BRIEF RESEARCH REPORT

Hiding in Plain Sight: Quantifying Salbutamol and Ipratropium Inhaler Wastage in Hospitals

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ABSTRACT

Background: Previous studies have found significant inhaler wastage in the inpatient setting, which contributes to unnecessary health care expenditures. Wastage may involve inhalers available in automated dispensing cabinets (ADCs).

Objectives: To evaluate whether salbutamol and ipratropium inhalers were unnecessarily withdrawn from ADCs for hospital inpatients.

Methods: This cross-sectional study included patients from 16 health care facilities in British Columbia. ADC reports were run for the period August 2021 to January 2022 to identify salbutamol and ipratropium inhalers removed from ADCs.

Results: Over the study period, 8.3% (2180/26 324) of salbutamol and ipratropium inhalers were withdrawn from ADCs unnecessarily for the same patient encounter within a 2-day timeframe, and another 1118 (4.2%) represented instances when multiple inhalers were withdrawn for the same patient at the same time. Overall, 12.5% (3298/26 324) of all salbutamol and ipratropium inhalers were withdrawn unnecessarily. The total cost of these inhalers was about $31 600 over the 6-month period.

Conclusions: This evaluation revealed considerable wastage of inhalers, leading to wasted expenditures. Other health authorities should conduct similar analyses to determine whether similar problems exist in their settings.

Keywords: drug waste, health care expenditure, salbutamol, ipratropium, metered dose inhalers

RÉSUMÉ

Contexte : De précédentes études ont mis au jour un gaspillage important d'inhalateurs en milieu hospitalier, ce qui contribue à des dépenses de soins de santé inutiles. Ce gaspillage peut comprendre des inhalateurs disponibles dans des cabinet de distribution automatisé (CDA).

Objectif : Évaluer si les inhalateurs de salbutamol et d'ipratropium ont été inutilement retirés des CDA pour les patients hospitalisés.

Méthodes : Cette étude transversale comprenait des patients provenant de 16 établissements de soins de santé en Colombie-Britannique. Des rapports portant sur les CDA ont été générés pour la période d'août 2021 à janvier 2022 afin de recenser les inhalateurs de salbutamol et d'ipratropium qui ont été retirés des CDA.

Résultats : Pendant la période de l'étude, 8,3 % (2180/26 324) des inhalateurs de salbutamol et d'ipratropium ont été inutilement retirés des CDA pour la même rencontre avec le patient dans une fenêtre de 2 jours, et dans le cas de 1118 (4,2 %) inhalateurs, plusieurs inhalateurs ont été retirées en même temps pour un même patient. Dans l'ensemble, 12,5 % (3298/26 324) de tous les inhalateurs de salbutamol et d'ipratropium ont été inutilement retirés. Le coût total de ces inhalateurs s'élevait à environ 31 600 $ sur une période de 6 mois.

Conclusions : Cette évaluation a révélé un gaspillage considérable d'inhalateurs, ce qui entraîne des dépenses inutiles. D'autres autorités sanitaires devraient mener des analyses similaires pour savoir si des problèmes similaires se produisent dans leurs établissements.

Mots-clés : gaspillage de médicaments, dépenses de soins de santé, salbutamol, ipratropium, inhalateurs doseurs

INTRODUCTION

Metered dose inhalers (MDIs) are used frequently for hospital inpatients, which in turn may lead to significant waste and potential negative environmental impacts because of the nature of the devices used (i.e., made of plastic) and the number of doses within each device. A study in the United Kingdom determined that 80% of MDIs collected from a single local district hospital still had doses remaining, and the authors estimated this would have been equivalent to 2.63 tonnes of carbon dioxide emissions.[1] Furthermore, current disposal procedures for unused or expired prescriptions in British Columbia involve incineration. Burning plastic actuators can release additional greenhouse gases, as well as carcinogens.[2]

Two previous evaluations showed significant loss/wastage of partly used inhalers within our large urban health region.[3,4] Reasons cited for these findings included loss of the devices on patient transfer and their ready availability as ward stock. On the basis of these evaluations, it was suspected that wastage might be associated with inhalers available in automated dispensing cabinets (ADCs). ADCs frequently contain the short-acting inhalers salbutamol and ipratropium to allow quick and easy access for nurses in patient care areas. Given that the devices are not dispensed from the pharmacy as labelled, patient-specific

inhalers, there is a risk that they will remain unlabelled after removal from the cabinet. Nurses are then unable to determine to whom unlabelled inhalers belong, so they must be discarded (to maintain infection-control practices) and new inhalers obtained.

The objective of this study was to evaluate whether more salbutamol and ipratropium inhalers were withdrawn from ADCs than was deemed necessary.

METHODS

This cross-sectional study included patients for whom at least 1 salbutamol or ipratropium inhaler was provided from an ADC, across 16 inpatient health care facilities in British Columbia comprising quaternary and tertiary sites (n = 4), urban community sites (n = 9), and rural locations (n = 3) and serving a mixed adult and pediatric population. Within our facilities, the majority of inhalers for these 2 medications are obtained from ADCs rather than being supplied as patient-specific items from the pharmacy. Transaction detail reports were run for the period August 1, 2021, to January 31, 2022, for all salbutamol and ipratropium inhalers removed from ADCs in all areas of every hospital, including the emergency department.

For purposes of the analysis, we made several assumptions. First, we assumed that patients would not need more than 1 inhaler of any type on the same day or the subsequent day. We chose this timeframe on the assumption that patients would not use all 200 doses in an inhaler within 2 days, even if they were being treated for acute asthma exacerbation (2 puffs qid + PRN) or were being mechanically ventilated (10 puffs q4h + PRN). We therefore counted the number of instances when an additional inhaler was withdrawn for the same patient encounter within a 2-day timeframe; these were deemed to represent unnecessary withdrawals from the ADC. Second, we identified instances when multiple inhalers were withdrawn for the same patient at the same time and counted the number of extra inhalers removed; these were also deemed unnecessary. From these data, we calculated the total number and percentage of unnecessary inhalers. Third, we calculated the number of unnecessary inhalers per patient encounter by dividing the total number of unnecessary inhalers by the number of patient encounters in which the patient received salbutamol or ipratropium in the study period. Finally, we calculated the cost associated with unnecessary withdrawals of salbutamol and ipratropium inhalers.

RESULTS

During the study period, a total of 26 324 inhalers were withdrawn from ADCs at the 16 study sites. We found that 2180 (8.3%) of these inhalers were withdrawn unnecessarily for the same patient encounter within a 2-day timeframe, and another 1118 (4.2%) represented instances when multiple inhalers were withdrawn for the same patient at the same time. As such, a total of 3298 (12.5%) inhalers overall, or 1 in every 8 inhalers, were withdrawn unnecessarily (Table 1). We calculated that 1 of every 4.3 patient encounters involved an unnecessary inhaler, and the cost of these inhalers was about $31 600 over the 6-month period.

DISCUSSION

To our knowledge, this study is the first to use ADC transaction reports to quantify the number of extra inhalers withdrawn unnecessarily (i.e., for the same patient encounter within a short period or involving multiple inhalers for a given patient at the same time). This method can be applied in a reasonably efficient manner and is easily replicated. In addition, the results help to pinpoint ADC availability as a significant contributor to inhaler wastage within the hospital system.

One potential cause that we identified is the lack of automation for generating patient-specific labels for multidose inhalers at the time of withdrawal from an ADC. Busy nursing staff may not always take the extra step of manually requesting a patient label each time, which results in unlabelled inhalers that must be discarded, according to infection control protocols. As a result of this study, we have worked with ADC system administration to reprogram some of the ADCs to automatically print patient-specific labels for inhalers, and post-implementation evaluation of this intervention is currently underway. Furthermore, a survey targeting nursing staff is being developed to identify where medications are stored on the unit and to characterize the patient transfer process, in hopes of identifying additional simple strategies to reduce this type of waste.

TABLE 1. Unnecessary Inhalers Withdrawn from Automated Dispensing Cabinets (ADCs)

Drug	Total No. of Inhalers Withdrawn from ADC	No. (%) Additional Inhalers Withdrawn in 2-Day Period	No. (%) of Excess Inhalers Withdrawn at One Time	Total No. (%) of Inhalers Deemed Withdrawn Unnecessarily
Salbutamol	16 672	1356 (8.1)	755 (4.5)	2111 (12.7)
Ipratropium	9 652	824 (8.5)	363 (3.8)	1187 (12.3)
Total	26 324	2180 (8.3)	1118 (4.2)	3298 (12.5)

This study had multiple limitations. We did not assess the withdrawal of additional inhalers outside the 2-day timeframe; however, inhalers withdrawn over much longer periods could be deemed unnecessary if the initial inhaler still had doses remaining. We did not review orders placed for individual patients to determine whether one inhaler had been withdrawn for a regularly scheduled dose and a second inhaler against a PRN order. Therefore, this study likely underestimates the total inhaler waste from ADCs that is occurring in our facilities. Finally, we assumed that any extra inhalers withdrawn were used or wasted and not returned to stock.

CONCLUSION

This analysis demonstrates a quick and easy way to quantify inhaler waste at the point of the ADC. Unnecessary inhaler waste places a significant financial burden on already limited health care budgets and has a negative environmental impact. We encourage other health care institutions and health authorities to conduct similar analyses to determine whether similar problems exist elsewhere.

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Competing interests: For activities unrelated to this study, Aaron Tejani has received consulting fees for expert advice related to a legal case; speaker's fees for presentations to divisions of family practice in British Columbia, the BC Ministry of Health, and hospital rounds; and payment for advisory board participation for the ACTION ADE study (Vancouver General Hospital). No other competing interests were declared.

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