

COVID-19 CADTH HEALTH TECHNOLOGY REVIEW

Re-using Metered Dose Inhalers in a Health Care Setting: Clinical Effectiveness, Cost-Effectiveness, and Guidelines

**This report was published on
May 21, 2020**

To produce this report, CADTH used a modified approach to the selection, appraisal, and synthesis of the evidence to meet decision-making needs during the COVID-19 pandemic. Care has been taken to ensure the information is accurate and complete, but it should be noted that international scientific evidence about COVID-19 is changing and growing rapidly.

Version: 1.0
Publication Date: May 2020
Report Length: 6 Pages

Authors: Christopher Freige, Suzanne McCormack

Cite As: *Re-using Metered Dose Inhalers in a Health Care Setting: Clinical Effectiveness, Cost-Effectiveness, and Guidelines*. Ottawa: CADTH; 2020 May. (CADTH Reference List).

Disclaimer: The information in this document is intended to help Canadian health care decision-makers, health care professionals, health systems leaders, and policy-makers make well-informed decisions and thereby improve the quality of health care services. While patients and others may access this document, the document is made available for informational purposes only and no representations or warranties are made with respect to its fitness for any particular purpose. The information in this document should not be used as a substitute for professional medical advice or as a substitute for the application of clinical judgment in respect of the care of a particular patient or other professional judgment in any decision-making process. The Canadian Agency for Drugs and Technologies in Health (CADTH) does not endorse any information, drugs, therapies, treatments, products, processes, or services.

While care has been taken to ensure that the information prepared by CADTH in this document is accurate, complete, and up-to-date as at the applicable date the material was first published by CADTH, CADTH does not make any guarantees to that effect. CADTH does not guarantee and is not responsible for the quality, currency, propriety, accuracy, or reasonableness of any statements, information, or conclusions contained in any third-party materials used in preparing this document. The views and opinions of third parties published in this document do not necessarily state or reflect those of CADTH.

CADTH is not responsible for any errors, omissions, injury, loss, or damage arising from or relating to the use (or misuse) of any information, statements, or conclusions contained in or implied by the contents of this document or any of the source materials.

This document may contain links to third-party websites. CADTH does not have control over the content of such sites. Use of third-party sites is governed by the third-party website owners' own terms and conditions set out for such sites. CADTH does not make any guarantee with respect to any information contained on such third-party sites and CADTH is not responsible for any injury, loss, or damage suffered as a result of using such third-party sites. CADTH has no responsibility for the collection, use, and disclosure of personal information by third-party sites.

Subject to the aforementioned limitations, the views expressed herein do not necessarily reflect the views of Health Canada, Canada's provincial or territorial governments, other CADTH funders, or any third-party supplier of information.

This document is prepared and intended for use in the context of the Canadian health care system. The use of this document outside of Canada is done so at the user's own risk.

This disclaimer and any questions or matters of any nature arising from or relating to the content or use (or misuse) of this document will be governed by and interpreted in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein, and all proceedings shall be subject to the exclusive jurisdiction of the courts of the Province of Ontario, Canada.

The copyright and other intellectual property rights in this document are owned by CADTH and its licensors. These rights are protected by the Canadian *Copyright Act* and other national and international laws and agreements. Users are permitted to make copies of this document for non-commercial purposes only, provided it is not modified when reproduced and appropriate credit is given to CADTH and its licensors.

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Questions or requests for information about this report can be directed to requests@cadth.ca

Research Questions

1. What is the clinical evidence regarding the safety of re-using the canister portion of metered dose inhalers across multiple patients in a health care setting?
2. What is the cost-effectiveness of re-using the canister portion of metered dose inhalers in a health care setting?
3. What are the evidence-based guidelines regarding the re-use of the canister portion of metered dose inhalers in a health care setting?

Key Findings

Three non-randomized studies were identified regarding the safety of re-using the canister portion of metered dose inhalers across multiple patients in a health care setting. No cost-effectiveness studies were identified regarding the re-using the canister portion of metered dose inhalers in a health care setting. Furthermore, no evidence-based guidelines were identified regarding the re-use of the canister portion of metered dose inhalers in a health care setting.

Methods

A limited literature search was conducted by an information specialist on key resources including both Medline and PubMed, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine’s MeSH (Medical Subject Headings), and keywords. The main search concepts were MDI canisters and reuse or contamination. Search filters were applied to limit retrieval to guidelines for Q3 only. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2010 and May 5, 2020. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients of all ages requiring medication administered via metered dose inhaler (MDI) in a health care setting
Intervention	MDI canisters used across multiple patients (i.e., MDI nozzle is disinfected and re-used with a patient-specific spacer)
Comparator	Q1: MDI canisters used for only one patient No comparator Q2: MDI canisters used for only one patient Q3: Not applicable
Outcomes	Q1: Safety (e.g., risk of infection, pneumonia, mortality, cross contamination, bacterial cultures of the MDI nozzle) Q2: Cost-effectiveness Q3: Recommendations regarding the re-use of the canister portion of MDI, recommendations regarding the sterilization of the canister portion of MDIs

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports and systematic reviews are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Three non-randomized studies¹⁻³ were identified regarding the safety of re-using the canister portion of metered dose inhalers across multiple patients in a health care setting. No health technology assessments, systematic reviews or randomized controlled trials were identified. Furthermore, no cost-effectiveness studies were identified regarding the re-use of the canister portion of metered dose inhalers in a health care setting. Lastly, no evidence-based guidelines were identified regarding the re-use of the canister portion of metered dose inhalers in a health care setting.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Three relevant non-randomized studies¹⁻³ were identified regarding the safety of re-using the canister portion of metered dose inhalers (MDIs) across multiple patients in a health care setting. The study by Gowan et al.¹ compared shared canister MDI therapy to single-patient canister MDI therapy in mechanically ventilated patients. Overall, no statistically significant differences were found between the two groups in the incidence of ventilator-associated pneumonia, hospital mortality, ventilator days and ventilator associated events.¹ The study by Liou et al.² administered MDIs using patient-specific, valved holding chambers and then returned the MDIs to the pharmacy for cleaning with 70% isopropyl alcohol prior to re-dispensing to a different patient. Ten percent of MDIs were tested for bacterial growth from three categories: prior to pharmacy cleaning, after pharmacy cleaning, and new/unused control group.² Overall, no bacterial growth was found on the tested MDIs from any of the three categories.² Lastly, the study by Matt et al.³ cultured MDIs used on the general medical and surgical services units using broth immersion or swabbing. MDIs were then disinfected with 70% isopropyl alcohol by either spraying or 2-minute immersion and were re-cultured using a liquid broth method.³ As such, four groups of MDIs were included in the study: broth and immerse, broth and spray, swab and immerse, swab and spray.³ MDIs cultured using the broth immersion technique had significantly more colonies of organisms compared to MDIs cultured using the swab technique.³ Furthermore, MDIs disinfected using the immersion technique had significantly less colonies of organisms compared to MDIs disinfected by spraying.³ Overall, the only statistically significant difference between the four groups for all organisms regardless of pathogenicity was between the broth and immerse and the broth and spray groups.³

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

No literature identified.

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

1. Gowan M, Bushwitz J, Watts P, et al. Use of a Shared Canister Protocol for the Delivery of Metered-Dose Inhalers in Mechanically Ventilated Subjects. *Respir Care*. 2016 Oct;61(10):1285-1292.
[PubMed: PM27143787](#)
2. Liou J, Clyne K, Knapp D, Snyder J. Establishing a quality control program: ensuring safety from contamination for recycled metered-dose inhalers. *Hosp Pharm*. 2014 May;49(5):437-443.
[PubMed: PM24958955](#)
3. Matt L, Mirzoyan M, Taylor H, Butler R, Gopalakrishna K. Bacteriologic Assessment of Reused Metered Dose Inhalers: An Analysis of the Safety of the "Common Canister Protocol". *Infect Dis Clin Pract*. 2011;19:265-267.
https://journals.lww.com/infectdis/Abstract/2011/07000/Bacteriologic_Assessment_of_Reused_Metered_Dose.10.aspx

Economic Evaluations

No literature identified.

Guidelines and Recommendations

No literature identified.

Appendix — Further Information

Previous CADTH Reports

4. Plastic or Reusable Aerochambers in Multi-Dose Inhalers: Clinical Effectiveness and Guidelines. (*CADTH Rapid response report: summary of abstracts*). Ottawa (ON): CADTH; 2020: <https://www.cadth.ca/plastic-or-reusable-aerochambers-multi-dose-inhalers-clinical-effectiveness-and-guidelines>
5. Disposable Spacers for Metered-Dose Inhalers: Clinical Effectiveness and Guidelines. (*CADTH Rapid response report: reference list*). Ottawa (ON): CADTH; 2015: <https://www.cadth.ca/disposable-spacers-metered-dose-inhalers-clinical-effectiveness-and-guidelines>
6. Re-Using the Canister Portion of Metered Dose Inhalers in a Hospital Setting: Clinical Review of Safety, Cost-Effectiveness and Guidelines. (*CADTH Rapid response report*). Ottawa (ON): CADTH; 2005: <https://www.cadth.ca/re-using-canister-portion-metered-dose-inhalers-hospital-setting-clinical-review-safety-cost>

Review Articles

7. Larson T, Gudavalli R, Prater D, Sutton S. Critical analysis of common canister programs: a review of cross-functional considerations and health system economics. *Curr Med Res Opin*. 2015 Apr;31(4):853-860. [PubMed: PM25686651](#)
8. Neel S., Tauman A. Can Successful Implementation of the Common Canister Program Deliver Cost Containment and Improved Infection Control? *Hosp Pharm*. 2012;47(9):700–711. <https://journals.sagepub.com/doi/abs/10.1310/hpj4709-700#articleCitationDownloadContainer>
9. Malesker MA. Common Canister Policy: the devil is in the details. *Chest Physician*; 2016: <https://www.mdedge.com/chestphysician/article/113875/critical-care/common-canister-policy-devil-details>

Additional References

10. Metered Dose Inhaler (MDI) Canister Minimum Guidance Statement. Brentwood (TN): Tennessee Center for Patient Safety. [2020]: <http://www.tnpatientsafety.com/pubfiles/covid-19/mdicanisterminimum.pdf>
11. Spectrum Health. MDI Common Canister Standard Work. (*Clinical Pathways: Inpatient, Standard Work Activity Sheet*). 2020 Mar 24. <https://www.spectrumhealth.org/covid19/provider-resources>