



Pharmacoeconomic Analysis of Anticancer Drug Losses Related to Prescription and Reconstitution at Hôpital Général Idrissa Pouye (HOGIP), Dakar, Senegal

FALL Mor ¹, DIOP Moussa ², FAYE Djiby ², KHOUMA Saliou ³, AIDARA Souleymane ⁴, DIANGNE Coumba⁵, Niang Rokhaya Désirée⁶.

¹ Laboratory of Pharmacology, Iba Der Thiam University of Thiès, Thiès, Senegal, West Africa.

² Laboratory of Pharmaceutical Technology, Faculty of Medicine, Pharmacy and Odontology, Cheikh Anta Diop University, Dakar, Senegal, West Africa.

³ Laboratory of Pharmaceutical Technology, Iba Der Thiam University of Thiès, Thiès, Senegal, West Africa.

⁴ Laboratory of Pharmaceutical Technology, Iba Der Thiam University of Thiès, Thiès, Senegal, West Africa.

⁵ Oncology Department, Hôpital Général Idrissa Pouye (HOGIP), Dakar, Senegal, West Africa.

⁶ Department of Pharmacy, Faculty of Medicine, Pharmacy and Odontology (FMPO), Cheikh Anta Diop University, Dakar, Senegal

*Corresponding author's E-mail: mfdocmor4@gmail.com

Received: 09-03-2026; Revised: 23-05-2026; Accepted: 28-05-2026; Published online: 20-06-2026.

ABSTRACT

Anticancer drugs represent a major financial burden for healthcare systems, particularly in low- and middle-income countries. Their high cost, combined with constraints such as individualized dosing, limited stability after reconstitution, and inappropriate vial sizes, contributes to significant drug waste. This study aimed to assess the pharmacoeconomic impact of drug losses related to the prescription and reconstitution of anticancer drugs in the oncology department of Hôpital Général Idrissa Pouye (HOGIP), Dakar, Senegal. A retrospective descriptive study was conducted over a three-month period from October to December 2023, including chemotherapy protocols from 585 patients. Drug losses were estimated by comparing dispensed quantities with the actual amounts used during preparation, and financial losses were calculated based on unit prices in CFA francs. A total of 16 International Nonproprietary Names (INNs) were identified, with a predominance of female patients (65.11%). The daily number of patients ranged from 4 to 13. Significant drug losses were observed, with an estimated total exceeding 5 million CFA francs over the study period. Bevacizumab accounted for the highest financial losses due to its high cost, while paclitaxel was among the most frequently used drugs. These losses were mainly attributed to mismatches between prescribed doses and available vial sizes, lack of centralized compounding, and logistical constraints. Anticancer drug losses represent a substantial economic burden in resource-limited settings. The implementation of centralized chemotherapy preparation units, the adoption of dose banding strategies, and the promotion of biosimilars could significantly reduce waste and improve access to treatment.

Keywords: Pharmacoeconomics, anticancer drugs, drug waste, chemotherapy, Senegal, oncology.

INTRODUCTION

Over the past decades, cancer has become a major global public health priority, representing one of the leading causes of morbidity and mortality worldwide, with approximately 19.3 million new cases and 10 million deaths estimated in 2020¹. This burden continues to increase, particularly in low- and middle-income countries, where more than 70% of cancer-related deaths occur². In Senegal, cancer incidence is rising due to population aging, urbanization, and lifestyle changes, with more than 8,000 new cases diagnosed annually³.

Gynecological cancers (breast and cervical cancers) predominate among women, while digestive, lung, and prostate cancers are more frequent among men⁴. In this context, chemotherapy remains a cornerstone of cancer management, often combined with surgery and radiotherapy⁵. However, anticancer drugs represent a significant proportion of hospital expenditures, accounting for up to 40% of the pharmaceutical budget in oncology in certain settings⁶.

These drugs have specific characteristics, including high cost, individualized dosing, limited stability after reconstitution, and strict aseptic preparation requirements. These constraints contribute to significant drug losses, particularly due to the mismatch between prescribed doses

and available vial sizes⁷. At the international level, several studies have highlighted that anticancer drug waste is a major issue, with significant economic and organizational consequences⁸. In resource-limited settings, these losses are particularly critical, as they exacerbate barriers to treatment access and compromise equity in healthcare delivery⁹. Pharmacoeconomic analysis therefore emerges as an essential tool to assess resource use efficiency, identify sources of waste, and propose optimization strategies¹⁰.

At the Hôpital Général Idrissa Pouye, a referral oncology center in Dakar, the management of patients undergoing chemotherapy involves a complex medication-use process, from procurement to preparation and administration. In this context, evaluating drug losses is a key issue for improving quality of care and ensuring financial sustainability. The aim of this study was to analyze the pharmacoeconomic impact of losses related to the prescription and reconstitution of anticancer drugs in the oncology department of HOGIP, in order to identify key determinants and propose optimization strategies adapted to the Senegalese context.

Study setting

The study was conducted at the Hôpital Général Idrissa Pouye (HOGIP), named in honor of Professor Idrissa Pouye,



a prominent figure in the Senegalese healthcare system. The hospital plays a central role in the management of complex diseases, including cancer, cardiovascular diseases, and medical and surgical emergencies. It is equipped with modern technical facilities and specialized departments such as oncology, gynecology-obstetrics, and internal medicine.

Methodology

This was a retrospective descriptive study conducted on chemotherapy protocols of patients treated in the oncology department of HOGIP between October 2 and December 29, 2023. All therapeutic protocols recorded in the care register were analyzed and compared with prescriptions dispensed by the central pharmacy. Drug losses were evaluated by comparing the quantities dispensed with the actual amounts used during the preparation of cytotoxic drugs for each patient.

The following variables were collected for each preparation: prescription date, patient sex, prescribed dose (mg), type of packaging used, quantity dispensed, and unit price of the drug.

All data were entered into an-Excel database for analysis. Drug losses were calculated as the difference between prescribed quantities and actual volumes used during reconstitution. These differences were then multiplied by the unit price per milligram (in CFA francs) to estimate the economic cost of the losses.

RESULTS

A total of 585 patients were included in the study. The results are presented in the tables and figures below.

1. Gender Distribution

The gender distribution is illustrated in the figure below.

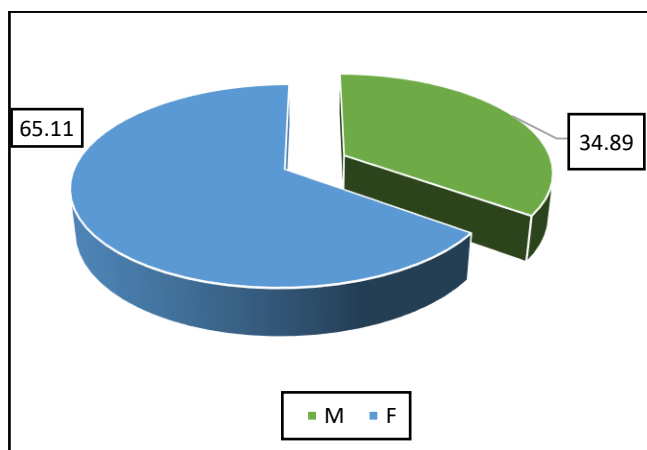


Figure 1: Distribution of patients by sex (Male/Female)

2. Number of patients per day

The number of patients receiving anticancer treatment per consultation day ranged from 4 to 13, as shown in the figure below.

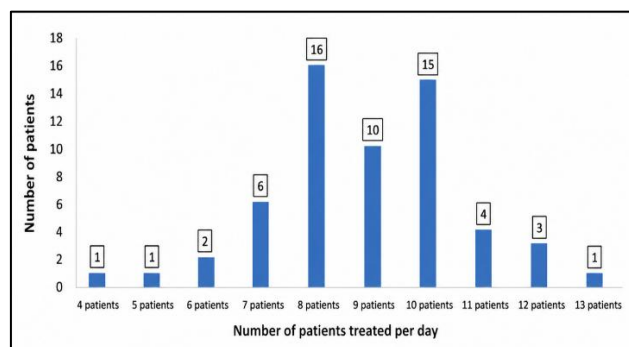


Figure 2: Daily frequency of patients receiving anticancer therapy

3. Distribution of International Nonproprietary Names (INNs)

Sixteen International Nonproprietary Names (INNs) were identified, with those exceeding 5% frequency shown in the figure below.

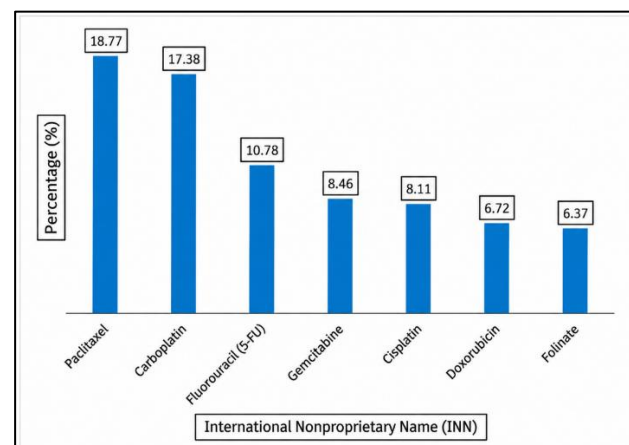


Figure 3: Percentage distribution of the most frequently used International Nonproprietary Names (INNs)

4. Cancer types

Twelve cancer types were identified according to the International Nonproprietary Names (INNs), as illustrated in the figure below.

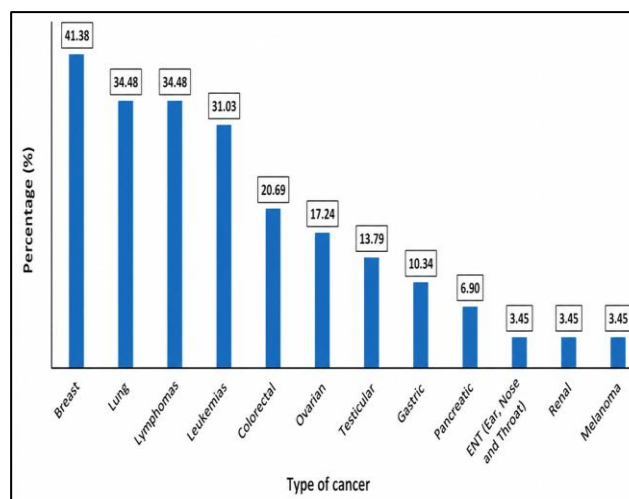


Figure 4 : Distribution of cancer types identified

5. Analysis of financial losses

Drug dispensing, whether followed by reconstitution or not, resulted in financial losses, as shown in the figure below.

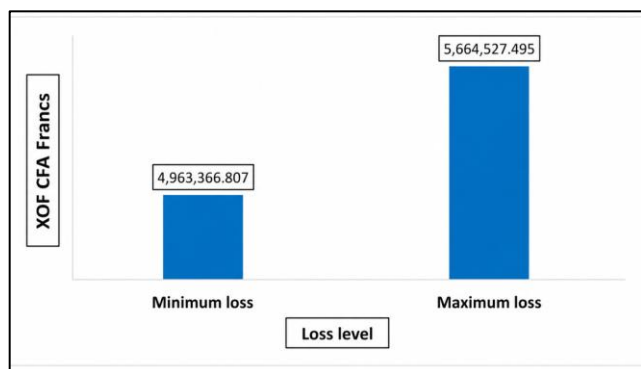


Figure 5: Actual and theoretical loss levels

6. Financial losses (CFA francs) by International Nonproprietary Name (INN)

Financial losses vary markedly depending on the INN, with the highest value observed for bevacizumab and the lowest for paclitaxel.

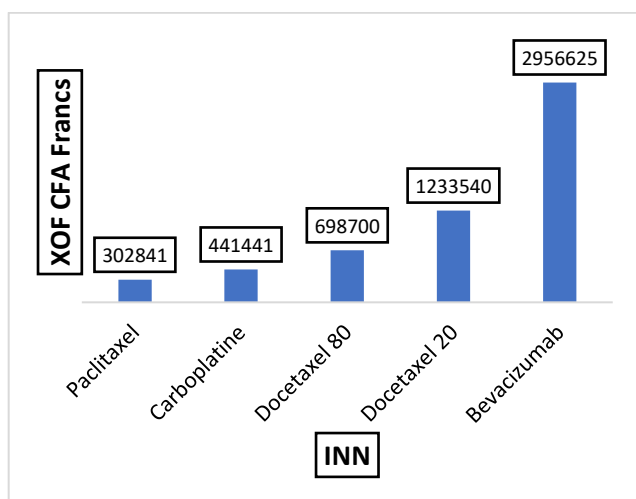


Figure 6: Value of losses in CFA francs by International Nonproprietary Name (INN)

DISCUSSION

Over a three-month period (October to December 2023), a total of 585 patients were included in this study. The results highlight key elements such as sex distribution, the diversity of molecules used (16 International Nonproprietary Names, INNs), daily patient flow, and, most importantly, the magnitude of drug losses. These findings are consistent with the international literature, which emphasizes the significance of medication waste in oncology, particularly in resource-limited settings¹¹.

The female predominance observed (65.11%) reflects national and regional epidemiological trends, characterized by a high incidence of breast and cervical cancers¹². This distribution is comparable to that reported in several sub-Saharan African countries¹³. A precise understanding of these trends is essential to adapt supply strategies and

reduce losses related to mismatches between needs and availability¹⁴.

The number of patients managed daily (4 to 13) indicates a moderate but steady level of activity, requiring rigorous organization of chemotherapy preparation. In many similar settings, the absence of centralized compounding units is associated with increased drug losses and variability in practices¹⁵.

The diversity of molecules used (16 INNs) reflects the complexity of therapeutic protocols in oncology. Monoclonal antibodies, such as bevacizumab, are particularly expensive due to their biotechnological production processes, lengthy and costly development, and stringent regulatory requirements¹⁶. These characteristics amplify the economic impact of losses, even in small quantities¹⁷.

The mismatch between prescribed doses and available vial sizes is a major contributor to waste. Single-dose vials, widely used for microbiological safety reasons, often lead to the disposal of unused fractions¹⁸. Strategies such as dose banding or the use of multi-dose vials have demonstrated effectiveness in reducing such losses¹⁹.

Paclitaxel and carboplatin, widely used in the treatment of ovarian and breast cancers, are among the most frequently administered drugs in this study. Their efficacy has been well established, with significant response rates in advanced cancers²⁰. However, their handling requires strict precautions due to risks of toxicity and contamination, which may also contribute to drug losses²¹.

The financial losses observed, estimated at over 5 million CFA francs over three months, are substantial. They result from multiple factors: inappropriate vial sizes, lack of centralized preparation, limited stability of products after opening, and logistical failures such as cold chain disruptions²². Similar studies have reported comparable losses in other African settings²³.

These losses have both direct and indirect consequences. At the hospital level, they lead to increased costs and pressure on pharmaceutical budgets. At the patient level, they may increase out-of-pocket expenses and limit access to treatment²⁴. Bevacizumab appears to be one of the main sources of economic loss due to its high cost, while paclitaxel is associated with high usage volumes. This duality (cost versus frequency) is well documented in the literature and represents a major challenge in pharmaceutical management²⁵.

To reduce these losses, several strategies can be considered. The implementation of a centralized chemotherapy compounding unit would allow dose pooling and standardization²⁶. Dose banding, negotiation of appropriate vial sizes, and the promotion of biosimilars are also effective approaches²⁷. Continuous staff training and the establishment of regular pharmaco-economic monitoring are essential to improve practices and ensure optimal use of resources²⁸.

Finally, these results highlight the need to strengthen national cancer control policies, particularly regarding access to medicines and the optimization of hospital supply chains²⁹.

CONCLUSION

This study highlights significant drug and financial losses in oncology, mainly driven by inappropriate vial sizes, lack of centralized compounding, and logistical constraints. Optimizing preparation practices, implementing centralized units, and adopting strategies such as dose banding and biosimilars are essential to reduce waste and improve access to treatment in resource-limited settings.

Acknowledgements

The authors would like to thank the staff of the oncology department of HOGIP for their valuable collaboration and support during data collection.

Ethical Approval

This study was conducted in accordance with ethical standards and approved by the relevant institutional ethics committee. Patient confidentiality was strictly maintained.

Data Availability Statement

The data used in this study are available from the corresponding author upon reasonable request.

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- World Health Organization. Global cancer observatory: cancer today. Lyon: International Agency for Research on Cancer; 2020.
- World Health Organization. Cancer fact sheet. Geneva: WHO; 2022.
- International Agency for Research on Cancer. Senegal cancer profile. Lyon: IARC; 2021.
- Gueye SMK, Gueye M, Coulbary SA, Diouf A, Moreau JC. Problématique de la prise en charge des cancers du sein au Sénégal. Pan Afr Med J. 2016;25:3.
- World Health Organization. Cancer control: knowledge into action. Geneva: WHO; 2022.
- World Health Organization. Pricing of cancer medicines and its impacts. Geneva: WHO; 2019.
- Vogler S, Vitry A, Babar ZU. Cancer drugs in 16 European countries: availability, prices and affordability. Lancet Oncol. 2017;18(6):717–26.
- Jahn P, et al. Medication waste in cancer care: a narrative review. Eur J Cancer Care. 2018;27(3):e12790.
- Atun R, et al. Expanding global access to cancer care. Lancet Oncol. 2015;16(10):e463–74.
- Michael Drummond, et al. Methods for the economic evaluation of health care programmes. 4th ed. Oxford: Oxford University Press; 2015.
- Bouvy JC, Vogler S. Pharmaceutical expenditure and policies. Value Health. 2021;24(5):678–85.
- Bray F, et al. Global cancer statistics 2020. CA Cancer J Clin. 2018;68(6):394–424.
- Jedy-Agba E, et al. Cancer incidence in sub-Saharan Africa. Lancet Glob Health. 2016;4(12):e923–34.
- Yadav P. Health product supply chains in developing countries. Health Syst Reform. 2015;1(2):142–54.
- Descoutures JM. Reconstitution des chimiothérapies anticancéreuses. Ann Pharm Fr. 2018;76(1):1–10.
- Kazazi-Hyseni F, Beijnen JH, Schellens JH. Bevacizumab. Oncologist. 2010;15(8):819–25.
- IQVIA. Global oncology trends report. 2022.
- European Medicines Agency. Guideline on single-use vials. EMA; 2019.
- Plumridge RJ, et al. Dose banding in chemotherapy. Eur J Hosp Pharm. 2020;27(2):89–94.
- Langer CJ, et al. Paclitaxel and carboplatin in advanced cancer. Eur PMC. 1995;22(4):18–29.
- National Institute for Occupational Safety and Health. Hazardous drug exposure. CDC; 2016.
- USAID. Pharmaceutical waste management in LMICs. Washington DC; 2021.
- Ofori-Asenso R, Agyeman AA. Irrational use of medicines in Africa. BMC Health Serv Res. 2016;16:144.
- Xu K, et al. Financial protection in health systems. Lancet. 2007;370:125–33.
- DiMasi JA, Grabowski HG, Hansen RW. Innovation in the pharmaceutical industry. J Health Econ. 2016;47:20–33.
- International Society of Oncology Pharmacy Practitioners (ISOPP). Standards of practice. 2022.
- Blackstone EA, Joseph PF. The economics of biosimilars. Am Health Drug Benefits. 2013;6(8):469–78.
- Pedersen CA, et al. ASHP national survey of pharmacy practice. Am J Health Syst Pharm. 2020;77(13):1026–50.
- World Health Organization. National cancer control programmes. Geneva: WHO; 2022.

For any questions related to this article, please reach us at: globalresearchonline@rediffmail.com
New manuscripts for publication can be submitted at: submit@globalresearchonline.net and submit_ijpsrr@rediffmail.com

