Identifying and quantifying drug-related waste in a Healthcare Establishment

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Background

In France, 8% of CO_2 emissions (eCO_2) come from the healthcare system. Healthcare establishment represent 38% of those and 50% are attributable to the medicines and medical devices used in hospital (1). Several sustainable development initiatives are beginning to be implemented in hospitals, including the management of waste associated with medicines (2).

Objective

The aim of the study is to identify and quantify the sources of medicinal waste to implement virtuous sustainable development actions.

Materials and Methods

First, we targeted the pharmacy and two clinical departments in test phase : Follow-up and Rehabilitation care (FRC) for spinal cord injuries (Department A) and FRC for geriatrics (Department B). We chose these wards for the patient typology, average length of stay (ALOS), number of beds, dispensing method and type of storage (table 1). We created a specific blue trash in which all products in contact with medicine was throwed (pills, primary packaging, vial, syringe, plastic container…) (picture 1). Secondary packaging was not included in the study, because it was not in contact with the medicine.

Next, we extended to other clinical departments : FRC for pneumology and mucoviscidosis (Department C) and orthopedic surgery (Department D) (Table 1)

Medicines-related waste was quantified over 2023 by recording the number of bins, the fill rate and the weight. Waste qualification was based on observation of a sample of thirteen bins in the test phase for which the type of waste they contained was recorded.

Picture 1 : Medicine waste circuit

Characteristic	Department A	Department B	Department C	Department D
Ward	FRC neurology	FRC geriatry	FRC pneumology	Orthopedic surgery
Number of bed	26	45	29	44
ALOS	78	30	24	3
Dispensing method	Nominative and manual / twice-weekly	Globale	Globale	Globale
Number of référence in ward	144	192	162	103

Table 1 : Wards charactéristic

Results

Average bins fill is 73% (61 to 79%) and it depend on the type of waste which are throw in barrels. Nurses have to carry containers which are sometimes heavy, so they have not completed them all.

Average weight of medicine waste per bed in wards is 9,35Kg a Year (19,9 to 2,1 Kg) and it depend on the type of medicines they have to use for their patients. The weight of waste medicines per bed is 1,4Kg in the pharmacy.

In ward, System of administration (tubular bag) had the higher impact on weight and represent an average of 5,8Kg per bed a year. Glass bottle usually associate with them for medicine preparation represent an average of 2,2Kg per bed a year.

All wards produced primary packaging's pills, plastic bottle and syringe but only some specific ward use a lot of drinkable sachet. Those waste are lighter than the other but take a lot of place in barrels.

RESULTS TABLE	Department A	Department B	Department C	Department D	Pharmacy
% Fill	68%	83%	61%	79%	77%
Annual Weight (Kg)	224	96	576	301	197
Annual weight per bed (Kg)	8,6	2,1	19,9	6,8	1,4
Weight répartition (%)	Department A	Department B	Department C	Department D	Pharmacy
Glass bottle	25%	14%	34%	0%	45%
Tubular bag	23%	42%	56%	93%	0%
Drinkable sachet	20%	0%	0%	0%	0%
Primary packaging pills	13%	31,50%	4%	5%	31,30%
Plastic bottle and serynge	19%	12,50%	6%	2%	23,70%

Conclusion and Relevance

This study show us that every wards have their specific kind of medicine waste : In neurology a lot of drinkable sachet are taken by patient who have sympathetic and parasympathetic digestive's syndrome. In pneumology and especially mucoviscidosis a lot of intravenous antibiotics are used and in surgery a lot of infusions because they're administrated in operative room and reanimation, and disconnected in orthopedic ward.

We can observe some inconsistent data that lead us to interrogate nurses : In geriatric only empty waste was throw in the container, full one was put with infectious risk trash. This observation permit us to change some bad practice.

Type of medicine have an impact on the waste we produce : For example intravenous administration has a strong impact on eCO_2 and we must try to reduce it in the future (3). Also, the containers were not completely full, and this has a major financial impact as we pay by the container and not by weight.

In pharmacy we have a significant amount of out-of-date medication, whereas in clinical ward, waste come from the activity, except when the nurse forgets to return the medication to the patient on discharge.

The pharmacy is the backbone of the hospital's medication circuit, so it must take steps to dispose of medicinal waste in an ecologically responsible way. To do this, it is essential to know the quantity of waste and the specific characteristics of each department.

In the future we need to reduce wastage, reuse medicine when it's possible, recycle the packaging and rethink the way we use medicines to treat patient. The first main areas for improvement is reducing wastage and a secondary study is launched about the evaluation of wastage medicine in clinical wards and pharmacy in our hospital.

Références

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(3) Davies, Jessica F., et al. "Environmental and financial impacts of perioperative paracetamol use: a multicentre international life-cycle analysis." British Journal of Anaesthesia (2024).