

# The Characteristics of Drug Wastage at the Hospital, Tuanku Jaafar Seremban, Malaysia: A Descriptive Study

MOHAMED AZMI HASSALI, AZUWANA SUPIAN, MOHAMED IZHAM IBRAHIM, HARITH K. AL-QAZAZ, MAHMOUD AL-HADDAD, FAHAD SALEEM, SUBISH PALAIAN

## ABSTRACT

**Objective:** To identify the types and the costs of medication wastage.

**Methods:** Excessive or extra medicines were collected from visiting hypertensive patients, from their houses. The medications were listed and the cost was calculated by using the cost price from the Integrated Store Hospital, Tuanku Jaafar Seremban, Malaysia. The returned medicines from the volunteer patients that were collected at the pharmacy counter in the hospital were listed and the cost was calculated by using the cost price. This study was conducted from June to November 2007.

**Results:** A total of 20,799 excessive pills were collected, with an average of 202 pills per patient from visited hypertensive

patients. The total cost which was lost or wasted was MYR 4,362.28, with the average wastage being MYR 42.35/patient. A total of 131,098 pills were collected from volunteers at the pharmacy counter, with an average of 21,850 pills per month. The total cost which was lost or wasted was MYR 59,566.50, with the average wastage being MYR 9,927.75 per month.

**Conclusion:** The data on the patients' adherence and medicine wastage may provide useful information to the Ministry of Health with regards to the selection of the first-line medication which was recommended, based on the need to maintain a patient on a given treatment. Pharmacists should clearly explain the patients how to use their drugs and guide them through their initial periods of therapeutic inactivity and transient side-effects.

**Key Words:** Drug wastage, Excessive medicine, Cost loss

## INTRODUCTION

Worldwide, hypertension has been found to be the most prevalent health problem among the adult primary care patients, but its treatment has often been sub-optimal. The introduction of newer medicines has increased the total expenditures on the anti-hypertensive therapy, but the non-adherence to the prescribed medicines has costly financial implications [1]. Adherence to the anti-hypertensive medication therapy was not adequately achieved because a high percentage of the subjects discontinued the treatment within 12 months of starting it [2-4]. It was associated with patient-related factors such as age, concurrent chronic pharmacologic treatments, previous hospital admissions for cardiovascular disease and the initial prescribed class of anti-hypertensive medicines. In North Wales, a study reported that over £1.1 million worth of medicines are returned to pharmacies to be destroyed. In the United Kingdom, it was estimated that more than £90 million worth of medicines were returned unused to the pharmacy and that all these returned medicines could never be re-used by the pharmacists [5]. The Northamptonshire Teaching Primary Care Trust (PCT) spends more than £80 million a year on medicines which have been prescribed, but millions of pounds worth of medicines which have been dispensed to patients are being returned unused to the pharmacies [6].

The extent of medication wastage by the Malaysian consumers was first studied by Ibrahim and colleagues in their study in 1996 [7]. This household survey study managed to collect 451 types of unused medicines from 101 houses. The findings showed that the trend of medicine usage was more towards wastage, because the consumers were not fully aware of the types of medications which were used or as to how they could be used properly. Patients tend to

keep medicines longer than necessary and they have the tendency of re-using and sharing, which can lead to undesirable effects and poisoning. A cohort study was conducted in a Local Health Unit of Ravenna (North Eastern Italy) by Esposti and colleagues to determine the duration for which patients remained on various anti-hypertensive medicines [8]. A total of 14,062 subjects were included in the study in which ACE inhibitors were the class of medications which were most commonly prescribed as the first-time therapy (28.0%). Within the group, it was observed that 60.3% of patients discontinued the use of the medications and that 30.9% continued and that 8.8% switched on to the treatment.

A study was conducted in Alberta, Canada from May to November 1999 by Morgan in 2001, to assess the occurrence, costs and the reasons for medication wastage in a population of older adults by doing in-home surveys and counts of leftover medicines [9]. A total of 73 subjects received in-home pharmacy evaluations and completed the questionnaires. The sum costs of the wasted medication was USD 2011 in the study group (n=66) and a total of 2078 wasted pills were found. The mean annual cost of the wasted medication was USD 30.47 and 31.5 pills wasted per person. The most frequently wasted medication classes were antibiotics, benzodiazepine and anti-hypertensives. The most frequent reasons for the wastage of medication were conditions which were resolved (n=44), perceived ineffectiveness (n=14), prescription change (n=14) and adverse effects (n=8).

## MATERIALS AND METHODS

This research was divided into 2 parts; part 1 was medicine wastage in the patients' house and part 2 was medicine wastage by the volunteers at the pharmacy counter. In part 1, a prospective,

randomized, community based trial was used in this research. The selected hypertensive patients were briefed about the research and were given a consent form to sign. In this research, all the excessive medications at the patients' houses were collected during the home visits. The excessive medicines in this research meant, the extra stock of the previous medications which were supplied to the patients' houses, which resulted from accumulation of the supplied medication or non-adherence to the medication. Only the previous excessive stocks of medicines were taken and the current medicines which were supplied were left behind. All the excessive medications would be collected in order to work out the costing component by using the cost price from the Integrated Store Hospital, Tuanku Jaafar Seremban, for the year 2007.

In part 2, the wasted medicines were collected from the volunteer patients or consumers who sent back the unwanted medicines to the pharmacy counter in the Hospital Tuanku Jaafar Seremban. A box was placed at the counter to collect and count the medicines from June to November 2007. The medicines were listed and the cost was calculated by using the cost price from the Integrated Store Hospital Tuanku Jaafar Seremban for the year 2007. This study was approved by the Ministry of Health Ethical Committee (MREC).

## RESULTS

One hundred and twenty-one patients met the enrolment criteria and they agreed to participate in this research, but throughout the eight months (April to November 2007), a total of 103 patients (85.12 %) were visited. A total of 20,799 excessive pills were collected with an average of 202 pills per patient from the hypertensive patients' houses. The total cost which was lost or wasted was MYR 4,362.28, with an average wastage of MYR 42.35/patient. A total of 131,098 pills were collected from volunteers at the pharmacy counter, with an average of 21,850 pills per month. The total cost which was lost or wasted was MYR 59,566.50, with an average wastage of MYR 9,927.75 per month.

The medicines that were listed as the top six quantities of excessive medicines from the patients' houses were metformin, potassium chloride, frusemide, captopril, isosorbide dinitrate and lovastatin [Table/Fig-1]. The medicines that were listed in the top six quantities of returned medicine were isosorbide dinitrate, metformin, lovastatin, frusemide, trimetazidine and potassium chloride. The medicines that were listed as having the top six highest costs of drug wastage from the patients' houses during the study period were gabapentin, insulin (Mixtard®), amlodipine, ticlopidine, captopril and isosorbide dinitrate; and the list which had the highest costs of returned medicine at the pharmacy counter consisted of donepezil hydrochloride, rivastigmine, atorvastatin, isosorbide dinitrate and lansoprazole [Table/Fig-2].

## DISCUSSION

The total cost of the collected excessive medicines from the patients houses during home visits by the researchers was MYR 4,362.28, with an average of MYR 42.35 for each patient (n=103). A total of 20,799 pills were found and an average of 202 pills was wasted by each patient. It was quite a small amount, but when it was multiplied with the number of patients who were seen in the Medical Outpatients Department in the Hospital Tuanku Jaafar Seremban in the year 2007 (36,176 patients, Annual Report 2007 Hospital Tuanku Jaafar, Seremban), it was found to cost the government about MYR 1,532,053.60. A similar study was done by Thomas M. Morgan, who found that the sum which was wasted in terms of the cost of the medication was USD 2,011.00 and there were 2078 pills in the study group (n=66) [9]. The mean annual cost of the wasted medication was USD 30.47 and 31.5 pills were wasted per-person. It also revealed that an average medication waste of USD 30.00 per-person-year represented a conservative estimate, and that the total national cost due to medication wastage would not be less than USD 1 billion per year. In this research, the average medication wastage or excessive supply was found to be MYR 42.35 per person and the total loss of government money throughout Malaysia would exceed a few millions.

The total cost of the medications which were returned within the time frame of the research was MYR 59,566.50, with an average of about MYR 9,927.75 each month; and the expected total cost of the wastage from the returned medications for the year 2007 at the pharmacy in Hospital Tuanku Jaafar Seremban was MYR 119,133.00. This finding was consistent with that of a study which was done by Oboh (2006), who reported that 6 to 10% of the total prescribing costs were lost from wasted medications and that up to 50% of those with long-term conditions failed to take their medicines correctly. The economic consequences of the

Excessive medicines from patients homes		Returned medicines from volunteer patients	
Item	Quantity	Item	Quantity
Metformin 500 mg tab	3,520	Isosorbide Dinitrate 10 mg tab.	12,760
Potassium Chloride 600 mg tab	2,930	Metformin 500 mg tab	9,040
Frusemide 40 mg tab	2,150	Lovastatin 20 mg tab	7,470
Captopril 25 mg tab	1,390	Frusemide 40 mg tab	5,360
Isosorbide Dinitrate 10 mg tab.	1110	Trimetazidine 20 mg tab	4,860
Lovastatin 20 mg tab	865	Potassium Chloride 600 mg tab	4,740

**[Table/Fig-1]:** List of the top 6 of excessive medicines (quantities) from patients' houses and returned medicines from volunteer patients

Excessive medicines from patients homes			Returned medicines from volunteer patients		
Item	Quantity	MYR	Item	Quantity	MYR
Gabapentin 300 mg cap	440	836.00	Donepezil 5 mg tab	690	6,129.00
Mixtard insulin	36	450.00	Amlodipine 5 mg tab	1920	1,996.80
Amlodipine 5 mg tab	420	436.80	Rivastigmin 4.5 mg cap	300	1,925.00
Ticlopidine 250 mg cap	694	312.30	Atorvastatin 20 mg tab	640	1,763.41
Captopril 25 mg tab	1390	296.04	Isosorbide dinitrate 10 mg tab	8150	1,687.05
Isosorbide Dinitrate 10 mg tab.	1110	229.77	Lansoprazole 30 mg tab	636	1,630.28

**[Table/Fig-2]:** List of the top 6 of excessive medicines (cost) from patients houses and returned medicines from volunteer patients

non-adherence increased when about half of the patients did not take their prescribed medications seriously. In the United States, hypertension was found to affect more than 60 million people at a cost which exceeded USD 8 billion [10].

The medicines which were listed as the top six quantities of excessive medicines from the patients' houses were metformin, potassium chloride, frusemide, captopril, isosorbide dinitrate and lovastatin. A similar pattern was found for the returned medicines at the pharmacy counter. The medicines that were listed in the top six quantities of returned medicine were isosorbide dinitrate, metformin, lovastatin, frusemide, trimetazidine and potassium chloride. From the list, it was found that each medicine had a tendency due to which the patients could not adhere to it. The frequency of the maintenance medicine intake for isosorbide dinitrate, metformin and captopril was three times daily. The number of medicines which were prescribed and the frequency of their doses could influence the patients' adherence. The same results were shown by Paes and colleagues, where the adherence rates of the diabetic patients who took oral hypoglycaemic agents was 74.8% for once-a-day doses and it was 38% for thrice daily doses [11]. Therefore, the most effective strategy for improving the patient adherence by using anti-hypertensive medication was to simplify the dosing regimen to a once daily dosage [12] as long as the increased cost did not cause a barrier to the adherence.

Lovastatin was suggested to be taken at night when patients tended to forget it and frusemide which has an inconvenient side-effect especially the urged for urination (diuresis). Patients discontinue the chronic medications frequently because of their side-effects, perceived ineffectiveness and personal considerations which are related to their use and the need for the treatment [13]. Diuretics are usually prescribed for most of the patients with uncomplicated hypertension, either alone or combined with drugs from other classes (JNC7). Most of the patients who were interviewed, complained of this inconvenient side-effect, which led them to omit this medication when they wanted to travel or were away from their houses. Pharmacists should clearly explain to the patients as to how to use their drugs and guide them through the initial periods of the therapeutic inactivity and transient of possibly avoidable side-effects. By counselling and educating patients, pharmacists can help the patients by giving them ideas or solutions on how to overcome this problem.

The high cost of the medicines will increase the cost of their wastage even though their quantity is small. The highest cost of the drug wastage from the patients' houses during the study period included Gabapentin (MYR 836.00), followed by mixtard insulin (MYR 450.00) and amlodipine (MYR 436.80) and the highest cost of the returned medicine at the pharmacy counter involved the acetylcholinesterase inhibitor group which was used in the treatment of Alzheimer's disease (dementia). The total cost of the donepezil hydrochloride tablet (Aricept ®) was MYR 6,129.50 and that of the rivastigmine tablet (Exelon ®) was MYR 3,465.00. Even though the quantity was small (23 boxes of 30 tablets of donepezil hydrochloride and only 9 boxes of 60 tablets of rivastigmine tablet), the high cost of each medicine would increase the total cost of the returned medication. A study which was conducted by Thomas M. Morgan claimed that there were four main causes for the wastage [9]; the diagnosis of the disease condition for which the medication was prescribed (37.4%), patient-perceived ineffectiveness (22.6%), prescription changes by the physician (15.8%) and patient-perceived adverse effects (14.4%). But sometimes, the waste

cannot be helped. Two of the main causes were the change of treatment by the physician and the returning of the medicines following the death of a patient.

The discontinuation of the anti-hypertensive medication treatment has also some important economic implications. Patients who discontinue the therapy may provide useful information to the health ministry, in that they can help in the selection of the first-line medication based on the need to maintain a patient on the treatment as well as on therapeutic efficacy. Improving the adherence with the treatment should be pursued in the short term for a more appropriate use of the pharmacologic resources, and in the long term, to reduce the cardiovascular risk and the high costs which are associated with the specialist hospital treatment. The former Health Minister of Malaysia, Datuk Dr. Chua Soi Lek, in a press statement (NST, April 16, 2005), said that the ministry could not afford the current practices anymore because of the increasing cost of the subsidizing expenditure for the medicines [14]. Datuk Dr. Chua Soi Lek also dictated that the prescription of medicines for the patients in a government hospital should have to be reviewed, to prevent their abuse and wastage. The researchers also found that the patients tended to collect as many possible medication supplies as they could, even though they still had enough stock left for a few months, because they thought that it was free and subsidized by the government.

Just like plastics, paper and glass, medicines should also be managed in an environmentally responsible manner. The recycling of medicines is generally illegal, because the medicines no longer have the assurance or guarantee of strength, quality, purity or storage condition and these unwanted medicines are regularly returned to the pharmacy for disposal [15]. A campaign can be held to raise public awareness on the health and environmental risk which is associated with the storage and the disposal of the unwanted and out-of-date medicines.

The Royal Pharmaceutical Society of Great Britain (RPSGB) (1998) suggested that any audit of medication wastage must involve the prescribers, since they are the ones who are able to make most of the changes. It may be helpful to gain the support of the health authorities. The RPSGB produced the data collection sheet of the medication wastage (Appendix K), which could be used by the pharmacists to start with the audit of medication wastage. Medicine wastage should be prevented wherever possible, through trial prescription programs, dispensing of smaller quantities, and by educating the patients, prescribers, the government and the pharmaceutical industry on the cost of waste (National Association of Pharmacy Regulatory Authorities Canada (NAPRA), 1997).

All these reasons give an impact of the patients' adherence to their treatment and medication. This is where pharmacists could play their role as counsellors to counsel and educate the patients regarding the treatment and medicines. The Pharmacist Homecare Service is one of the strategies that can be implemented where the pharmacists can visit the patients' homes to discuss together with their family. Pharmacists are in an ideal position to assess and act on the individual patient's reasons for returning the medication and to assist in the safe disposal of the unwanted medicines. As poor adherence was related to the presence of an increased number of medicines in homes, it might be improved by reviewing back the medication regimen through the choice of the medication and its dose and frequency [16].

## CONCLUSIONS

The data on the patient's adherence and medicine wastage may provide useful information to the Ministry of Health in the selection of first-line medication which has been recommended, based on the need to maintain a patient on a given treatment. The type of the medicines which have been prescribed and the frequency of their doses can influence the patient adherence and consequently, the medication wastage. Pharmacists should clearly explain to the patients as to how to use their drugs and guide them through the initial periods of therapeutic inactivity and transient side-effects. Through patient education and counselling, a pharmacist can help by giving ideas or solutions on how to improve the adherence to the medication.

## REFERENCES

- [1] Xu KT, Moloney M, Philips S. Economics of sub-optimal drug use: cost-savings of using JNC-recommended medications for the management of uncomplicated essential hypertension. *The American Journal of Managed Care*. 2003; 9: 529-36.
- [2] Bloom BS. Continuation of the initial anti-hypertensive medication after 1 year of therapy. *Clinical Therapeutic*. 1998;20: 671-81.
- [3] Caro JJ, Salas M, Speakman JL. Persistence with the treatment for hypertension in the actual practice. *Canada Medical Association Journal*. 1999;160: 31-7.
- [4] Jones JK, Gorkun L, Lian JR. Discontinuation of and changes in the treatment after the start of new courses of anti-hypertensive drugs: a study of a United Kingdom population. *British Medical Journal*. 1995;311: 293-5.
- [5] The Anglesey Local Health Board. Drug wastage: facts about drug wastage. 2008 [cited 2008 April 1]; Available from: <http://www.wales.nhs.uk/sites3/documents/272/ACFC43B.pdf>.
- [6] Northamptonshire TP. The cost of drug wastage in Northamptonshire. 2006 [cited 2008 April 2]; Available from: <http://northamptonshire.nhs.uk/pct/news/2007/May/naodrugwaste.htm>.
- [7] Ibrahim MIM, Awang R, Razak DA. A drug wastage and utilization study: a preliminary community project. *International Conferences on Improving Use of Medicines* 1997.
- [8] Esposti LD, Martino MD, Saragoni S, Sgreccia A, Capone A, Buda S, et al. Pharmacoeconomics of anti-hypertensive drug treatment: an analysis of how long the patients remain on various anti-hypertensive therapies. *The Journal of Clinical Hypertension*. 2004;6: 76-82.
- [9] Morgan TM. The economic impact of wasted prescription medication in an outpatient population of older adults. *The Journal of Family Practice*. 2001;50: 779-81.
- [10] Kjellgren KI, Ahlnera J, Siiljiib R. Taking anti-hypertensive medication-controlling or co-operating with the patients?. *International Journal of Cardiology*. 1995;47: 257-68.
- [11] Paes AH, Bakker A, Soe-Agnie CJ. Impact of the dosage frequency on the patient compliance. *Diabetes Care*. 1997;20: 1512-17.
- [12] Domino FJ. Improving adherence to the treatment for hypertension. *American Family Physician*. 2005;71: 2089-90.
- [13] Hugtenburg JG, Blom ATG, Kisoensingh SU. Initial phase of the chronic medication use; the patients' reasons for discontinuation. *British Journal of Clinical Pharmacology*. 2006;61: 352-54.
- [14] Ramli J. Drug prescription review. *New Straits Times*. 2005 April, 16.
- [15] National Association of Pharmacy Regulatory Authorities. "Recycling" and Disposal of Dispensed Drugs 2002 [April 1, 2008].
- [16] Sorensen L, Stokes JA, Pufdie DM, Woodward M, Roberts MS. Medication management at home : medication risk factor prevalence and inter-relationships. *Journal of Clinical Pharmacy and Therapeutics*. 2006;31: 485-91.

### AUTHOR(S):

1. Dr. Mohamed Azmi Hassali
2. Mr. Azuwana Supian
3. Dr. Mohamed Izhah Ibrahim
4. Harith K. Al-Qazaz
5. Dr. Mahmoud Al-Haddad
6. Mr. Fahad Saleem
7. Dr. Subish Palaian

### PARTICULARS OF CONTRIBUTORS:

1. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.
2. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.
3. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.
4. Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.

5. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.
6. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains, Malaysia, 11800 Penang, Malaysia.
7. Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains, Malaysia, 11800 Penang, Malaysia.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Mohamed Azmi Hassali, B.Pharm, M.Pharm (Clinical), PhD  
 Discipline of Social & Administrative Pharmacy,  
 School of Pharmaceutical Sciences,  
 Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia  
 Phone: +6046533888 ext. 4085, Fax: +604-6570017  
 E-mail: [azmihassali@gmail.com](mailto:azmihassali@gmail.com)

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