MDI
Common Canister Protocol

Common Canister Protocol refers to the practice of giving medication from a single Metered Dose Inhaler (MDI) canister to multiple patients. The enclosed abstracts discuss three separate experiences whereby hospital clinicians were able to successfully implement a common canister protocol in their respective institutions. Issues surrounding infection control, increased staff efficiencies, and cost savings are addressed.

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MULTIPLE PATIENT METERED DOSE INHALER (MDI) PROGRAM

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Rationale:

The hospital's long-standing metered dose inhalation (MDI) administration process was found to contribute to delays in getting MDI canisters from the pharmacy to the patient's nursing station. Additionally, MDI canisters, once dispensed, were disappearing before the patient was discharged causing medication to be re-ordered. Finally, an analysis of the hospital's costs, associated with MDI purchases, appeared to be excessive. These factors provided an opportunity for a continuous quality improvement (CQI) activity involving Pharmacy, Respiratory Therapy (RT) and Nursing.

Objectives:

From this report the reader will be able to:

- Describe a MDI distribution process that eliminates any Pharmacy distribution delays in patient therapy.
- Describe a MDI distribution process that allowed Respiratory Care Practitioners (RCP) to have immediate access to MDI canisters.
- Identify the cost savings associated with the sharing of MDI canisters between patients.
- Recognize the risk-free aspects of multiple patient MDI use.

Methods or procedures used:

A prototype project was developed in which the RT department would have direct access to, and responsibility for the administration of MDI therapies. Originally, when ordered by a physician, each patient received their own labeled MDI canister and mouthpiece from Pharmacy. Nursing department then notified both Pharmacy and RT since the RCP was then responsible to provide the patient with the initial MDI instruction and aerosol spacer device. Once the RCP provided the initial MDI instruction, he/she kept the patient on their caseload until the patient became proficient in self-administration and usage of the MDI and spacer device. Pharmacy department billed the patient account for the full canister when dispensed. Thereafter, Nursing provided all follow-up MDI therapies to the patients capable of self administrated treatments. However, this traditional method of MDI administration was identified as being problem prone since:

- Patient care was being delayed until the replacement MDI canister was delivered.
- MDI canisters, labeled with the patient's name and room number, were disappearing before the patient was discharged, resulting in dispensing of another full MDI. (When a second canister was provided, the patient account was charged for another full canister, which provided additional hospital revenue, but the direct hospital costs were unnecessarily increased).
- RCP treatment schedules and staffing assignments were negatively affected whenever MDI canisters disappeared.
- Hospital costs associated with MDI purchases were escalating.

Presented at the American Society of Healthsystems Pharmacists Conference December, 1997 in Atlanta, GA.

Recognizing the issues listed above, a process improvement team, composed of representatives from Pharmacy, Respiratory Therapy and Nursing was formed. The Director of Respiratory Therapy had heard reports that some hospitals were attempting to share MDI canisters between patients, giving the RT department exclusive control of the inventory, administration and billing of the MDI therapies. A literature search was conducted in the Spring of 1996, but no printed reports on the sharing of MDI canisters between patients (later termed "common canister protocol") were identified. One Respiratory Therapy Director from a hospital in Lawrenceville, Georgia was contacted and at their institution the Respiratory Therapists utilized a "common canister protocol" [1]. Their protocol called for a single MDI canister to be taken to a patient, the canister nozzle tip wiped with an alcohol prep pad, then inserted into a DHD ACE spacer, and the prescription administered. The same canister was then taken to the next patient, and just prior to administration, the canister nozzle tip was wiped with an alcohol prep pad. This department Director had compiled, but had not yet published, a report. Their document concluded that cross contamination of MDI canisters to spacer devices is unlikely when following the common canister protocol". Armed with a copy of their preliminary findings, we prepared a methodology that described a similar, but slightly different practice.

The prototype project introduced several new MDI administration practices. This new methodology, now know as multiple patient MDI use:

1. Authorized the RT department to maintain a constant inventory of MDI canisters, supplied by the Pharmacy.
2. Allowed the RCP to initiate the MDI therapy immediately upon receipt of notification of a physician's order.
3. Caused the MDI canisters to be shared between patients and utilized until the canister was empty.
4. Changed the patient charge structure from a "per canister" to a "per puff' charge.

The MDI canisters are now carried throughout the day by each RCP and used to deliver all of the RCP's scheduled MDI patient therapies. The RCP was instructed to swab the canister's actuator tip with alcohol before inserting the canister tip into the Aerosol Cloud Enhancer (ACE) spacer manufactured by DHD Healthcare. After administration of the MDI therapy, the canister was removed from the ACE, the actuator tip was again swabbed with alcohol, and the canister was retained by the RCP to be used again with other patients. The ACE spacer remained with the patient. This methodology resulted in a revised RT policy and procedure. The RT policy was reviewed and ultimately approved by the hospital's Infection Control Committee, Guest Relations Department, Risk Management Department and the RT Administrative and Medical Director.

The Infection Control Committee required microbiological sampling of the MDI actuator tip and aerosol spray before giving final approval.

[1] March 28, 1996, discussion with Ms. Debi Hinson, RRT, Director of Respiratory Care. Gwinnett Hospital System, 1000 Medical Center Boulevard, Lawrenceville, GA 30245.

Results:
Multiple patient usage of MDIs has provided the following six findings:

1. Multiple patient usage of MDIs has eliminated any delays in MDI therapy due to the time between order entry and delivery to the patient's floor.
2. Multiple patient usage of MDIs has permitted RCPs to have immediate and shift-long access to MDI canisters, thereby allowing the RCP to respond quickly and to remain on-schedule with previously ordered MDI therapies.
3. Multiple patient usage of MDIs has reduced the hospital's MDI purchase costs by fifty-five percent.
4. Multiple patient usage of MDIs has reduced the number of MDI canisters purchased on an annual basis.
5. Multiple patient usage of MDIs has minimized any risks of cross contamination associated with the multiple patient usage of MDIs.
6. Multiple patient usage of MDIs has allowed the patient's hospital bill to accurately reflect a charge for each dose of medication administered through a MDI. The former practice of charging the patient for unused medication has been eliminated.

Our results showed delays in patient therapies, related to the delivery of the MDI canisters to the nursing stations, to be eliminated. No MDI canisters needed to be re-dispensed before a patient is discharged since no MDI canister is labeled for any one patient. MDI therapies are now exclusively delivered and monitored by RCPs, permitting (A) therapies to occur on time and as needed and (B) eliminating the need to have any Nursing personnel available to perform MDI therapies. Overall hospital labor costs and supply costs were reduced.

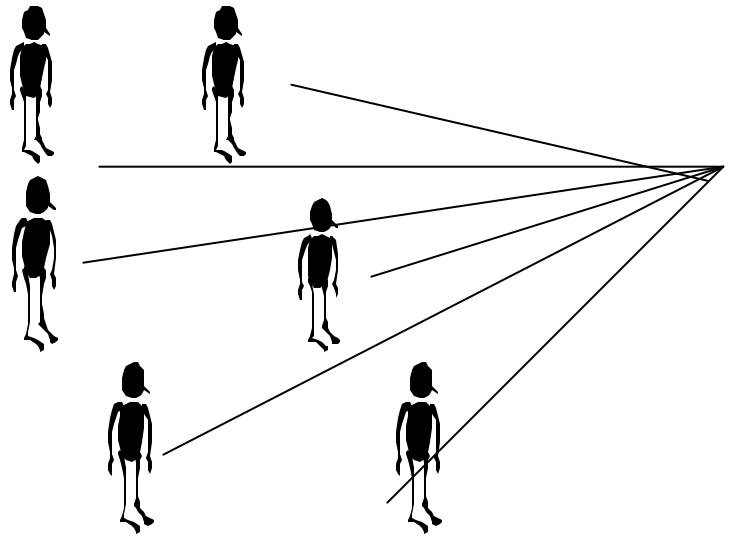
Microbiological sampling of actual canisters used to administer treatments showed no growth of organisms cultured from the actuator tip or the canister's aerosol spray after being swabbed with alcohol. Patient risk of cross contamination was also minimized by the design of the ACE spacer's one-way breathing valve.

Final approval of the prototype project through the hospital's Infection Control, Guest Relations, Risk Management, and Respiratory Care Medical Director was sought and obtained. Nursing, Respiratory Care and Pharmacy policies were revised and the protocol project has now become the house-wide standard of care.

Conclusions:
Options for delivery of MDI therapies exist, including multiple patient MDI use. Any institution choosing to institute a procedure permitting multiple patient MDI use, in conjunction with an ACE spacer, can do so provided the MDI's actuator tip is swabbed with alcohol before and after insertion into the spacer. Coupled with a change in the patient's charge structure, the hospital has realized a reduction in labor costs, meditation costs and eliminated therapy time delays. Pharmacy's cooperation with this improvement process allowed the hospital to realize a fifty-five percent (55%) savings in the annual purchase cost of MDIs.

Example With One Drug (i.e. Proventil)

Current Therapy – 6 Patients per Week



6 Canisters at $10 per canister =

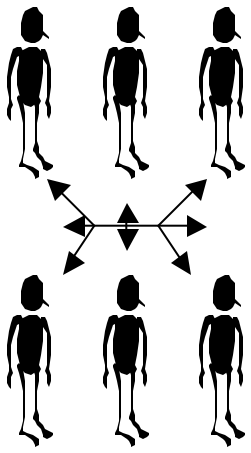
$60 per week

$3,120 per year

Common Canister Protocol

Assumption:
8 puffs per day per patient x 6 patients x 7 days = 336 total puffs needed

336 Puffs = ~ 2 canisters

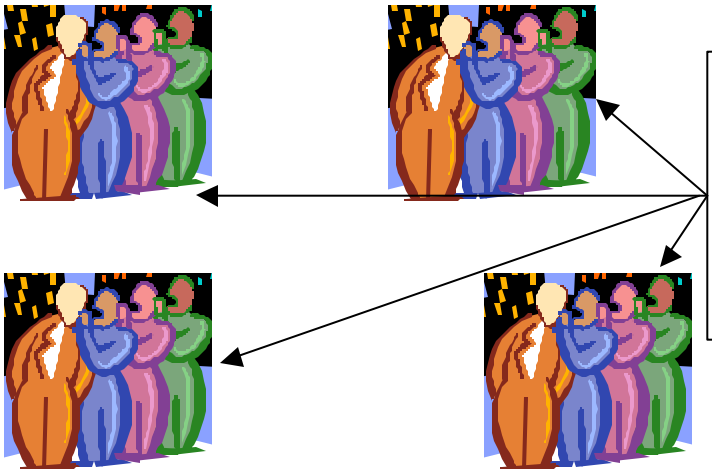


2 Canisters at $10 per canister =

$20 per week

$1,040 per year

Current Therapy – 100 Patients per Week



100 Canisters at $10 per canister

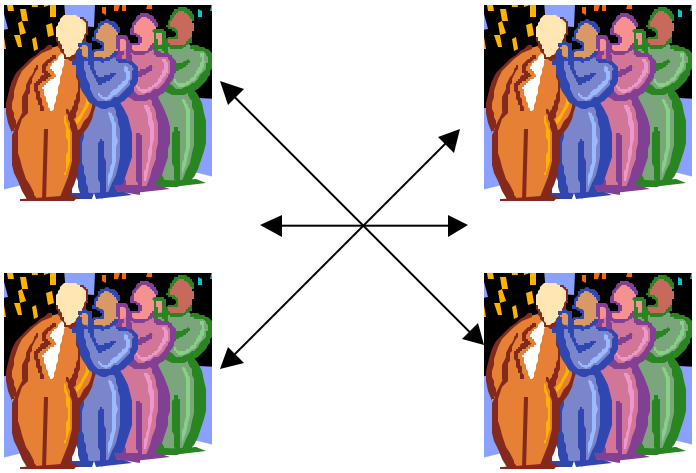
$1,000 per week

$52,000 per year

Assumption:

8 Puffs per day per patient x 100 patients x 7 days = 5,600 total puffs needed

5,600 Puffs = 28 canisters



28 Canisters at $10 per canister =

$280 per week

$14,560 per year

$37,440 in savings

Single Canister Protocol Worksheet

Example

1. Average number of patients per day 20
2. Average number of treatments per patient per day 3
3. Average number of doses per treatment 3
4. Average total doses per day (#1 x #2 x #3) 180
   (Multiply #1 by #2 then multiply answer by #3)
5. Number of canister (s) needed per day .90
   (Divide #4 by 200 (Assumes 200 doses per canister))
6. Average patient turn over per day 7
7. Total number of canisters available per day 7
   (#7 = #6 – Assume one new canister per new patient per day)
8. Total number of canisters saved per day 6.10
   (#7 - #5)
9. Total dollars saved per day $61.00
   (#8 x $10 – Assume a cost of $10 per canister)
10. Total dollars saved per year $22,265
    (#9 x 365)

Single Canister Protocol Worksheet

1. Average number of patients per day _____
2. Average number of treatments per patient per day _____
3. Average number of doses per treatment _____
4. Average total doses per day (#1 x #2 x #3) _____
   (Multiply #1 by #2 then multiply answer by #3)
5. Number of canister (s) needed per day _____
   (Divide #4 by 200 (Assumes 200 doses per canister))
6. Average patient turn over per day _____
7. Total number of canisters available per day_____
   (#7 = #6 – Assume one new canister per new patient per day)
8. Total number of canisters saved per day_____
   (#7 - #5)
9. Total dollars saved per day_____
   (#8 x $10 – Assume a cost of $10 per canister)
10. Total dollars saved per year_____
    (#9 x 365)

SURVEILLANCE OF RESERVOIR CROSS-CONTAMINATION WITH MULTIPLE PATIENT MDI USE

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Introduction:

At many hospitals, it is standard practice for RCP's to deliver MDI therapy to patients. Each patient is supplied with his own reservoir device, and a common canister is used for multiple patients. The purpose of this study was to perform infection control surveillance of MDI canisters for cross-contamination with multiple patient reservoir devices, as they are currently used at a local hospital.

Materials & Methods:

Human subjects approval was obtained and data was collected at a 600 bed acute care university teaching institution. The Aerosol Cloud Enhancer (ACE) was the reservoir device monitored in the study. All patients in the study had been using the ACE for at least 24 hours prior to data collection. All data was collected by the same investigator using universal precautions. The study population consisted of 101 non-intubated patients who were receiving MDI treatments. Three cultures were obtained for each subject. The sequence of specimen collection was carried out as follows: Swab MDI canister nozzle (culture A); disinfect MDI canister nozzle with alcohol prep pad; repeat swab of canister nozzle (culture B); swab ACE MDI adapter site (culture C); administer MDI treatment. Specimen collection swabs were inserted into transport packs, labeled & analyzed by a clinical microbiologist for growth after 1, 2, 3, and 5 days of incubation. Subjects were profiled according to gender and age. Probabilities for the number of positive cultures were calculated from a binomial distribution, with a significance level of 0.05.

Results:

67 subjects were male: 34 were female. Mean age of subjects was 56. The following tables contain results of each culture series (A. B, C) at 23. 48, 72 and 96 hours. Binomial distributions for each culture set (A,B and C), at 1, 2, 3 and 5 days incubation were <0.001, indicating significantly low probability of obtaining a positive culture.

	24 Hours	48 Hours	72 Hours	96 Hours	Total
A	0	5	0	1	6
B	0	5	0	0	5
C	1	3	3	2	9

Table 1. Number of positive cultures for culture sets at 1, 2, 3, and 5 days.

Conclusion:

The likelihood of contamination is low when common canisters are used with multiple reservoir devices. Because canisters may be shared without significant risk of contamination, this may translate into savings for both patient and respiratory care department.

	24 Hours	48 Hours	72 Hours	96 Hours
A		Staphylococcus epidermidis x 5		Staphylococcus epidermidis x 1
B		Staphylococcus epidermidis x 5		
C	Staphylococcus epidermidis x 1	Staphylococcus epidermidis x 3	Staphylococcus epidermidis x 3; Pseudomonas flourescens x 1	Staphylococcus epidermidis x 2; Staphylococcus aureus x 1

Table 2. Organisms cultured from each set at 1, 2, 3, and 5 days.

Presented at the American Association of Respiratory Care International Conference December 1997 in New Orleans, LA.

INCIDENCE OF CONTAMINATION OF METERED DOSE INHALER CANISTERS WHEN USED WITH MULTIPLE PATIENTS USING SPACER DEVICES

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Introduction:

The use of a single MDI canister for multiple patients using spacer devices may offer cost savings to both the patient and the hospital, while promoting direct respiratory care practitioner (RCP) instruction and assessment of aerosolized medication delivery to the patient.

Purpose:

Concern for potential cross contamination prompted a pilot surveillance program to assess the presence of pathogens on MDI canisters being used with spacer devices from multiple patients.

Methods:

The surveillance was in three phases- Phase I; 21 MDI canisters (6 Atrovent, 5 Proventil, 4 Azmacort, 3 Vanceril, 2 Intal and 1 AeroBid) were collectively used in delivering > 300 MDI treatments to at least 25 different patients over a one week period. A 'common canister protocol' was followed for these treatments which provides for a single canister to be taken to a patient, the canister nozzle tip wiped with an alcohol prep pad, then inserted into a DHD ACE spacer, and the prescription administered. The same canister was then taken to the next patient, and just prior to administration, the canister nozzle tip was wiped with an alcohol prep pad. The common canister protocol was not used for patients on isolation precautions. At the end of the week on July 8,1992 after completing AM treatment rounds, the 21 canisters were collected, each canister nozzle tip was wiped with an alcohol prep pad to simulate preparation for patient delivery and then environmentally cultured. Phase II: On March 1,1993, the same process as described in Phase I occurred with 18 canisters and approximately the same treatment/patient volume; however the canister nozzle tips were not wiped with an alcohol prep pad just prior to the culture in an effort to assess the potential results of failure to wipe the canister nozzle tip with an alcohol prep pad prior to patient use. Phase III: On May 10,1993, the method in Phase I was repeated utilizing 16 canisters whose nozzle tips were cleaned with an alcohol prep pad just prior to the environmental culture.

Results:

Phase I: 21/21 cultures resulted in no growth. Phase II: 17/18 cultures resulted in no growth. 1/18 culture resulted in growth of Strepococci Group D Enterococcus. Phase III: 16/16 cultures resulted in no growth.

Conclusions:

We conclude that cross contamination of MDI canisters to spacer devices, is unlikely when following the common canister protocol as described.