



Review on Errors in Inhalation Technique: Need of Educations and Interventions

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Received: 05-06-2018; Revised: 27-06-2018; Accepted: 11-07-2018.

ABSTRACT

Asthma and Chronic obstructive pulmonary disease (COPD) are the major respiratory disorder in worldwide. Approximately 235 million people are thought to suffer from asthma globally, and 65million are affected by moderate-to-severe COPD. Nowadays, asthma and COPD are mainly treated by inhalation therapy. Inhaled bronchodilators and steroids are required for the treatment of COPD and asthma because of their capacity to alleviate symptoms, improve the airflow, decrease the rate of exacerbations and improve the quality of life also it have the faster onset of action, lower required doses, and fewer systemic adverse effects than the oral route of delivery. The importance of inhaler device and its education is a recurring theme in much of the current literature. Improper inhaler use is a leading cause of poor disease control and poor clinical outcomes accompanied by both systemic and local adverse reactions. The local adverse reactions including oropharyngeal candidiasis, dysphonia, pharyngitis, tongue abrasion, choking, tongue burning and cough that affects patient's quality of life. For inhalers to be effective, good inhalation technique (specific steps) and adequate adherence are important. The aims of this review are to assess the quality of inhalation technique in patients and to determine the effect of a single intervention by community pharmacies to improve knowledge of patient regarding use of inhalers in asthma and COPD.

Keywords: inhalers, inhalation technique, intervention, patient education, aerosol therapy.

INTRODUCTION

Chronic obstructive lung diseases like asthma and chronic obstructive pulmonary disease are accompanied by a major burden of symptoms, lost of productivity and cost of medications on the individuals, health care utilization.¹ The first line administration method of asthma and COPD management is by inhalation of medication to the site of the disease progression. The medications are directly delivered into the airways by achieving higher local concentration with very less risk of systemic side effects is the major advantage of inhalers.² But the main problem with inhalers is the incorrect usage which may adversely affect the benefits to be gained from inhalation therapy.³ The inappropriate usage of inhalers leads to higher rates of morbidity, hospitalizations, healthcare expenditures and probably mortality, in addition to an unnecessary escalation of therapy.⁴ In addition, incorrect inhalation technique may also increase the risk of local or systemic side effects and thereby reduce the safety and tolerability of inhaled medications.⁵ As a result of deposition of actively inhaled corticosteroids (ICS) during administration, local adverse reactions will occur in the oropharynx. The formulation of steroids, type of delivery system, and patient's compliance are the factors that influence the proportion of an inhaled dose that is deposited in the oropharyngeal cavity.⁶ Patient compliance to aerosol therapy is important in the treatment of asthma and COPD.⁷ The disease instability and poor clinical management, with increases in hospital admissions, emergency room visits, school/work absenteeism,

morbidity, and mortality are due to non-adherence to medications.⁸ Poor patient adherence to inhaler therapy can be due to lack of knowledge, cognition, competence, or contrivance are the major reasons for poor patient adherence to inhaler therapy.⁹ That means Patients who have not been trained or failed to grasp use of drug and device combinations (cognition) typically do not have the flexibility to use an aerosol device properly (competence).¹⁰

DISCUSSION

Common errors

Common errors seen in clinical trials, listed below, vary widely and in some case are surprising.¹¹ These errors highlight that no step can be taken for granted. Error severity varies among studies, but all are shown to impact medication delivery and therefore end asthma outcomes in some way.¹² The vast majority of these errors resolved with subsequently employed teaching strategies, particularly when the teaching was repeated and reinforced often.¹³

1. Most commonly observed, device independent

(a) Not exhaling before actuation of MDI (Metered dose inhalers).¹⁴

(b) Not holding breath for 5 to 10 seconds after actuation.¹⁵

(c) Incorrect inhaler position.¹⁶

2. Errors during device preparation can be device dependent



- (a) Not removing cap before deploying inhaler.
 - (b) Not shaking the inhaler before use.¹⁷
 - (c) Using an empty inhaler.
 - (d) Inversion of DPI after medication is loaded.^{18,19}
3. Error during device utilization can be device dependent
- (a) Not sealing lips around inhaler.
 - (b) Inhaling through the nose instead of the mouth.
 - (c) Coordination of breath and actuation of MDI.¹³
 - (d) Exhaling through DPI after the medication is loaded.
 - (e) Breathing stopped as soon as inhaler is actuated.
 - (f) Not inhaling at all.¹⁵
 - (g) Insufficient inhalation to deliver effective dose (too fast or too slow, depending on device).
 - (h) Taking more than 1 puff in quick succession without a pause.^{13,14}

Reasons for inhalers error

Multiple factors impact on inhaler use. These can be grouped into several broad categories, which relate to the device itself, the patient (consumer) or the health care professional.²⁰

The device

There are many different types of inhaler devices available to patients and they can differ in terms of:

- The way in which the inhaler dispenses the medication; whether it is passively or actively generated (i.e. the aerosol-generating properties which can be propellant, mechanical, or compressed air).²¹
- The type of formulation (e.g. solution, dry powder etc).²²
- Whether the inhaler contains medication in a single- or multi-dose, is disposable or refillable, or contains a reservoir.²³
- Dose preparation for DPIs.

Each of the different drug delivery systems demands a certain level of physical skill, manipulation, dexterity, hand strength, lung capacity and/or hand-lung co-ordination in order to ensure optimal/correct inhaler use.²⁴

Often, it is the very young and the elderly who experience physical difficulties when using an inhaler device. Therefore, there may be an increased risk of inhaler errors if due consideration is not given to the patients' individual practical abilities when prescribed inhaler devices.²⁵

The patient/consumer

In addition to physical capabilities, several other patient related factors may impact on inhaler use including their

health beliefs/beliefs about medications, adherence and patient device preference. While understanding the patient's psychosocial status and the way in which it impacts on health behaviour is complex, some key criteria need to be considered in terms of inhaler use. In order to optimize disease management, patients are required to demonstrate correct inhaler technique, both at the outset of treatment and as they continue to use their inhaler over time.²⁶

The healthcare professional

The role of healthcare professionals in inhaler use is critical both in achieving initial correct inhaler technique and also in maintaining this correct inhaler use over time. Inhaler technique training delivered to patients by healthcare professionals is important in terms of nature, frequency and skill level. Another critical concept is the nature of the education delivered.^{27, 28} The most effective patient training technique in correct inhaler use has been found to be verbal instruction combined with physical demonstration.²⁹ Repeating this education over time increases the proportion of patients returning to follow-up visits who maintain the correct technique.³⁰

Cultural barriers and inhaler use in asthma

Barriers including religious and cultural beliefs may impact on the use of inhalers and reduce the impact of educational interventions.³¹ In some populations, the use of an inhaler is seen as improper or impolite and oral drugs may be favoured. Moreover, healthcare professionals need to be aware that some CFC-free inhalers contain alcohol, since certain populations may have religious and/or cultural concerns regarding the use of such preparations.³²

The drug and dosing

The type of aerosol devices used to administer prescribed medications as well as its frequency, type, and a number of drugs to be taken are the factors associated with patient adherence to prescribed medications. A relationship between frequency of a drug must be taken and subject adherence was found in a previous research study.³³ Clinicians should consider an appropriate drug option which makes dosing more convenient by reducing the frequency and number of doses to be taken by patients because with the increasing frequency of medication use the patient adherence will decline. Also by modifying the dosing to fit patients' schedules and incorporating medication administration into meal times and before bedtime we can increase the patient adherence to prescribed medications.³⁴

Effective educational interventions

Interventions to improve and maintain skill in inhaler use will reduce error. Inadequate inhaler technique decreases the effective delivery of drugs, thus interventions which reduce inhaler error may improve patient outcomes.^{35,36} Although multiple studies suggest that new "improved" inhaler devices reduce errors and improve outcomes, a



review of controlled trials demonstrated that a broad range of inhaler devices are equally effective in delivering therapy when patients use them appropriately.³⁷

Improving healthcare professional inhaler knowledge and skills

While virtually all comprehensive patient education programs include some level of education about the correct use of inhalers, most patients do not participate in such formal programs and instead rely on an instruction received from healthcare professionals in the clinic. However, these healthcare professionals typically lack the appropriate knowledge and skills in using different inhaler devices.³⁸ For this reason, studies have examined educational interventions designed to “train the trainer” and improve healthcare professional inhaler competence. It has been demonstrated that a single education session improves medical residents’ inhaler knowledge and skills.³⁹ Another study demonstrated that pharmacists who participated in a single-session education workshop showed significantly better knowledge and skills than a control group and that this knowledge was retained at a high level.⁴⁰

The patients will not be able to use the device without effective instructions even though they have an adequate understanding of how to use an aerosol device correctly.²⁹ Strategies that help clinicians individualize patient education in aerosol therapy are provide one-on-one individualized training, use a device preferred by the patient, keep the device consistent, provide effective instructions, develop psychomotor skills of patients with teaching devices, prepare personalized inhaler technique labels, and follow-up with patients to check the inhaler technique.³⁰

Provide one-on-one individualized education sessions

An individual training session is more effective than large-group classes. To improve medication adherence and clinical outcomes individualized patient education sessions through open-ended questions, reflective listening, and summary statements should be considered.⁴¹ Each patient education session should include:

- (1) Basic facts about the patient’s disease
- (2) The role of medications
- (3) The skills needed to use aerosol devices
- (4) Monitoring disease symptoms
- (5) Daily self-assessment to monitor conditions
- (6) An action plan to respond to exacerbations.

Selecting the device based on patient preference

To gain a greater degree of satisfaction in the therapy, patient preference is very important and it is linked to the ability to perform properly the inhalation technique.⁴² Several factors were associated with ease of use,

including fewer steps to use the inhaler, easier coordination of breathing maneuvers, confirmation that the dose had been taken correctly, and less resistance during inhalation.⁴³ Improvement in patient adherence and clinical outcomes and a reduction in health-care cost can be achieved by increasing patient satisfaction.⁴⁴

Keeping the aerosol device consistent

The patient will become confused when more than one type of device is given to the patients because of the different techniques for each device.⁴⁵ Therefore, to increase the patient’s adherence to aerosol therapy can provide same type of aerosol device for different inhaled medications.⁴⁶

Providing effective instructions

The written instructions alone are not sufficient for an effective patient education in aerosol therapy. Therefore, written and verbal instructions with a practice and demonstrations should be provided in a patient education program. The written form of instructions should be short, clear, and easily understood by patients and caregivers.⁴⁷ Also, demonstrating each step of the correct technique during the education session can help overcome language barriers between the patient and health-care provider. Clinicians should provide repeated instructions during patient education sessions to ensure the patient’s knowledge about inhaler therapy and to improve patient adherence to inhalation technique.⁴⁸

Developing patient’s psychomotor skills with devices

Patients can use aerosol devices in the most correct and efficient manner by developing the psychomotor skills of patients through training session. Health-care professionals should use simple teaching devices with or without placebo to develop the psychomotor skills of the patient needed for the device.⁴⁹

Individualized patient information leaflets

Patients are not usually aware of the incorrect inhalation technique and do not have sufficient knowledge about inhaler use, also they do not ask health-care professions for more information. Patient adherence to aerosol therapy can be increased by making inhaler technique labels in a personalized manner and highlighting wrong steps on the label.⁵⁰

Follow-up with patients after prescribed aerosol therapy

Following up with patients and their caregivers are the major components of effective educational intervention. This can help the healthcare professionals to answer any questions that arise from patients, ensure patient’s knowledge of prescribed medications and treatments and correct mistakes in their device technique. A time for assessment and training should be included in the follow-up sessions. This simple strategy can be used by health-care professionals to improve nonattendance in follow-up visits and may improve adherence to aerosol therapy.⁵¹



Improving patient inhaler knowledge and skills

Focused educational interventions designed to improve inhaler skills of adults and children with MDIs (metered-dose inhalers), pMDIs (pressurized metered-dose inhalers) and DPIs (dry-powder inhalers) can result in significant reduction in patient inhaler error.⁵² Written and verbal instructions alone improved patient technique, but the addition of a physical demonstration delivered by a pharmacist resulted in markedly better retention of inhaler skills.⁵³ Another study showed that a simple 2.5 min inhaler education intervention delivered by trained community pharmacists not only significantly improved patient inhaler technique but also resulted in improved asthma outcomes.⁵⁴ Other educational strategies for improving the efficacy of inhaler technique include the use of multimedia computer presentations, use of a training aid and telepharmacy counselling combined with an interactive video.⁵⁵

General principles in teaching inhaler use

The use of written instructions alone is not sufficient for effective patient education in aerosol therapy. Therefore, a proper education program with demonstrations and practice should be included. The written instructions should be clear, concise and easily understood by patients and caregivers.⁵⁶

- Conduct a demonstration of inhaler technique, verbally describing each step
- Repeat the demonstration without explanation
- Repeat again with verbal comments
- Have the patient demonstrate the maneuver
- Identify problems with the patient's technique
- Repeat the instruction and have the patient demonstrate again
- Ask the patient to verbalize most of the aspects of the procedure and those she or he finds most trouble some
- Arrange a follow-up instruction
- Remind the patient to bring his or her inhalers and spacers to every appointment
- Provide instruction to family and friends
- Review and dispense instructional leaflets, if available.⁵⁷

CONCLUSION

Inhalation therapy plays a central role in the treatment of patients with asthma and COPD, and its use requires supervised continuous training. Correct inhalation technique and education is essential for effective drug delivery in COPD and asthma. Pharmacists are in excellent position to educate patients about inhalation technique. The demonstration and counselling session is more effective than other interventions on proper inhalation technique. Successful training in inhaler technique depends upon effective communication of proper technique and its purpose, and monitoring to ensure that the skills have been learned and retained. Pharmacists

can play a pivotal role in reducing the implications of improper inhaler use.

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Source of Support: Nil, Conflict of Interest: None.

