

Execution of An Academic Interference To Advance The Accurate Usage Of Asthma Inhalers

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Abstract- Metered-dose inhalers (MDI) are routinely prescribed for patients with asthma. Healthcare professionals are encouraged to check the patient's ability to use an inhaler as inhalers are most effective when used correctly. However, many healthcare professionals are unable to use an inhaler correctly. This pilot study tested the ability of nurse practitioner students to correctly use an MDI. Findings indicated that nurse practitioner students are unable to use an MDI correctly. These students then participated in a "teach to goal" educational intervention. Four weeks later, students were significantly more likely to be able to use an MDI correctly (p=0.000). All nurse practitioner students completed the Healthcare Professional Asthma Knowledge Questionnaire before and after the intervention. Although scores increased, from 10.67 to 11.33, this was not statistically significant (p=0.252). There was no relationship between ability to use an inhaler correctly at pre or post-test and years of experience as an RN, previous education on inhalers, or personal use of an MDI. Age was only significant in the pretest as the younger students were more likely to be able to use an MDI correctly; there was no significant difference at the post-test. These findings indicate that all nurse practitioner students should be taught how to use an MDI during their course of study.

Keywords: Metered-dose inhalers, asthma, inhaler usage, nurse students

INTRODUCTION

Asthma affects 18.7 million adults in the United States. Asthma complications and symptoms cause 1.8 million emergency room visits every year and 3,345 deaths (Centers for Disease Control and Prevention, 2014) which results in 10 million lost days of work every year accounting for a loss of \$3 billion in productivity.

Proper use of medications improves asthma control. Good asthma control in adults reduces loss of work days, improves quality of life, reduces asthma exacerbations, and reduces use of health care resources. There are many negative effects of poor asthma control. Asthma can cause bronchoconstriction which prevents that patient from engaging in physical activity. Patients with poorly controlled asthma are at higher risk for obesity and

are less physically active than those with good control or without asthma. Poor asthma control is associated with an increased risk of pneumococcal infections and those with the worst control are the most likely to develop pneumococcal infections, although the mechanism for this is not understood (O'Bryne et al,2013).

Metered-dose inhalers (MDI) are one of the most common forms to deliver inhaled corticosteroids or bronchodilators to patients. Inhaled treatment has many benefits. One benefit is that inhaled therapy quickly reaches the lungs and rapidly produces local effects while limiting any systemic effects. The canister generally contains 200 doses and the dosing is reproducible, ensuring that the patient receives the same dose each time. Additionally, MDIs are small and portable, which is important as many quick-acting bronchodilators are used

suddenly to prevent patient harm. Use of spacer with an MDI reduces the amount of medication that is deposited in the oropharyngeal area (Lavorini, 2013).

Correct use of an MDI is necessary to receive the benefit of the medication and improve asthma control. A study of hospitalized adults with COPD or asthma who used an MDI found that 62% of their study participants misused the MDI at baseline.

Additionally, of the 72% of patients who stated that they were confident in the use of the MDI, only 31% used them correctly (Press et al., 2012). Therefore, not all patients are able to assess their own ability to correctly use MDIs.

Another study among emergency room patients found that 45% of patients used their asthma MDIs incorrectly. Incorrect use was correlated with uncontrolled asthma and having visited that emergency room three or more times in the past year. Also, patients were more likely to use the device improperly if they had not received education on the device and asthma, and if they did not make regular follow-up appointments with physicians (Al-Jahdali et al., 2013). Another study found that 47% of patients using an MDI for asthma or COPD did not use their inhaler correctly. Furthermore, more than half of these patients could not remember having their inhaler technique checked by a health care provider (Bryant, Bang, Chew, Baik, & Wiseman, 2013).

Due to high prevalence of asthma and its cost on the health care system as well as personal costs, policy makers have established recommendations and guidelines related to asthma. Healthy People 2020 includes 8 main objectives that address asthma. These include reducing death, hospitalizations, and emergency room visits. Objective 5 is to reduce missed days of work due to asthma episodes. Several objectives are related to asthma education, which includes objective 7.2, to increase the percentage of patients who receive education on how to use an inhaler. Another example is objective 6 which is to increase the proportion of patients who receive formal asthma education (Office of Disease Prevention and Health Promotion, 2015).

METHODS

The project used a quasi-experimental pre-test/post-test design. All participants completed the Healthcare Professional Asthma Knowledge Questionnaire. Participants demonstrated use of a metered-dose inhaler as they would demonstrate use to a patient. The technique of inhaler use of all participants was scored for correct use by completing each step from the National Heart, Lung, and Blood Institute's steps for using an MDI. Those who performed all steps on the checklist correctly were excluded from the remainder of the study. The remaining participants received the "teach to goal" educational program, which is a demonstration of correct use by the instructor followed by a return demonstration by the participant until the participant is able to demonstrate correct use. Participants returned in 4 weeks, completed the questionnaire, and demonstrated inhaler use again. Inhaler use was again scored using the same National Heart, Lung, and Blood Institute's steps for using an MDI. The questionnaire was used to determine if the program increases knowledge of asthma and inhalers. The inhaler use score was used to determine if the educational program increases the percentage of participants that correctly demonstrate inhaler use. The Healthcare Professional Asthma Knowledge Questionnaire is self-administered to assess asthma knowledge in healthcare professionals based on true/false questions. Internal reliability is 0.92 with good content, face, construct, and discriminant validity (Kritikos, Krass, Chan, & Bosnic-Anticevich, 2005). Permission to use and amend the questionnaire was obtained from the lead author. Questions 9 and 16 were eliminated as these were about dry powder inhalers, question 13 was eliminated as Intal is no longer available in the U.S., and question 12 was eliminated as it discussed an Australian specific program. In question 18, Eformoterol was changed to long-acting beta 2 agonist to be more general as students may not know about specific medications. Therefore, the questionnaire contained a total of 14 questions. A convenience sample was used. All participants were nurse practitioner students at Mayo Hospital Rawalpindi. Participants were contacted via the School of Nursing graduate email lists. Participants were at least 18 years old and enrolled as adult/geriatric, family, or community-health nurse practitioner

students at Mayo Hospital. Exclusion criteria was current certification as a nurse practitioner. The implementation of the educational program was done in a classroom at the Mayo Hospital, School of Nursing.

There was no need for funding for this project. Participants were entered into a raffle to win a \$10 gift card. Minimal expenses were encountered and were paid for by the researcher.

Outcomes

Twenty nurse practitioner students participated with 18 females and 2 males. All participants were final semester master's level students. All were in the family nurse practitioner program except one who was in the community health nurse practitioner program. In the first session, only 2 participants (10%) were able to use an MDI correctly. The most commonly missed steps were not breathing out fully before inhalation and holding breath and counting to 10 after inhalation. No participants required more than one round of "teach to goal". Only 15 participants returned for the second session. Of those, 12 were able to use the MDI correctly (80%).

What is the relationship between "teach to goal" educational intervention and pre and post inhaler use?

The ability of participants to use an MDI correctly was compared before and after the "teach to goal" intervention. 2 out of 20 participants were able to correctly use the inhaler before the intervention. After the intervention, 12 out of 15 participants were able to use the MDI correctly. Using a paired t-test, $t=7.483$, $p=0.000$. Therefore, there is a statistically significant difference in the ability to use an MDI between before and after the "teach to goal" intervention.

What is the relationship between participation in an educational program designed to increase ability to use an MDI and participant's pretest to posttest knowledge scores on the Healthcare Professional Asthma Knowledge Questionnaire?

Scores on the Healthcare Professional Asthma Knowledge Questionnaire were compared before and after the "teach to goal" intervention. The questionnaires were scored out of 14 possible points, with 1 point for each correct answer. The mean

score before the intervention was 10.67 and 11.33 after the intervention. Using a paired t-test, $t=1.195$, $p=0.252$. Although the scores increased, the increase was not statistically significant. The pretest mean of 10.67 indicates that these students started with knowledge about asthma and the use of MDIs.

What is the relationship between demographic variables (age, gender, nurse practitioner program, years of RN experience, previous education on MDI, and personal use of MDI) and proper use of an MDI?

Age. Of the two participants who were able to demonstrate proper use, one was in the age group less than 25, and one was in the age group of 25 to 29. Using Pearson's

chi-square, $\chi^2=10.123$ and $p=0.038$. However, since the majority of the population is in the 25 to 29 age group, this would be expected. In the post-test, participants in all age groups were able to correctly demonstrate use of an MDI. Using Pearson's chi-square, $\chi^2=2.5$ and $p=.475$, which is not statistically significant. Therefore, age was only associated with correct inhaler use in the pre-test.

Gender. Only 2 males did the pretest and neither male completed the post-test. Therefore, it cannot be determined if there is a relationship between gender and proper use of an MDI.

Nurse Practitioner program. Only one participant was a community nurse practitioner program student, with the remaining students from the family nurse practitioner program. Therefore, it cannot be determined if there is a relationship between nurse practitioner programs and proper use of an MDI.

Years as RN. The two participants who correctly demonstrated use of an MDI had less than 5 years of experience as an RN. However, it is not statistically significant, $\chi^2=1.818$, $p=.403$. After the intervention, participants from all years of experience categories were able to correctly demonstrate use of an MDI; $\chi^2=.625$, $p=.732$ which is not statistically significant. Therefore, years of experience as an RN was not found to be associated with ability to use an MDI.

Previous education on MDI. Participants were asked if they had previously received education on how to use an MDI. For the pre-test, of the two who were able to correctly use the MDI, one had previously received education and one had not. Using Pearson's chi-square and Fisher's exact test, there is no statistical significance, $\chi^2=0$, $p=1$. For the post-test, 6 who had received education before the intervention and 6 who had not

were able to correctly use the MDI. There is no statistical significance, $\chi^2=.268$ and $p=1$. Therefore, there is no relationship between previous education on MDI use and ability to use an MDI.

Personal use of MDI. At the pretest, all 4 participants who responded that they had personally used an MDI were unable to correctly demonstrate use of the MDI. Using Pearson's chi-square and Fisher's exact test, $\chi^2=.556$, $p=1$. Therefore, it is not statistically significant. For the post-test, all 4 participants who personally used an MDI were able to correctly demonstrate use. Thus, no statistical significance was found ($\chi^2=1.364$ and $p=$

.516). No statistically significant relationship between personal use of an MDI and ability to use an MDI correctly was found for this study.

Limitations

The most significant limitation of the study was the small sample size. A small sample limits generalizability. Therefore, this study should be replicated with a larger sample size. A second limitation was that only 20 out of 31 possible students agreed to participate, introducing a non-response bias. A final limitation is that only 15 participants returned for follow-up. This may have introduced attrition bias.

Significance

This study was supported by and supports the current literature regarding the ability of health care professionals to correctly use inhalers. There was a statistically significant improvement in proper MDI use after the "teach to goal" intervention. The change in ability to use the inhaler from pre to post-test indicates that the "teach to goal" was effective among nurse practitioner students and that these students retain the knowledge for four weeks. The nurse practitioner students had

an average score of 10.67 on the pretest Healthcare Professional Asthma Knowledge Questionnaire. This shows that nurse practitioner students have good knowledge about asthma. Post-test scores did increase to an average of 11.33, but this is not statistically significant.

This study demonstrated that years of experience as an RN and previous education on use of an MDI were not associated with proper use. Therefore, one cannot expect a nurse practitioner student to correctly learn to use an MDI through work experience or previous education. Additionally, personal use of an MDI was not associated with proper use. Therefore, even medical providers who personally use an MDI may not be using correct technique. Age was statistically significant as the younger age groups were more likely to correctly use an MDI before the intervention. However, due to the small sample size the significance of this is limited.

This study demonstrated that nurse practitioner students were unable to correctly use an MDI. Therefore, all nurse practitioner students should be educated on asthma and inhaler use during their course of study. Current healthcare professionals should ensure that they are able to correctly demonstrate inhaler use and review inhaler use with every patient.

Plans for the future

Many studies have shown that different healthcare professionals are unable to use an MDI correctly. This study found that nurse practitioner students are also unable to use an MDI correctly. However, it shows that a "teach to goal" intervention can be easily implemented and improve inhaler use. Therefore, nurse practitioner students should be taught how to correctly use an MDI in their course of study. Further research should be conducted with a larger group of nurse practitioner students with a longer time between pretest and posttest to ensure that the nurse practitioner students retain this information.

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