

## Pharmaceuticals and Environment: Role of Community Pharmacies

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### 29.1 Introduction

Over the last several years, many new medications have been launched on the market and more medications have come to be consumed worldwide. At the same time, the importance of minimizing their impact on the environment has become more obvious. In fact, human and environmental health are potentially affected by each step from the production of medicines to their utilization. In this context, what are the duties of the community pharmacist?

In this chapter, the magnitude of the problem of unwanted medicines and the role of community pharmacies in the waste disposal process will be discussed. This will include the collection of medicines, the education of patients regarding this collection and the appropriate use of medicines, as well as the prevention of hoarding and prescription of unwanted medicines.

### 29.2 Unwanted Medicines

Among the many reasons medicines may become unwanted are

- Death of the patient;
- Change in prescription;
- Poor adherence to medication;
- Poor adaptation of packaging size;
- Repeat filling of prescriptions without assessing the amount on hand.

Patients often stock medicines for short or long periods of time in their medicine cabinets and eventually discard them before or after their expiration date. However, keeping unused medicines at home or discarding them in an insecure fashion can increase the risks of misuse, which may lead to poisoning and suicides.

In addition, the improper disposal of unwanted medicines represents a source of pharmaceutical pollution. The way people choose to dispose of their unwanted medicines is influenced by the household hazardous products management policy in their locality. The habits in disposing of medicines identified in three studies (Kuspis and Krenzelo 1996; Slack et al. 2005; Abahussain and Ball 2007) are presented in Table 29.1. Although their settings are not comparable, all three studies show that returning medicines to pharmacies is clearly not the first option used. It should be noted that in the area where the second study was conducted, there were campaigns promoting the re-

**Table 29.1.** Disposal habits for unwanted medicines

	Kupsis and Krenzelok (1996)	Slack et al. (2005)	Abahussain and Ball (2007)
Number of respondents	500	400	200
Returned at pharmacy	1.4%	~24%	Included in "others"
Thrown in the trash	54.0%	~43%	97%
Flushed down the sewages	35.4%	~29%	1%
Others	9.2%	~4%	2%

turn of unwanted medicines to pharmacies. According to another recent study carried out in an outpatient pharmacy in the USA (Seehusen and Edwards 2006), more than 35% of patients believe that it is acceptable to flush medicines down the toilet and 21% believe it is acceptable to rinse them down the sink.

Most studies on unwanted medicines are based on what is returned to pharmacies, and hence provide a limited view of the topic. Even if the studies are performed in different settings, they provide an estimate of the amounts and types of medicines wasted. More than two-thirds of returned medicines, mostly capsules and tablets, are prescription drugs; the remainder consists of OTC products and a few samples (Garey et al. 2004; Isacson and Olofsson 1999). The proportion of each drug class returned is similar for classes of prescribed medications (Garey et al. 2004), although chronic treatment medications, in particular drugs to treat cardiovascular, respiratory and central nervous system disorders, are more often returned than those for acute treatments (Langley et al. 2005). Most returned drug classes, however, are not necessarily those that cost the most. Numerous studies have found that 20% to 53% of returned medicines were unopened, with many of the remainder being almost complete (Bronder and Klimpel 2001; Ekedahl 2006; Mackridge and Marriott 2007).

These figures illustrate the difficulties encountered by patients in managing their medications. In a Swedish study conducted by Ekedahl (2006), 19% of returned packs were current treatments that had passed their expiration date. This study also found that 3% of patients returned 24% of all returned medicines, with each patient returning twenty-three or more different packs. The majority of patients who returned their medications to their pharmacy were sixty-five years of age or older. A cross-sectional study amongst this population estimated that drug wastage accounted for 2.3% of all drug costs (Morgan 2001). These results confirm that elderly people should be the principal targets for patient empowerment and medication review. It is also important to note that about 30% of the packs were returned from deceased patients (Ekedahl 2006). Treatment at the end of a patient's life is tricky to manage, and many changes can occur. For these patients, a nurse or pharmacist using a weekly delivery system may better manage medication use.

Published studies, however, do not provide a comprehensive overview of the determinants of medicine returns. Patients often mention that they returned medicines to the pharmacy because they were cleaning out their medicine cabinets or the medicines were out of date. Only the reasons medicines remained unused can help in un-

derstanding and preventing wastage. In addition, when a patient returns several medicines, there may be different reasons for returning each one, a factor often not considered in studies. Furthermore, the person who returns medicines to the pharmacy may not be the person for whom these medicines were prescribed. Little is known about unused medicines directly collected from patients' homes, with only a fraction brought back to pharmacies.

The economic value of wasted medications has also been studied. In each country where studies have been performed, the wastage represents tens of millions of euros, and even this amount is probably an underestimate because these figures represent only medicines returned to pharmacies (Bronder and Klimpel 2001; Ekedahl 2006; Isacson and Olofsson 1999). In addition to the costs of the unused drugs, their economic value also includes the time needed to prescribe and dispense these medications. Furthermore, poor adherence leads to increased health care costs through additional hospital admissions, doctor visits, tests and supplementary prescriptions. Finally, the cost of destruction by high temperature incineration further adds to the financial burden.

Another important factor to consider is the impact of drug reimbursement plans. Some countries have economic incentives to discourage patients from obtaining drugs they will never use. In fact, a German study, consisting of two periods of evaluation in the same setting separated by a ten-year interval, showed that the quantity of wasted prescribed medicines was not reduced by higher charges (Bronder and Klimpel 2001).

### 29.3

#### Collection of Unwanted Medicines in Community Pharmacies

The distribution network used in reverse is the most effective solution to the problem of disposing of unwanted medicines, thus minimizing the negative effects on the environment and promoting public safety. Hence, in many countries, community pharmacies often are the principal collection points. The wholesaler plays the role of the waste carrier from the pharmacies to the nearest hazardous waste disposal facility. There, the medicines are incinerated at high temperatures by a regulated incinerator. Pharmaceutical industries also have a responsibility, which is why they often pay for part of the disposal costs.

Community pharmacies are an ideal location to establish collection programs. By definition, they are accessible places, visited by the consumers of medicines. The pharmacy staff is qualified to properly handle medicinal waste, and appropriate and safe storage areas, using special containers, are available. To ensure the safety of the staff, handling of medicines should be minimized and performed using protective equipment according to proper procedures. Pharmacists should be aware that a returned bag of mixed medicines may contain unexpected products, including mercury, iodized products, pesticides, cytotoxic products, sharps, needles and so on. These products must be identified by opening the bag or emptying it in front of the patient. Each must then be disposed of separately from ordinary solid forms using the proper precautions.

Generally, this return service is free of charge for customers but not for pharmacies. Indirect costs of sorting and storage, working time and infrastructure are not compensated. In some cases, pharmacists even have to assume the elimination ex-

penses. Moreover, pharmacies often dispose of medicines that customers obtained from other sales channels. On the other hand, this service can generate positive advertising for pharmacies, because customers are generally pleased to have the ability to safely discard their unused drugs. However, public and health authorities should better recognize the added value of this pharmaceutical service.

Over the past twenty years, various waste medicine disposal programs have been set up in many countries around the world. In Europe, pharmaceutical return programs generally encourage residents to bring unwanted medicines to pharmacies. In the UK, for example, the disposal of unwanted medicines has constituted essential service n° 3 of the NHS community pharmacy contract. The whole process is regulated, in particular the conditions of sorting and storage for each kind of pharmaceutical product ([www.psnc.org.uk/index.php?type=more\\_news&id=1572](http://www.psnc.org.uk/index.php?type=more_news&id=1572), October 2007). In France, a reverse distribution network called Cyclamed has operated for several years. It is currently being completely reorganized, due to the application of a recent law preventing drug donation ([www.unpf.org/cyclamed/index.htm](http://www.unpf.org/cyclamed/index.htm), October 2007). In Portugal, the return medicine disposal network called Valormed was created in 2001 by pharmacists, pharmaceutical companies and wholesalers' associations, and nearly all Portuguese pharmacies are members of this network ([www.valormed.pt](http://www.valormed.pt), October 2007). In Switzerland, there is no nationally harmonized system, but pharmacies generally accept unwanted medicines for free. In some areas, however, Swiss pharmacists have to pay for incineration (Dommer Schwaller 2004). In Germany, a private service provider, mandated by 75% of community pharmacies, collects and destroys expired medicines in addition to the collection of packaging. Waste is sorted by pharmacists into three categories: primary packing, packages and leaflets, and unused medicines ([www.ctm.at/vfw/index.html](http://www.ctm.at/vfw/index.html), November 2007).

In Australia, the National Return and Disposal of Unwanted Medicines Project, launched in 1998, is financed by the government and the pharmaceutical industry. In addition, pharmaceutical wholesalers have agreed to discount charges for the delivery and collection of containers from pharmacies. Protocols for returning unwanted medicines have been written for each step of the disposal. Furthermore, the program promotes consumer awareness ([www.ctm.at/vfw/index.html](http://www.ctm.at/vfw/index.html), November 2007).

In the USA, there are many different return programs available to the public, including ongoing collection at pharmacies or household waste facilities, single-day collection events, mail-back programs and public education. Nevertheless, it is important to note that some states have laws preventing pharmacies from accepting returned medications. Because no regulations are in place at the national level, guidelines for disposal were issued by the American Pharmaceutical Association and the White House encouraging the public to dispose of unused drugs through collection programs, if available. In areas where no such program was available, they recommended taking unwanted medicines out of their original containers, mixing them with an undesirable substance and putting them in opaque containers that are thrown in the trash just before the next garbage collection ([www.returnmed.com.au](http://www.returnmed.com.au), October 2007).

In Canada, the pharmaceutical industry voluntarily established the Medications Return Program. Although this program has been implemented on a national level, each province has taken a slightly different approach. With the support of industry, volunteer pharmacists have established a collaborative program to return and dispose of unwanted medicines, inform patients about this service and maintain return sta-

tistics ([www.whitehousedrugpolicy.gov/drugfact/factsht/proper%5Fdisposal.html](http://www.whitehousedrugpolicy.gov/drugfact/factsht/proper%5Fdisposal.html), October 2007).

## 29.4

### Patient Information and Drug Donation Issue

Patients need clear guidance on how to dispose appropriately of their unwanted medicines. The potential dangers in retaining unusable medicines at home and the ecologic consequences of using wrong disposal routes must also be communicated to the public; a call to avoid the oversupply and hoarding of medicines is needed as well.

In countries with national disposal systems, funds are often allocated to consumer awareness campaigns, using TV advertisements, posters, newspaper and magazine articles, websites, and brochures. Every time a patient comes to the pharmacy, however, the pharmacy staff should consider using the opportunity to explain to the patient what to do with remaining medicines. In a recent study, previous counseling about disposal was positively associated with increased return rates of medicines to pharmacies or other care providers (Seehusen and Edwards 2006).

To prevent people from donating drugs, the dangers of this practice must also be communicated to the public. Drug donations are considered controversial. Obviously, returned medicines should not be recycled, on safety and ethical grounds, because it is not possible to guarantee that they were stored under appropriate conditions. On the other hand, however, many people cannot afford to buy medicines they need, and some medicines are simply not available in some areas.

Although donors have good intentions, many do not realize the possible unintended consequences to people who receive these medications. They often have the mistaken belief that in acute emergency situations, any type of drug is better than none at all. Many problems related to donated drugs are due to a lack of communication between the donor and the recipient. For example, these medicines may not be appropriate to the disease pattern of the recipient, not be labeled in the local language or in English or be unfamiliar to local healthcare practitioners. In addition, the quantities of drugs may be too large relative to the expiration date. Thus considerable amounts of donated medicines are not usable and must be disposed of at the emergency area. When shipment charges and customs taxes are included, drug donation is clearly not a cost-effective solution to disposing of unwanted medicines. For example, following the Southeast Asia Tsunami in 2004, 4 000 tons of medicines were received for fewer than two million people, according to figures published by *Pharmaciens Sans Frontières* ([www.medicationsreturn.ca](http://www.medicationsreturn.ca), October 2007). These medicines were labeled in more than sixteen foreign languages. Of the amount donated, 600 tons have been identified for destruction, which will cost an estimated 2.4 million Euros.

To coordinate drug donation practices, guidelines were established in 1999 by the World Health Organization, according to statements of the Federation International of Pharmacists adopted in 1997 ([www.psfci.org/new/fr/Medias/synthese.pdf](http://www.psfci.org/new/fr/Medias/synthese.pdf), October 2007; [www.euro.who.int/document/EHA/PAR\\_Donate\\_Guidelines.pdf](http://www.euro.who.int/document/EHA/PAR_Donate_Guidelines.pdf), October 2007). Several countries have enacted their own laws, often based on these guidelines. *Pharmaciens Sans Frontières* has applied these guidelines since 1999 for acute emergencies and focused their actions on development aid in non-emergency situations ([www.fip.org/www2/uploads/database\\_file.php?id=196&table\\_id=](http://www.fip.org/www2/uploads/database_file.php?id=196&table_id=), October 2007).

## 29.5 Prevention of the Waste of Medicines

Visits to the pharmacy can provide opportunities for educating patients about their medicines, including preventing the delivery of medicines that will not be consumed. It is important to determine the effectiveness and tolerability of medications for each patient before prescribing full quantities. Indeed, the supply of test quantities during therapy changes and initiation is an effective practice and, according to a Canadian survey, has been accepted by patients (Paterson and Anderson 2002).

Specific actions can also be organized, such as “brown-bag events” ([www.psfci.org/new/indexuk.htm](http://www.psfci.org/new/indexuk.htm), October 2007), in which patients are encouraged to gather all their prescriptions and over-the-counter medications and supplements and return them to their pharmacist. This type of event enables pharmacists to identify possible problems, including improper dosing, lapsed expiration dates, drug mismatches, compliance issues, duplicate medications and poorly stored medications. The pharmacist can then follow up by counseling the patient on appropriate medication usage and, when necessary, can refer the patient to his physician. Implementation of regular, timely medication review, including patient interviews, may contribute to the reduction of drug wastage. This is especially true for the elderly population, which generates a large quantity of unused medicines (Ekedahl 2006; Morgan 2001). Promotion of therapeutic adherence and good prescription practices can also have an indirect effect on preventing drug wastage.

The systems by which patients request prescription refills have been found to contribute to wastage of medicine. Among the measures that may reduce this problem are setting maximum dispensed dosages per year and not allowing the next refill until two-thirds of the anticipated treatment period delivered has passed, even if, as in Sweden, this last measure does not prevent a minority of patients from hoarding medicines by obtaining several prescriptions for the same drug (Ekedahl 2006). In all cases, however, it is important to make patients aware that once the medicine is delivered, it should not be reused, even if the package or the vial is unopened and not expired, and it should not be donated to patients in a developing country.

Better coordination between health care professionals during the hospital discharge of a patient should lead to better outpatient care, including the management of medications. This will be clinically beneficial to the patient and enhance the rational use of medicines.

## 29.6 Conclusion

The best way to keep the environment free of the impact of unwanted medicines is to advise customers to bring back their unused medicines to the pharmacy, which can then dispose of them properly. The community pharmacist, however, should also be involved upstream of the waste disposal problem. The pharmacist should promote good prescription practices, optimal dispensation, drug use and patient adherence. In addition, every returned prescription medicine represents wasted health care expenditure. Careful analysis of medicines not taken by patients may provide important clues about ways to decrease waste in health care funds.

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