste medications was sent back to the pharmaceutical distributors. Interestingly, more than one-third of pharmacists in our survey used improper methods to discard different pharmaceutical dosage forms.

The results were inconsistent with those of a study in a neighboring country (Saudi Arabia) that found the primary disposal method for all dosage forms was to return them to the distributors (>75 %) (Alghadeer & Al-Arifi, 2021b).

Dissimilar to our findings, a study conducted in India showed >90 % of solids and semi-solids are disposed of in the general garbage, around 18 % of liquid medications are rinsed in the sink, and only 5 % are flushed down toilets (Dar et al., 2019).

Although pharmacists acknowledge that proper medication disposal through contractors is a compulsory process to prevent hazardous waste to the environment and public health, they cannot afford to do so for all medications. The licensed pharmacists disclosed that they would dispose of all medications through contractors if the cost were affordable. As for distributors, they only took back what they had previously agreed upon with the pharmacists during the sale, which off course do not include all medication/products. Therefore, some medications were easier for pharmacists to dispose of through unofficial ways despite the risks associated with this act.

This study assessed pharmacists' knowledge about the methods of discarding medications by contractors and distributors. Most pharmacists did not know how contractors or distributors discarded the expired medications. In contrast, very few pharmacists implied that returned medications are being thrown in the garbage, sink or incinerated. Likewise, pharmacists in New Zealand did not know how contractors or distributors got rid of the medications sent back to them, while some pharmacists believed they used incineration, which includes treatment of solid hazardous waste at high temperatures, forming residue or gas products (Tong et al., 2011).

Comparing our study results to studies in different countries, many of our results are comparable to one conducted in Nigeria, indicating that their pharmacists also demanded a specialized disposal center. Many pharmacists in Nigeria discard waste medication down the toilet. However, Nigeria's pharmaceutical officials have supported the notion of including management of medical waste lectures in pharmacy schools' curricula, which leads to a professional discarding practice (Auta et al., 2012).

When assessing pharmacists' opinions, it was clear that their years of practice affected the results, where a significant association between the age group and years of experience was noticed. Moreover, pharmacists who have ten years of experience or less

Table 5
Demographic characteristics, knowledge, practice and attitude of participants based on their years of experience.

	Years of experience				P value
	< 10 years (n = 222)		> 10 years (n = 196)		
	n	%	n	%	
Gender					0.24
Male	80	36	88	44.9	
Female	142	64	108	55.1	
Age					0.002
< 24	128	57.7	40	20.4	
25–34	70	31.5	52	26.5	
35–44	18	8.1	54	27.6	
> 45	6	2.7	50	25.5	
Routes of disposal solid medications					0.01
Contractors	140	45.3	78	32.2	
Rubbish bin	48	15.4	34	14.1	
Sink	14	4.5	42	17.4	
Toilet	18	5.8	32	13.2	
Return to distributor	90	29	56	23.1	
Routes of disposal of semi-solid medications					0.033
Contractors	118	40.1	88	33.6	
Rubbish bin	28	9.6	36	13.7	
Sink	22	7.5	42	16	
Toilet	28	9.5	50	19.1	
Return to distributor	98	33.3	46	17.6	
Routes of medication disposal of liquid medications					0.039
Contractors	126	41.2	94	36.7	
Rubbish bin	24	7.9	26	10.2	
Sink	22	7.2	30	11.7	
Toilet	28	9.2	56	21.8	
Return to distributor	106	34.5	50	19.6	
Knowledge on the medications' destruction methods by contractors					0.54
Incineration	74	33.3	56	28.6	
Garbage	46	20.7	38	19.4	
Toilet	12	5.4	30	15.3	
Sink	10	4.5	20	10.2	
Unknown	80	36.1	52	26.5	
Knowledge on the medications' destruction methods by distributors					0.68
incineration	70	31.5	66	33.7	
Garbage	40	18	38	19.4	
Toilet	10	4.5	32	16.3	
Sink	14	6.3	14	7.1	
Unknown	88	39.7	46	23.5	
Opinion about having national centers for medication disposal in the UAE					<0.001
Yes	168	75.7	118	60.2	
No	54	24.3	74	37.8	
Do not know	0	0	4	2	
Opinions about the responsible for minimizing medications wastage					0.42
Pharmacists	102	45.9	100	51	
Prescribers	78	35.2	54	27.6	
Patients	36	16.2	42	21.4	
Do not know	6	2.7	0	0	
Methods to manage medicines' quantities in stock					0.04
Stock limitation	133	59.9	83	42.3	
Collaborations with other pharmacies to exchange the nearly expired drugs	89	40.1	113	57.7	

strongly believe that the UAE needs a specialized center for waste management. Surprisingly, those findings are inconsistent with the results of the Saudi Arabia study (Alghadeer & Al-Arifi, 2021b), which can be rationalized that younger pharmacists are more updated and aware of safe disposal requirements.

When discussing ways to minimize drug wastage and decrease the number of waste medications, the participating pharmacists had many suggestions, starting with controlling the batch order and asking patients about the drugs they already have at home. Others mentioned prioritizing medications that expire within eight months to be sold before the rest, dispensing according to the required prescription, and using FEFO “first in, first out” method (Hertog et al., 2014). Finally, approximately half of the pharmacists concurred on their capability of taking preventative approaches during dispensing. On the other hand, other pharmacists believed the prescribers were responsible for these actions.

Skin and hair care products were some of the most expired products in community pharmacies due to pharmacists ordering an excessive amount of these products. In reality, people buy skin care products in small quantities due to their high cost, with many similar products being cheaper in other retail stores supported by advertisements (Lee et al., 2020). In addition, antibiotics are also on the top list of expired products because of the variety of antibiotics available in the market from different companies with various dosage forms for the same antibiotics. However, a critical factor that should be accounted for to reduce the risk of antibiotic resistance and wastage is international treatment guidelines to restrict antibiotic prescription by healthcare physicians (Ebrahim et al., 2019). Similar to antibiotics, supplements come in various categories with different concentrations, leaving many of these products to accumulate in the pharmacy and later be discarded, again placing them at the top list of expired products. Our findings were

Table 6

The most common expired pharmaceutical classes in the community pharmacies.

Most commonly expired medications categories *	n	%
Skin Care and Hair Care products	282	12.1
Supplements: vitamins, minerals, and probiotics	258	10.8
Analgesic and anti-fever	150	6.4
Antibiotics	110	4.7
Mouth care products	98	4.1
Anti-diabetic medications	94	4
Asthma medications	92	3.9
Fertility Problem medications (contraceptive hormones)	90	3.8
Nasal Decongestants	88	3.7
Antihypertensive medications	88	3.7
Antacids	86	3.6
Baby Care products	82	3.5
Antihistaminic medications	78	3.3
Anti-hyperlipidemic agents	74	3.1
Eye disease medications (drops)	74	3.1
Antispasmodics	72	3
Anti-Epileptics	72	3
Thyroid disorder medications	66	2.8
Heart disease medications	66	2.8
Wound Healing products	66	2.8
Weight loss medications	64	2.7
Motion sickness medications	62	2.6
Laxatives	60	2.5
Nicotine replacement products	60	2.5
Anticoagulants	58	2.4

* Multiple responses allowed.

similar to New Zealand, where non-steroid anti-inflammatory drugs (NSAIDs) were one of the most discarded medications (Tong et al., 2011).

4.1. Study strengths and limitations

To the best of our knowledge, this is the first study in the UAE to explore the current practices undertaken by the community pharmacists to reduce of pharmaceutical waste that pursue suggestions to limit this medication wastage. Moreover, the portion of community pharmacists targeted in this study was large enough to include a representative number of pharmacists from different community pharmacies.

Nevertheless, this study had some limitations. The results relied on the accuracy and candor of the participants' responses, which might have led to information bias. Moreover, very few number of pharmacists (<10) requested further elaboration on questions which is better to be avoided in future studies.

Although the sample size was enough to achieve statistical power, a larger sample size is recommended to generalize the findings over the UAE pharmacists.

Finally, as this study was conducted before the global COVID-19 pandemic, it is necessary to assess changes in disposal protocols during and after the pandemic. Despite this limitation, comparing how the COVID-19 outbreak affected medication consumption in pharmacies with the current findings would be insightful.

The COVID-19 pandemic affected all disciplines globally, including the UAE. The outbreak lockdown led to the second large global economic recession in history. However, the UAE government obligated a very intense lockdown to handle the situation, which caused a huge decline in most medication sales. This drop led to a pharmaceutical stock crisis in the pharmacies. Indeed, this ended by increasing the number of expired medications in the pharmacies. Moreover, the UAE government lockdown prohibited people from wandering in the streets and between emirates, which restricted contractors and distributors from going to the pharmacy to collect expired medications. According to our knowledge, there is no significant difference in the practice of disposal of unused

medication among pharmacists in the UAE. The research team plan to conduct another research to compare how the pandemic affected the disposal practice in pharmacies. However, current study is important to assess (pre and post the pandemic era).

5. Conclusion

To conclude, most of the participants know that the practice of pharmaceutical product disposal needs improvement. Hence, increasing the knowledge and awareness of community pharmacists about the correct disposal practices is required. Nevertheless, pharmacists are mainly responsible for minimizing the disposal of waste medications and could reduce the number of expired pharmaceuticals from the start.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. The study questionnaire

Disposal practices for Expired medications in United Arab Emirates community pharmacies.

This questionnaire is designed to collect data to be utilized for academic purpose. In order to conduct the study in an ethical manner, the researchers would insure confidentiality and privacy of the participants.

Section1: Demographic information of participant for statistical purposes. *Please provide ONE answer as appropriate to you in the following questions.*

1. Which age group do you belong to?

- 24 years or below.
- 25–34 years.
- 35–44 years.
- 45–54 years.
- 55–64 years.
- 65 years and over.

2. Which gender group do you belong to?

- Male.
- Female.

3. How long have you been practicing as a pharmacist?

- <10 years.
- 11–20 years.
- 21–30 years.
- 31–40 years.
- Over 40 years.

Section 2: Prescription and over the counter (OTC) medicines

Please tick ALL the boxes that apply in your pharmacy.

Note: **Contractors = Disposal services employed by ministry of health for example (wekaya), whereas.**

Distributors = Wholesalers such as Propharma, pharmlink.

Drugs: How would you dispose of...

4. SOLID dosage forms (e.g. tablets, capsules, suppositories, pessaries, transdermal patches)?

In the rubbish bin.
 In the sink.
 In the toilet.
 In a medicines' bin collected by contractors\wekaya.
 Sent back to pharmaceutical distributor.
 Other (please specify).

5. LIQUID dosage forms (e.g. suspensions, elixirs, topical lotions, injections)?

In the rubbish bin.
 In the sink.
 In the toilet.
 In a medicines' bin collected by contractors\wekaya.
 Sent back to pharmaceutical distributor.
 Other (please specify).

6. SEMI-SOLID preparations (e.g. creams, ointments)?

In the rubbish bin.
 In the sink.
 In the toilet.
 In a medicines' bin collected by contractors\wekaya.
 Sent back to pharmaceutical distributor.
 Other (please specify).

Section 3: Role of pharmaceutical distributor or contractor in medicines destruction. If you dispose of any medicine through contractors or distributors, answer ONE or BOTH questions as appropriate.

Otherwise go to **Section 4**.

7. How do the contractor(s) you deal with destroy the collected wasted medicines?

By placing medicines in garbage before disposal in landfill.
 By incineration (or other forms of heat destruction).
 By flushing the medicines down the toilet.
 By flushing the medicines down the sink.
 Don't know, never been told how the medicines are destroyed.
 Other (please specify).

8. How do the pharmaceutical distributor(s) you deal with destroy the collected wasted medicines?

By placing medicines in garbage before disposal in landfill.
 By incineration (or other forms of heat destruction).
 By flushing the medicines down the toilet.
 By flushing the medicines down the sink.
 Don't know, never been told how the medicines are destroyed.
 Other (please specify).

Section 4: Funding for a state-run disposal and destruction system for wasted medicines.

Please tick ONE box from each question.

9. Do you think UAE needs a national medicines disposal scheme accessible to all pharmacies across the country?

Yes—Go to Question 13.
 No—Go to Question 14.
 Don't know or no comment.

10. If YES, who should fund a state-run medicines disposal and destruction system and why?

Patients.
 Ministry of Health/wekaya.
 Pharmaceutical companies.
 Community pharmacies.
 Reason.

11. If NO, why?

Reason.
Section 5: How to reduce medication wastage and cost.

12. Which actions are taken by in pharmacies to minimize medication wastage?

Actions by prescribers.
 Actions taken in the pharmacy during dispensing.
 Actions taken by the patient itself.

13. Are pharmacies managing the amount of medications that is kept in stock in the pharmacy in order to limit medication waste? if yes, How?

Limiting the amount that is kept in stock.
 Collaborating with other pharmacies to exchange almost expired drugs.
 Other:

14. Please explain other actions taken during dispensing that limit medication waste:

14.1. Please tick the most commonly expired medication in your pharmacy in the last 24-month, all that applied

- Skin Care and Hair Care products
- Supplements: vitamins, minerals, and probiotics
- Analgesic and anti-fever
- Antibiotics
- Mouth care products
- Anti-diabetic medications
- Asthma medications
- Fertility Problem medications (contraceptive hormones)
- Nasal Decongestants
- Antihypertensive medications
- Antacids
- Baby Care products
- Antihistaminic medications
- Anti-hyperlipidemic agents
- Eye disease medications (drops)
- Antispasmodics
- Anti-Epileptics
- Thyroid disorder medications
- Heart disease medications
- Wound Healing products
- Weight loss medications
- Motion sickness medications
- Laxatives
- Nicotine replacement products
- Anticoagulants

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