

Original Research

Cost Analysis Of Drug Wastage In An Oncology Day Care

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Abstract

Introduction: Drug wastage is defined as the amount of drugs issued but discarded without being given to the patient. Drugs used in oncology are usually prescribed based on weight or body surface area. There are studies that have shown significant drug wastage in oncology centers. This study aims to quantify drug wastage in an oncology center and identify the drugs that are more prone to wastage.

Methods: It's a retrospective observational study aimed at quantifying drug wastage in a daycare of an oncology unit. The drug wasted for each drug in a given prescription was calculated. The Cost of each given drug was acquired from the pharmacy and was used to calculate the total price of the drug prescribed and the total price of the drug wasted.

Results : a total of 281 prescriptions were studied which had a total of 32 drugs. In all 195715 mg of drugs were acquired of which 8358 mg (4.27%) of drug was wasted. Drug wastage for each drug varied from 1.65% to 36.6%. The highest wastage among drugs that were prescribed 5 or more times were carfilzomib (36.6%), dacarbazine (10.5%), carboplatin (8.5%), pemetrexed (8.06%) and nab-paclitaxel (7.2%). The total cost of drugs that were acquired during the study period was Rs. 60,41,271 of which drugs worth Rs. 1,05,445 (1.7%) were wasted. The total expenditure on drugs that were given on flat dosing and thus are not prone to wastage was Rs. 38,33,236. Wastage for drugs that are dosed based on weight or body surface area was 4.7% (1,05,445 of 22,08,035). 5 drugs with the highest contribution to the cost of drug wastage nab-paclitaxel (n=20;17.9%), carfilzomib (n=5; 17.2%), carboplatin(n=82;15.9%), trastuzumab (n= 8; 11.7%) and paclitaxel (n=51;8.3%).

Conclusion : Approximately 5% of drug wastage was seen in our study. The study identifies nab-paclitaxel and carfilzomib as drugs that are prone to expensive wastage. mitigation strategies such as vial sharing, or the availability of multiple-strength vials should be explored to counter drug wastage.

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Introduction

Drug wastage is defined as the amount of drugs issued but discarded without being given to the patient(1). Drugs used in oncology are dosed either based on weight or body surface area (BSA) or have a fixed flat dosing. The drugs that are dosed based on weight or BSA are prone to wastage. Cytotoxic chemotherapy is a potential health hazard for sanitation and healthcare workers and requires proper disposal of wasted drugs.(2) The drugs that are wasted if used efficiently can help in reducing the stress on healthcare spending by the government.(3)This study aims to quantify drug wastage in an oncology center and identify the drugs that are more prone to wastage so that

mitigation strategies can be developed to reduce such wastage.

Methods

It's a retrospective observational study aimed at quantifying drug wastage in a daycare of an oncology unit. Drug wasted is defined as the quantity of drug that was issued but not given to the patient. Medical records from oncology day care were collected for a month. The drugs with their dose given to each patient and the total quantity of drug acquired for each patient was recorded. The drug wasted for each drug in a given prescription was calculated. The Cost of each given drug was acquired from the pharmacy and was

used to calculate the total price of the drug prescribed and the total price of the drug wasted.

Results

A total of 281 prescriptions with either single or multiple drugs were given in the study period of 1 month. 32 drugs were used in the study period. Drug wastage for each drug varied from 1.65% to 36.6%. Total drug wastage constituted 4.27% of the total drug issued. The drug with the highest percentage of

wastage was carfilzomib (36.6%) followed by vinorelbine (30%), vinblastine (20%), daunorubicin (12.5%), and dacarbazine (10.5%). Among drugs with 5 or more prescriptions during the study period, the drugs with the highest percentage of wastage were carfilzomib (36.6%) followed by dacarbazine (10.5%), carboplatin (8.5%), pemetrexed (8.06%) and nab-paclitaxel (7.2%).

Drug	Number of prescriptions	Total dose acquired (In mg)	Total dose given (In mg)	Total dose wasted (In mg)	% of drug wasted	Cost of the total drug acquired (Rupees)	Cost of the drug wasted (Rupees)
Carboplatin	82	33000	30185	2815	8.5	198225	16849
Paclitaxel	51	10780	10340	440	4.08	215600	8796
Gemcitabine	48	65200	64120	1080	1.65	176971	2920
Cisplatin	43	3070	2954	116	3.7	20507	758
Cyclophosphamide	37	34100	32384	1716	5.03	4092	205
Doxorubicin	33	2760	2648	112	4.05	18547	751
Nab-paclitaxel	20	4300	3990	310	7.2	262300	18885
Oxaliplatin	16	3120	2990	130	4.1	62400	2558
Docetaxel	14	1520	1510	10	0.65	95000	617
Bevacizumab	13	6600	6440	160	2.42	79200	1916
Pemetrexed	9	7500	6895	605	8.06	33885	2733
Trastuzumab	8	3520	3325	195	5.5	224000	12320
Dacarbazine	7	3800	3400	400	10.5	8208	861
Rituximab	6	3600	3600	0	0	118944	0
Carfilzomib	5	300	190	110	36.6	49700	18190
Nivolumab	5	1280	1280	0	0	1273600	0
Cetuximab	4	2300	2250	50	2.17	227700	4941
Amivantamab	3	3150	3150	0	0	882000	0
Ado-trastuzumab	3	720	700	20	2.7	224977	6074
Pertuzumab	3	1260	1260	0	0	826683	0
Epirubicin	3	300	300	0	0	6840	0
Daunorubicin	3	80	70	10	12.5	1012	126
Irinotecan	2	820	760	60	7.3	10742	784
Vinblastine	2	20	16	4	20	404	80
Vinorelbine	1	50	35	15	30	16938	5081
Pembrolizumab	1	200	200	0	0	394498	0
Daratumumab	1	800	800	0	0	151000	0
Etoposide	1	100	100	0	0	172	0
Methotrexate	1	50	50	0	0	41	0
Bleomycin	1	15	15	0	0	630	0

Atezolizumab	1	1200	1200	0	0	396725	0
Nimotuzumab	1	200	200	0	0	59730	0
Total		195715	187357	8358		6041271	105445

Table 1: Details of drugs used in the daycare of the oncology unit including cost, frequency of use over a month, and the amount and cost of drugs wasted. The total cost of drugs wasted in the study period was Rs. 1,05,445. Figure 1 shows the drugs with the highest proportion of contribution in the total cost of drug wastage were nab-paclitaxel (n=20;17.9%), carfilzomib (n=5; 17.2%), carboplatin(n=82;15.9%), trastuzumab (n= 8; 11.7%) and paclitaxel (n=51;8.3%).

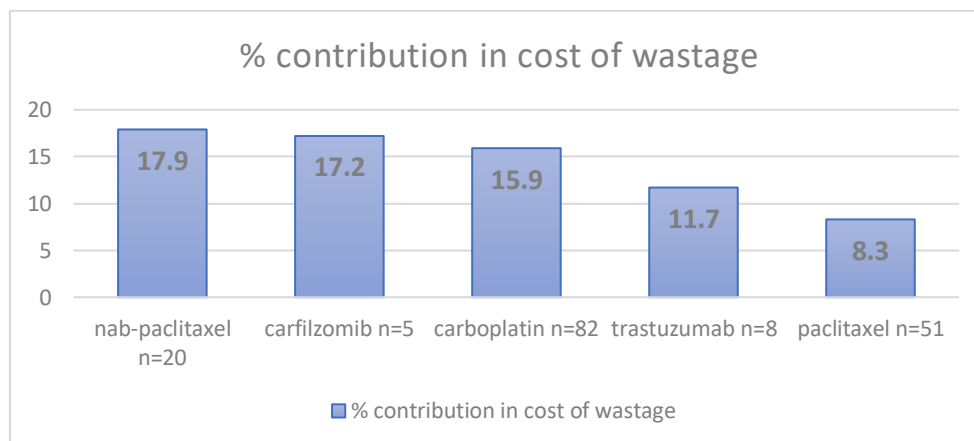


Figure 1: chart showing 5 biggest contributors to the cost of wasted drugs. n- number of prescriptions of the given drug.

In our study, the maximum cost of wastage in the disease was seen in breast cancer (n=56;21.2%), lung cancer (n=33;19%), multiple myeloma (n=11;17.29%), ovary cancer (n=26;12.6%) and head and neck cancer (n=57;11.3%)

Disease	Number of cases	Total mg of drugs wasted	Cost of drugs wasted (in Rs)
Head and neck cancer	57	1400	11928
Breast cancer	56	2038	22442
Lungs	33	1835	20050
Ovary	26	825	13310
Esophagus	16	565	5420
Multiple myeloma	11	210	18235
Gall bladder	9	141	930
NHL	9	0	0
Colon	8	210	3061
Pancreas	7	0	0
HL	7	424	1094
Rectum	6	110	1635
Urinary bladder	6	50	300
Prostate	6	10	617
Sarcoma	5	120	320
Medulloblastoma	3	5	33
Renal cell cancer	3	0	0
Cervix	3	10	200

ALL	3	10	126
Stomach	2	195	5204
Germ cell tumor	2	200	540
Endometrium	2	0	0
CLL	1	0	0
Total	281	8358	105445

Table 2: Details of drug wastage in different diseases as seen during the period of study

In this study, the total cost of drugs was 60,41,271 of which 1.7% that is 1,05,445 was wasted. Of the drugs given in the study, the drugs that are prescribed with flat dosing like 200 mg for pembrolizumab or 1200 mg for atezolizumab constituted to be worth Rs.38,33,236. When this cost was reduced from the total, we got the drugs that had the potential to be wasted which cost Rs. 22,08,035. The total cost of drugs that was wasted was 4.7% of this group of drugs where wastage was a possibility.

Total expenditure on drugs issued during the period of study	Rs.60,41,271
Total expenditure on drugs that are given on flat dosing (atezolizumab, nivolumab, pembrolizumab, pertuzumab, amivantamab, nimotuzumab) [n= 11]	Rs.38,33,236
Total expenditure on drugs issued including only drugs which are dosed based on weight or body surface area (excluding atezolizumab, nivolumab, pembrolizumab, pertuzumab, amivantamab, nimotuzumab) [n= 270]	Rs.22,08,035
Total cost of drugs wasted	Rs.1,05,445
Percentage wastage with respect to total cost of drugs used	1.7
Percentage wastage with respect to total cost of drugs which are dosed on the basis of weight or body surface area and prone to wastage	4.78

Table 3. Details of drug wastage in our study

Limitations of the study: Retrospective Single center Data is from daycare so doesn't capture the data of multiday chemotherapy regimens for which patients are admitted in the inpatient wards.

Discussion

Drug wastage is an economic burden on the patients which can be relieved by efficient use of resources. Especially in a low-middle-income country like India waste of drugs becomes an impediment in providing affordable care to patients. In our study, the total amount of drug wasted (in mg) is 4.27%, while in a similar study by D'souza et al(1), it is around 6.1%. In our study, the highest wastage in drugs with 5 or more total prescriptions was seen in carfilzomib (36.6%) followed by dacarbazine (10.5%), carboplatin (8.5%), pemetrexed (8.06%) and nab-paclitaxel (7.2%). While in the study by D'souza et al (1) trastuzumab (29.55%), followed by etoposide (20.4%), dacarbazine (17.14%), daunorubicin (16.67%), and carboplatin (11.29%) were the highest wasted drugs. Our study shows that wastage was minimal with

drugs where smaller dose vials were available like docetaxel, while it was higher where the vials were higher than the required dose. One way to address this wastage is by vial sharing for which the drugs should have multiple-use vials available as an option to facilitate it. Another option to reduce wastage is a pharmacist or central dispensation of medicines as it would ensure proper vial sharing. Dose rounding off is a method of preventing wastage that can be more effectively used by physicians. It is recommended by the Hematology /Oncology Pharmacy Association/HOPA to round off to the nearest 10% of the calculated dose. (4)

Conclusion

The cost of drug wastage in our study was 4.7% of the total non-flat-dosed drugs. The drugs that contributed the highest to drug wastage in our study were nab-paclitaxel, carfilzomib, carboplatin, trastuzumab, and paclitaxel. Mitigation strategies to reduce wastage can be beneficial especially in resource-limited setting like India.

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