Returned medicines: waste or a wasted opportunity?

Adam J. Mackridge1, John F. Marriott2

1Pharmacy Practice Research Group, School of Pharmacy and Chemistry, Liverpool John Moores University, Byrom Street, Liverpool L3 3AF, UK
2Pharmacy Practice Research Group, School of Life and Health Sciences, Aston University, Aston Triangle, Birmingham B4 7ET, UK

Address correspondence to Adam J. Mackridge, E-mail: a.mackridge@ljmu.ac.uk

ABSTRACT

Background Re-use of unused medicines returned from patients is currently considered unethical in the UK and these are usually destroyed by incineration. Previous studies suggest that many of these medicines may be in a condition suitable for re-use.

Methods All medicines returned over two months to participating community pharmacies and GP surgeries in Eastern Birmingham PCT were assessed for type, quantity and value. A registered pharmacist assessed packs against set criteria to determine the suitability for possible re-use.

Results Nine hundred and thirty-four return events were made from 910 patients, comprising 3765 items worth £33 608. Cardiovascular drugs (1003, 27%) and those acting on the CNS (884, 24%) were most prevalent. Returned packs had a median of 17 months remaining before expiry and one-quarter of packs (1248 out of 4291) were suitable for possible re-use. One-third of those suitable for re-use (476 out of 1248) contained drugs in the latest WHO Essential Drugs List.

Conclusion Unused medicines are returned in substantial quantities and have considerable financial value, with many in a condition suitable for re-use. We consider it appropriate to reopen the debate on the potential for re-using these medicines in developing countries where medicines are not widely available and also within the UK.

Keywords unused medicines, primary health care, equipment reuse

Introduction

Unused medicines pose a risk to public health through poisoning and suicide when allowed to accumulate in the home and to the environment through poor disposal. Therefore, minimizing the quantity of unused medicines generated and ensuring the safe disposal of unavoidable unused medicines is an important public health concern. Few published studies have attempted to measure unused medicines in primary care in the UK. However, the limited data indicate that large quantities are present in primary care. One study reported 3099 items returned to a single community pharmacy over a three-year period, whereas another reported 1091 items returned to 30 pharmacies over one month. A pilot study considering medicines returned to a GP surgery reported 340 items returned to eight community pharmacies and five GP surgeries over four weeks.

The cost of medicines dispensed in primary care in England during 2005 was almost £8000 million. During 2004, over 580 tonnes of unused medicines were destroyed in England through the community pharmacy Disposal of Old Pharmaceuticals (DOOP) service. This scheme involves removal of unused medicines by licensed waste carriers for high-temperature incineration and is funded by the Department of Health at an estimated cost of over £1 million per annum. Additional costs are also incurred by community pharmacies through collection and handling of these unused medicines. Re-issuing these medicines is currently considered unethical by both the British Medical Association and the Royal Pharmaceutical Society of Great Britain. The World Health Organisation Guidelines for drug donations also state that sending medicines overseas that would not otherwise be used within the source country is unacceptable. However, the possibility of re-use has been mooted a number of times and one UK charity has been re-using patients’ unused medicines for humanitarian aid for a number of years. Additionally, in the USA, some schemes exist where medicines returned from patients are recycled for use in developing countries.
In the present study, we aim to provide detailed data on the nature and scale of unused medicines in primary care, including GP surgeries as a disposal route, and the potential for re-use of these returned medicines.

Methods

Medicines returned to pharmacies and GP surgeries were used as a surrogate marker of unused medicines in primary care in line with previous studies in this field.\(^5\)\(^–\)\(^7\) Data were collected over eight weeks in May and June 2003 in Eastern Birmingham Primary Care Trust (PCT), a predominantly urban PCT with an ethnic minority population of ~20%. The age and sex distribution of the PCT were similar to those for the UK as a whole.\(^20\)\(^–\)\(^21\) All pharmacies and GP surgeries in the PCT were invited to participate. The study was not publicized to patients and no promotion of the DOOP service was recorded locally or nationally in the 24 months prior to data collection.

A return event was coded as any event where an individual returned a quantity of unused medicines for disposal and was identified by a uniquely coded label attached at the time of the return. An item was coded as all the packs of a given medicine from one return event with the same date and location of dispensing. All medicinal items that had previously been dispensed by a UK pharmacy, identified by the presence of a dispensing label, were included in the study.

The person making each return event was asked to provide the reason for return and relevant patient demographics (date of birth, postcode); all other data were obtained from the label and packaging of the returned medicines. Number of doses remaining in the pack was based on the dosage reported on the label and where no dose was identifiable, this was recorded as missing data.

Financial value was calculated for all returned medicines using the NHS reimbursement cost and categorized into therapeutic class based on the British National Formulary chapter structure.\(^22\)

Returned medicines were assessed by a registered pharmacist (AJM) for their suitability for possible re-use using the following criteria: over six months remaining before expiry; complete and unadulterated patient pack; an unbroken security seal in the case of devices; no special storage requirements.

Data were recorded in MS Access 2003 and analysed using MS Excel 2003 and Minitab v14. The Spearman rho test was used to determine significant correlation. Data are presented as mean ± standard deviation (range) where normally distributed or median (interquartile range) where the data are non-normal.

Results

Three-quarters of the primary healthcare sites participated, 51/60 (85%) pharmacies and 42/61 (70.5%) GP surgeries. During the eight-week study period, 934 return events were made (190 GP surgeries, 744 pharmacies), comprising 3765 items (431 GP surgeries, 3334 pharmacies) and totalling 4934 individual packs. The medicines were valued at £33 608 (£3432 GP surgeries, £30 176 pharmacies).

Medicines were returned from 910 patients with a mean age of 63.5 ± 0.78 years (10 months to 99 years) and there was no detectable correlation between the mean number of items returned per patient and their age (Spearman rho = 0.09, \(n = 516\)). Multiple return events were attributed to 51 patients and medicines for between 1 and 10 patients were present in each individual return event.

Medicines were returned from all therapeutic classes with the exception of immunological products and vaccines. The most commonly represented categories were cardiovascular drugs (1003 items, 26.6%) and drugs acting on the central nervous system (884 items, 23.5%). Table 1 shows the number of items returned by the therapeutic class and the reason given for return. Items from the majority of classes were most commonly returned following a patient death, with the exception of anti-infective drugs and those acting on the eye, which were most often returned following a clearout.

The therapeutic categories with the greatest financial value of returned items were inhaled corticosteroids (£2455, 7.3%) and opioid analgesics (£2091, 6.2%).

The most commonly returned drugs were aspirin (102 items), co-codamol (98), salbutamol (96), furosemide (90) and glyceryl trinitrate (78). Additionally, almost 3000 tramadol and over 16 000 paracetamol tablets and capsules and over 50 g of morphine and 4 g of diamorphine were also returned.

The mean financial value of returned items was £8.93 ± 18.21 (£0.00–358.20). Items contained sufficient remaining doses for a median 21 (0–42.7) days of treatment and one-third of items (1272, 33.8%) had less than two days treatment removed. Almost three-quarters (2154, 71.1%) of the 3030 items with a dispensing date were returned within one year of supply with the median time from dispensing to return being 128 (1–437) days. The 4291 packs with expiry dates had a median of 17 (0–28) months remaining before expiry. Half (2627, 53.2%) of the returned packs were unopened and 1248 (25.3%), with a financial value of £10 415, met the criteria for re-use. Of the packs classified as suitable

Approval was obtained from East Birmingham Local Research Ethics Committee prior to the study commencing.
for re-use, 476 contained drugs listed on the WHO model list of essential drugs and had a financial value of £2452. The total weight of medicines returned was 294 kg. However, no correlation was found between the weight of unused medicines and any clinical or financial value assessed.

**Discussion**

**Main findings of this study**

Patients in primary care routinely return substantial quantities of unused medicines to both community pharmacies and GP surgeries. Extrapolating the data by population suggests that over 2 million return events of this type may be made each year in the UK, incorporating 8 million items with a value of £75 million. Indirect costs associated with both the supply of medicines which are unused and their destruction by high-temperature incineration further add to the financial burden on the NHS.

**What is already known on this topic**

Data from the DOOP scheme and other published studies have already highlighted the issue of unused medicines. However, data are limited to crude weight measurements or from small studies, and the specific quantities and types of unused medicines are not clearly known. The possibility for re-use of these medicines cannot be estimated without such data.
What this study adds

The data in the present study represent a large-scale assessment of unused medicines in primary care and allow an estimation of the potential for re-use of these medicines. Additionally, the data provide a basis for a better understanding of the reasons leading to unused medicines.

While patient death was responsible for the single largest proportion of the unused items, two-thirds of items were returned as a result of potentially predictable factors, including medicines stopped owing to ineffective therapy and adverse drug reactions. For example, one-third of the cardiovascular items was returned through a clearout of accumulated medicines or because the patient stopped taking the medicine and a further one-fifth was unused as a result of changes in prescription. Ensuring appropriate supply quantities, by taking account of factors such as the likelihood of treatment success, possible dose changes and adverse drug reactions may help to reduce quantities of unused medicines to a minimum.

The traditional NHS repeat prescribing system presently used in GP surgeries throughout the UK may, in some cases, contribute to surplus supply of medicines. It has been shown that the supply of newly prescribed medicines in small instilments and using the new pharmacy-based repeat dispensing procedure, implemented across England and Wales in 2005, can lead to a reduction in unused medicines without unduly increasing workload. It is possible that extending these practices could help to minimize unused medicines generated through excess supply.

It is unlikely that unused medicines would be entirely eliminated in any system, and the data indicate that approximately one-quarter of returned medicines is in a condition potentially suitable for re-use with almost two-fifths of these being essential medicines as defined by WHO. This concurs with data from a similar study performed in France. It is possible that returned medicines may not have been stored in accordance with the manufacturer’s instructions and while the likelihood of this leading to a significant change to the medicine is slim, it cannot be ignored. However, with current stability testing guidance and by utilizing modern packaging techniques, including tamper-evident seals and ‘smart’ labels that react to temperature and humidity, it would be possible to identify inappropriately stored medicines. Additionally, if formulations are deemed unstable such as to render them unusable following reasonable storage in the home, this would raise questions regarding the normal use of such medicines for the primary recipient within the expiry date. These findings lead us to suggest that the potential re-use of medicines should be reconsidered by UK authorities.

The weight of medicines returned in this study was consistent with available data from the DOOP scheme, although it was shown to bear no relationship with any clinical or financial factors assessed. It should be noted that the rising weight of unused medicines collected through the DOOP scheme is likely to lead to increasing costs of disposal since this is based upon weight of medicines handled. Therefore, reducing the quantities of unused medicines and sorting medicines for re-use would help to minimize the growth in this expenditure and costs of undertaking such tasks would therefore be partially offset.

While formal mechanisms exist for collection of unused medicines from community pharmacies, there is no equivalent service for GP surgeries. However, if the patient actions seen in this PCT are replicated throughout the UK, the data indicate that 400 000 return events comprising 1 000 000 items are routinely made to GP surgeries each year. The final fate of such medicines is not currently known, but in light of current hazardous waste legislation, this issue also needs to be considered in more depth.

Limitations of this study

This study did not attempt to quantify disposal by other routes or to estimate quantities of unused medicines in patients’ homes, therefore it is likely to have substantially underestimated the extent of unused medicines present in primary care. Furthermore, the reasons identified for return of medicines, while providing some indication of the true causes of unused medicines, may have been open to differing interpretation by patients. A complementary study in the same populations investigated some of these issues using a postal questionnaire and identified that just one in three patients routinely disposed of medicines through pharmacies and general practices.

The use of returned medicines as a surrogate marker for unused medicines, although standard in studies investigating this issue, may have introduced some unknown bias. However, through the inclusion of GP surgeries and a large number of community pharmacies, we have minimized this potential. While this study is the most comprehensive assessment of unused medicines in the UK and possibly worldwide, the data were only collected in a single PCT over two months and therefore extrapolation of the findings should be viewed with caution.

Acknowledgments

The authors wish to thank the staff of participating community pharmacies and GP surgeries for their help and
support. Our gratitude is also expressed to Dr C. Langley for his contribution during the design phase and to the Royal Pharmaceutical Society of Great Britain who funded the study.

Competing interests

References