

# Public perceptions about the concept of medication reuse



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## Medication wastes: The public perceptions about the concept of medication reuse

### Chapter one

#### 1. Introduction

##### 1. 1 Background, definitions, and classification of medical wastes

There is a growing environmental realisation in the last few years, it is recognisable that the world's environmental carbon emissions, and global warming problems are increasing. Many organisations work to apply green principles of health care programs in their way for going green (Xie, 2012).

In the UK, the Centre for Sustainable Healthcare (CSH) the institution which was developed in 2008 to help NHS reduce carbon liberations and emissions by 80% by 2050 by involving health care professionals, patients, and the community clarifying the connections between environment and health care system (Stancliffe, 2014).

Waste is defined by European Union Waste Framework Directive (2008), as " any substance or object which the holder discards or intends or is required to discard".

All wastes created by medical activities falls under health care wastes. The Royal College of Nursing (RCN) report and the World Health Organisation (WHO) described health care wastes as all wastes produced by research facilities, laboratories, and organisations providing health and social care. Moreover, it involves the waste originating from small or sprinkled sources

such as that generated in the health care and social care started at home such as dialysis, insulin injections, bandages, swabs, sharps, blood, medicines and incontinence pads (RCN, 2014 and WHO, 2011).

Between (80) % of the waste produced by health-care providers is considered non-risk or general health-care waste, while the remaining (20) % of healthcare waste is considered as hazardous that maybe may be infectious, toxic or radioactive and may create a diversity of health risks. Health-care waste consists of possibly dangerous microorganisms with potential infectious risks such as development of microorganisms resistant to medication from health-care institution into the environment, and can infect patients, healthcare suppliers and the public. WHO classified the hazardous health care waste into (Appendix 1): infectious waste, pathological waste, sharps waste, pharmaceutical waste, genotoxic waste, chemical waste, heavy metals wastes and the radioactive waste. Pharmaceutical waste is waste containing pharmaceutical that are expired, or no longer used; items polluted by or including pharmaceuticals (WHO, 2011).

Usually not all the medications dispensed to the patients will be used, this is mainly due to many factors such as adverse drug reaction intolerance, relief of symptoms, changing the dose/dosage forms, medicine non-compliance and/or non-adherence issues and medicine being expired (Dharmender, 2013).

Pharmaceutical waste is defined by UK Department of health (2013), as expired, unused, spilt, and contaminated medicinal products, drugs, vaccines and sera that are no longer required and need to be disposed of

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appropriately; and/ or discarded items contaminated with medicinal, such as bottles or boxes with residues, gloves, masks, connecting tubing, syringe bodies and drug vials.

Abou-ouda HS (2003), defined medication wastage as " any medication or drug product that had been dispensed by a prescription or buy over the counter (OTC) which is not fully consumed".

## Chapter two

### 2. Literature review

#### 2. 1 causes of medication wastage

Drugs are wasted when dispensed to patients who are not taken them. In order to minimise the wastage of medications, it is important to investigate the causes behind medicines being returned, unused, and wasted by the patients. A review of the possible factors evidenced to potentially cause medication waste was conducted to summarise the most important causes of medicine returned unused.

##### 2. 1. 1 Patient death

Medications being returned unused by the patients resulting from patient death was reported in six studies. Mackridge *et al.* (2007), a cross sectional study of returned medicines to fifty one community pharmacies and forty two general practitioner surgeries in Eastern Birmingham (UK) over eight weeks, Cameron (1996), a self-reporting questionnaire study in 58 community pharmacies in Alberta (Canada) over eight weeks, and Ekedahl

(2006), a cross sectional study included fifty nine community pharmacies in Sweden reported that patient death was the most common cause of medication waste.

In the study by Langley et al. (2005), a small cross sectional observational study in eight community pharmacies and five general practitioner surgeries in East Birmingham/UK over four weeks, patient death was the second most common cause of returned unused medicines by the patients.

Data from Cook A (1996), a cross sectional study of returned medicines to seventeen community pharmacies over one month in UK, Hawksworth *et al.* (1996), a cross sectional study of returned medicines included thirty community pharmacies in UK, Coma *et al.* (2008), a cross sectional study of returned medicines to 38 community pharmacies over three months showed that patient death was reported but accounted only for about quarter of all returned unused medicines.

## 2. 1. 2 Medication changed or discontinued

There is a proof in the literature that changing medications is a considerable cause of medication returned unused by the patients, it is reported as a common cause of medication waste (Cameron 1996, Cook 1996, Hawksworth *et al.* 1996, Morgan 2001, Daniszewski *et al.* 2002, Langley et al. 2005, Abahussain et al. 2006, Ekedahl 2006, Mackridge *et al.* 2007, Braund et al. 2008, Coma *et al.* 2008, Braund and Gn et al. 2009, Braund and Peake et al. 2009, James et al. 2009).

Data from (Hawksworth *et al.* 1996, Daniszewski *et al.* 2002, Langley *et al.* 2005, Abahussain *et al.* 2006, Braund *et al.* 2008), found that changing medications was the most common reported cause of medication being wasted.

### 2. 1. 3 Medication Expired

### 2. 2 The environmental impact of unused wasted returned medications

The toxic ecological effects of the pharmaceutical presence in the environment was studied and evaluated in the last few years. Data from Heberer (2002) and Woodhouse (2003), confirm the presence of pharmaceuticals in water and considered it serious, as it is not totally removed and even if it is present in trace levels is still considered pollutant to water receivers. The improper household disposal practices of unused medicines, via the local waste, the sewers, and the toilet was identified, as a source of water contamination (Bound, 2006).

The effect of pharmaceutical wastes in the environment was linked to possible development of endocrine deactivating compounds, reducing fertility, and antibiotic resistance bacteria. Data from Schwartz *et al.* (2003), confirmed the development of bacterial resistance as vancomycin resistant enterococci and beta-lactam-hydrolysing Enterobacteriaceae were cultivated from all wastewater biofilms. In the study by Lange *et al.* (2001), the “feminising effects” of endocrine-disrupting compounds, such as ethinyl estradiol, the synthetic hormone used in the contraceptive pill, on fish near wastewater treatment works outfalls was measured.

## 2. 3 The economic impact of unused wasted returned medicine

Studies from inside (five) and outside (six) UK, estimated the value of the cost of medication waste are reviewed below.

Results from Hawksworth *et al.* (1996), a cross sectional study included thirty community pharmacies in Kirklees/West Yorkshire (UK) over a period of one month showed an estimated cost of £37 million of unused medicine were from patients home.

Langley *et al.* (2005), a small cross sectional observational study in eight community pharmacies and five general practitioner surgeries in East Birmingham/UK over four weeks, showed that the total cost of returned medicines was £3986 and £3751 respectively.

In the study by Mackridge *et al.* (2007), a cross sectional study reported an estimate of £75 million value of returned medicines to fifty one community pharmacies and forty two general practitioner surgeries in Eastern Birmingham over eight weeks. In the same year, the UK National Audit Office report, proposed that each year an estimate of £100 million value of unused returned medicine. As the £100 million estimate was based on unused medicine that actually returned, this was considered as an underrated figure of the full cost of wasted medicines, as a result the department of health estimated that as much as 10% of all drugs prescribed were wasted (10% of the NHS prescribing budget) which is estimated to be £800 million-worth of drugs are wasted annually in primary care.

Data from Trueman *et al.* (2010), a research undertaken by the York Health Economics Consortium and London School of Pharmacy in 2009, estimated that the annual cost of the primary and community care medicines wastage in UK NHS was around £300 million per year (£ 250-300 million per year), with estimated £90 million of unused medicines stored in individual's homes, £110 million returned to community pharmacies over the course of a year, and up to £50 million of NHS supplied medicines that are disposed of annually by care homes. The authors of this report also estimated that less than 50% of this total figure is cost effectively preventable.

International studies from outside UK was also included and reviewed. A Canadian study by Cameron S (1996), in fifty eight pharmacies over eight weeks estimated the cost of unused medicines returned was \$60350, the extrapolated cost which included the whole 750 community pharmacies in Alberta during the same eight weeks period was \$716400.

Coma *et al.* (2008), a cross sectional study included thirty eight community pharmacies in Barcelona/Spain over a period of three months, showed that the estimated cost of returned medicines was €8, 539. 9, the extrapolated cost for the 20, 461 community pharmacies in whole Spain was a round €129 million.

Although the reuse concept of patient's unused returned medicines is considered unethical in the United Kingdom (UK), the unused medicines are returned in large quantities and have important financial value, with the preponderance considered acceptable to be used again by another patient (Mackridge, 2007).



Table 1. Summary of research studies evaluating the economic impact of wasted medicine

Study	Study setting and duration	Study method	Country	Main Findings
Hawksworth <i>et al.</i> (1996)	30 CPs over duration of 1 month	Cross sectional questionnaire	UK	A total of 1,091 items were returned by 366 patients with estimated value of £37 million
Langley <i>et al.</i> (2005)	8 CP and 5 GPs over duration of 4 weeks	Cross sectional observational study	UK	A total of 340 items were returned (42 to GPs and 298

to CPs).

The total cost of returned items was £3986 to GPs and £3751 CPs.

A total of 3765 items

51 CPs  
and 42

were returned

Mackridge *et al.* (2007) GPs over duration of 8 weeks Cross sectional study UK

by 910 patients with estimated value of £75 million

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Cameron S (1996)	l total) over duration of 8 weeks		

Morgan (2001) Sample of 73 Hampshire retirees from a cross-sectional pilot survey/Questionnaire community citizens aged 65 years or older. over a duration of 7 months US The total cost of 2078 pills was US \$ 2,011.00 with a mean annual cost of wasted medication was \$30.47/person (range = \$0-\$131.56). Individual costs were modest, but if \$30/indivi

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Information from medication waste campaign website illustrated that the estimated cost of unused medication (£300 million/year) could pay (by the average cost) for 11, 778 more community nurses, 19, 799 more drug treatment courses for breast cancer, 101, 351 more knee replacements, 80, 906 more hip replacements, and 300, 000 more drug treatment courses for Alzheimer's. In 2012 the NHS of Berkshire started major actions to reduce medicine waste, data from the NHS south central press release, showed that an estimate cost of wasted medicine across the Berkshire NHS and south central was £20 million per year.

The full cost of wasted medicine is not only the cost of returned medicines as estimated by the studies reviewed above (Table 1), in addition the cost of the destroying processes of the returned medicines, and the hidden costs of non-compliance/non-adherence effects which was not studied should be added to the full cost of wasted medicines in future research (UK National Audit Office Report, 2007).

2. 4 Disposal practices for unused medications

2. 5 Public perceptions about unused/wasted pharmaceuticals

2. 6 Medication reuse and recycling

A medicine reuse concept involves the return of unused and/or sealed medicines to a pharmacy, healthcare facility or charitable organisation for subsequent redistribution to recipients locally or internationally. This was

implemented on a charitable basis in the United States of America (USA) and in developing countries which experienced poor medicine supply (Bero, 2010).

Although such practice is considered unethical and not approved in UK, it may have environmental and economic advantages as many of these considered acceptable to be used again (Mackridge, 2007).

Ipsos MORI conducted 1,101 face to face interviews for Sustainable Development Unit of the UK NHS (SDU) with respondents aged fifteen and more using around one hundred and fifty sample points. The research was carried out in two periods between the eleven of November and the fifth of December 2011. All data was weighed to re-constitute the population profile of British people aged fifteen and more. Data from this recent survey reported that around half of the British people (52%) agreed to accept reissued medicines returned (that are unused and the safety was checked) by other patients while 32% said that they would not.

According to Dr David Pencheon the director of sustainability unit, "medicine reuse concept had been unaccepted in the past based on the assumption that patients are not willing to take the medicine returned by others. In healthcare system, the health care provider is always deviate strongly on the side of safety caution and discard medicines. For the time being, the economics of this behaviour need to be reconsidered" (Cooper, 2012).

## Chapter Three

### Research plan

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Ecologic

al

Is medicine being  
wasted

Impact

No

Yes

Imagine that Mr. Smith who is ill with diabetes is prescribed four medications each month. He doesn't pay for his medicines. He use all medicines as prescribed.

Imagine that Mr. Smith who is ill with diabetes is prescribed four medications each month. He doesn't pay for his medicines. He sometimes fails to take his medicines as prescribed.

No

Yes

Appendices

Appendix 1 (WHO and RCN Definitions and classifications of health care wastes

1. Infectious waste contaminated by blood and its secondary products, cultures and supplies of infectious agents, waste come from isolated patients, any

infected thrown away diagnostic samples with blood and body fluids, infected animals from laboratories, and contaminated swabs, bandages, and equipment such as disposable medical devices.

Pathological waste Recognizable parts of the body and contaminated animal dead bodies.

Genotoxic waste Very dangerous, mutagenic, teratogenic ' and carcinogenic, such as cytotoxic drugs and their metabolites.

Pharmaceutical waste Expired, unused, and contaminated drugs; vaccines and sera

Radioactive waste Such as contaminated glass materials with radioactive diagnostic or therapeutic materials.

Heavy metals waste Such as broken mercury thermometers.

Chemicals Such as broken mercury thermometers

Sharps	Such as syringes, needles, disposable scalpels and blades
	Clinical waste if it contains or is contaminated  with a medicine containing either:
Hazardous or Non Hazardous waste	2. A pharmaceutically-active substance (a substance able to affect biological systems); or  3. A dangerous substance such as chemicals at sufficient concentration to produce a hazardous property.
Clinical or Non Clinical waste	Hazardous if it contains or is contaminated with a cytotoxic or cytostatic medicine. Other medicines are not hazardous waste.
Offensive waste or sometimes called hygiene waste)	Is waste that is non-infectious and not clinical, but may cause offence due to the presence of recognisable health care waste materials, body fluids or odour, and secretions or excretions or that collection and disposal is not subject to special

requirements in order to prevent  
infection.

\*Adapted from WHO fact sheet (2011), and RCN guidance (2014)