

## Original Research Article

# Patient education on nasal spray technique for allergic rhinitis

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### ABSTRACT

**Background:** Allergic rhinitis (AR) is a common condition worldwide. Intranasal corticosteroid spray (INCS) is the mainstream and effective first line monotherapy treatment of AR. However, the efficacy of INCS may be dependent on factors such as the patient's compliance and delivery technique of the nasal spray. The correct delivery technique of INCS depends on the adequacy of patient education. Hence, our study was conducted to assess the benefit of the different methods of patient education and the best method of patient education on INCS usage technique. Objectives of the study were to determine if proper education in the usage of INCS affected the treatment of AR and to determine the best teaching method of nasal spray technique using both subjective and objective methods of assessment.

**Methods:** This is a prospective study that was performed over 2 years duration from the year 2017 until 2019. A total of 96 patients were recruited based on our inclusion and exclusion criteria. The effectiveness of the different methods of teaching were determined both subjectively by total nasal symptom score (TNSS) and objectively using Rhinomanometry test. The teachings method became increasingly more comprehensive as compared to the previous visit. Assessment was done every six weeklies for 4 times after each teaching methods of nasal spray usage on each visit. All Rhinometry test and patients follow up of was done by the same surgeon.

**Results:** There was statistically significant improvement ( $p < 0.05$ ) in patients symptoms based on the nasal resistance and TNSS with more comprehensive method of teaching nasal spray.

**Conclusions:** Our study showed the importance of educating patient regarding the use of INCS. Both objective and subjective assessment of improvement after each method of patient education showed statistically significant outcome.

**Keywords:** Allergic rhinitis, Teaching method, Intranasal corticosteroids, Rhinomanometry, Total nasal symptom score

### INTRODUCTION

Allergic rhinitis (AR) is a common disease worldwide which affects 10-25% of the population of all ages including children, adolescents and adults. Patients usually present with nasal obstruction, rhinorrhoea, sneezing and/or nasal itchiness.<sup>3</sup> In Malaysia, a study among paediatric patients shows that the overall incidence of rhinitis symptoms is 27%, with a significantly higher prevalence in the 12- to 14-year-old age group (38.2%) compared to the 5- to 7-year-old age group (18.2%).<sup>5</sup> In the tropical countries, majority of AR

cases are persistent in nature due to year-round warm and humid climate which is conducive for the proliferation of dust mites and moulds, two of the most common aeroallergens implicated in persistent AR. Patients with persistent AR are often symptomatic throughout the year and need long-term treatment. Therefore, ensuring total compliance to treatment is important.<sup>3</sup> Intranasal corticosteroid (INCS) spray is cardinal in the medical management of AR and chronic rhinosinusitis (CRS).<sup>5</sup> Topical nasal steroid is the first line treatment to control nasal congestion for AR. It is more effective than oral antihistamines in controlling rhinitis symptoms, particularly nasal congestion.<sup>6</sup>

Recent systematic reviews have demonstrated the effectiveness of INCS spray for CRS and AR. However, compliance has been shown to be poor even in very symptomatic patients. As a result, symptoms tend to worsen in non-compliant patients.<sup>5</sup> Training on the use of nasal spray and education on rhinitis increases compliance. However, patient education is often neglected in clinical practice and its effect should not be underestimated. A number of studies have investigated the intranasal distribution of steroid using INCS with many different application techniques but to date there is no study done to determine if the method to educate patients plays a role in the efficacy of treatment of AR.<sup>5</sup> Therefore, this study aims to determine the usefulness of patient education and if AR control is affected by different methods of teaching of nasal spray usage.

## METHODS

### *Study population*

The study recruited subjects aged 18 and above with clinical symptoms suggestive of mild persistent or moderate-severe persistent AR (ARIA guidelines 2008).

### *Inclusion criteria*

Inclusion criteria included AR who had never been on steroid nasal spray treatment.

### *Exclusion criteria*

Exclusion criteria excluded pregnant females, patients with medical co-morbid such as ischemic heart disease, cystic fibrosis and diabetes, and those on antihistaminic/antileukotriene medication, or already on intranasal or systemic steroid were excluded. Patients whom diagnosed to have nasal polyp, nasal septal perforation, granulomatous lesions, nasal masses, or previous nasal surgery were also excluded from the study.

### *Study design*

The study design used was cross-sectional prospective study.

### *Study duration*

2017-2019 parametric and nonparametric tests were used in statistical analysis. A sample size estimation of 91 would be necessary to detect at least 5% difference in nasal congestion with 90% of power and 5% of significance.

### *Study site*

The study carried out at the department of otorhinolaryngology (ORL) hospital Putrajaya, Malaysia.

### *Ethics approval*

This study was approved by the Malaysian research ethical committee. NMMR No:16-53-0-29516.

### *Methodology*

All patients were treated with intranasal mometasone furoate monohydrate (Nasonex) manufacture by MSD. The dose prescribed was two puffs in each nostril once daily. Each puff contains 50 mcg of Mometasone furoate monohydrate. The patients were reviewed and assessed 4 times after the initial visit. The interval between each visit was 6 weeks.

### *Intervention*

Patients were exposed to different methods of teaching on INCS spray technique on each visit. The 4 different methods of teaching are as mentioned below: Education of technique by pharmacists (E1), education of technique by researcher (E2), education of technique by researcher and providing a pamphlet on the technique (E3) and education of technique by researcher and providing a video showing the technique. The video was sent to patients through email (E4).

E1 method was taught by our hospital pharmacists. The pharmacist techniques are: example of the pictures is as in Figure 1.

*Step 1:* Shake bottle gently and remove the dust cap. Gently blow your nose.

*Step 2:* Hold the bottle with opposite hand and point the nozzle outwards, away from the nasal septum.

*Step 3:* Press once and apply the second puff. Repeat the same technique on the opposite nostrils. E2, E3 and E4 was taught by the researcher.

The nasal spray technique steps that were shown to the patients is as follow:

*Step 1:* (Figure 1A) gently blow your nose. Remove the dust cap. Hold the nasal spray bottle with thumb at its bottom and the tip in between index finger and middle finger. No need to tilt head forward or backwards.

*Step 2:* (Figure 1: B, C and D) hold the bottle with left or right hand depending on patient's preference. Insert nasal spray applicator about 30 degree from floor of nostril. Do not tilt the applicator to the side of nostril.

*Step 3:* Press once and wait for 10-15 seconds before applying the second puff. Repeat the same technique on the opposite nostril.

Pamphlets and video given to patients containing the same instructions along with pictures/audiovisual of the technique. Example of the pictures is as in Figure 1.

### Assessment and follow-up

Patients were seen every 6 weeks for 4 times in total after initial visit (V1). On each visit patients were assessed subjectively using the total nasal symptoms score (TNSS) questionnaire and objectively using active anterior rhinomanometry test.

The TNSS questionnaire consists of nasal symptoms (congestion, rhinorrhea, itching, and sneezing) were scored on a scale (0=none, 1=mild: symptom clearly present but minimal awareness, 2=moderate: definite awareness of symptom which is bothersome but tolerable and 3=severe: symptom is hard to tolerate and causes interference with activities of daily life and sleep). Total nasal symptoms score is 15. Classification of severity according to the total score: very mild (0-2), mild (3-6), moderate (7-9) and severe (>10).

Objective assessment was done using active anterior rhinomanometry test (ATMOS rhinomanometry 300 machine). Active anterior rhinomanometry was performed according to the guidelines of the standardization committee on objective assessment of the nasal airway.<sup>7</sup> Nasal resistance at 150-Pa pressure was taken. Initial visit Rhinomanometry test and TNSS were taken as baseline data. All the Rhinometry test and follow up of patients was done by a single operator.

Flow of the assessment was as described:

**Initial visit (V1):** Patients completed TNSS questionnaire and baseline rhinomanometry test. After assessment, patient sent to the pharmacy to collect nasal spray and received direct instruction of nasal spray application technique from pharmacist.

**Second visit (V2):** Patients completed TNSS questionnaire and rhinomanometry test. After assessment patient demonstrated nasal spray application technique using their used nasal spray bottle. Then, researcher taught the patients technique of INCS which has been used by ORL department of hospital Putrajaya.

**Third visit (V3):** Patients completed TNSS questionnaire and rhinomanometry test. After assessment, patients demonstrated nasal spray technique using their used nasal spray bottle. Then, patients received education on the hospital Putrajaya INCS spray delivery technique by researcher and pamphlet.

**Fourth visit (V4):** Patients completed TNSS questionnaire and rhinomanometry test. After assessment, patients demonstrated nasal spray technique using their used nasal spray bottle. Then, patients received education on the hospital Putrajaya INCS spray delivery technique

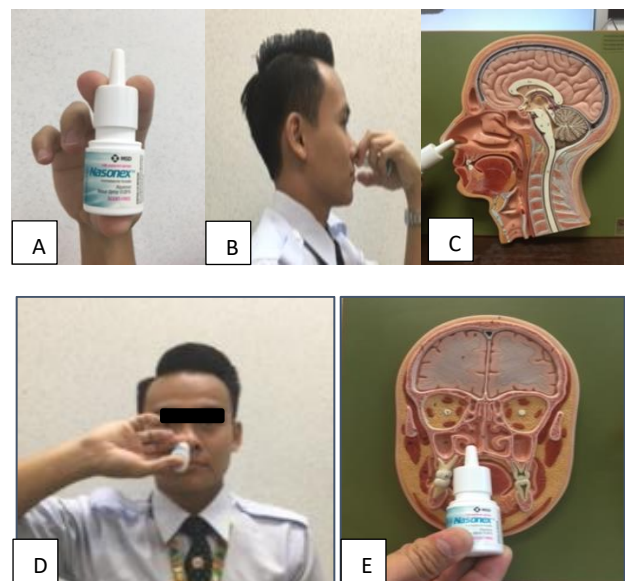
by researcher and a video on the technique was emailed to patients.

**Fifth visit (V5):** Patients completed TNSS questionnaire and rhinomanometry test. After assessment, patient demonstrated nasal spray technique using their used nasal spray bottle.

Data collection during each visit also included any adverse effect or complications such as epistaxis or septal perforation.

### Statistical analysis

All analysis was performed using statistical package for social science (SPSS) version 23 with statistical significance set at  $p < 0.05$ . Quantitative data distribution was determined using the Kolmogorov-Smirnov test. Univariate tests were conducted through descriptive analysis and normality tests. The results are reported in the form of frequency, percentage, mean, and standard deviation, median and interquartile range (IQR). Further analysis using bivariate tests, which were chi-square test ( $\chi^2$ ), Mann Whitney-U, Wilcoxon signed-rank test and Kruskal Wallis test were used to determine whether there was a significant relationship between rhinometry score and TNSS with the different methods of patient education.



**Figure 1: Hospital Putrajaya nasal spray technique.**

### RESULTS

A total of 96 patients satisfied the inclusion criteria and consented to participate in this study. Patients were between 19 to 62 years old (mean=30.8 years) and among them 37 (38.5%) were male patients and 59 (61.5%) were female patients. Majority of patients were Malays (n=85/96; 88.5%) followed by small fraction Indians, Chinese, foreigners and others. Based on the 2008 ARIA

guidelines, 87 (90.6%) patients were diagnosed with moderate-severe persistent (MSP) AR, 3 (3.1%) had moderate-severe intermittent (MSI) AR while 6 (6.3%) had mild persistent (MP) AR.<sup>8</sup> The demographic data and the diagnosing criteria are presented in Table 1.

**Table 1: Demographic data and diagnosis according to ARIA 2008 classification.**

Demographic and diagnostic details		No	Percentage (%)
Age (Years)	≤ 30	51	53.1
	> 30	45	46.9
Gender	Male	37	38.5
	Female	59	61.5
Race	Malay	85	88.5
	Chinese	3	3.1
	Indian	5	5.2
	Foreigner	1	1.0
	Others	2	2.1
ARIA	MSP	87	90.6
	MSI	3	3.1
	MP	6	6.3

Abbreviations: ARIA (allergic rhinitis and its impact on asthma), MSP (moderate severe persistent), MSI (moderate severe intermittent), MP (mild persistent), TNSS (total nasal symptoms score), V (visit).

Assessment on the techniques during the 2<sup>nd</sup> (visit 2) showed that none of the participants were able to show a correct technique on the usage of INCS. During the 3<sup>rd</sup> visit despite re-education, only 26% of participants were able

to show the correct techniques. However, by the 3<sup>rd</sup> and 4<sup>th</sup> visit, a good improvement was seen as more were able to demonstrate the INCS delivery technique correctly. At the end of the study, all 96 (100%) patients successfully applied and demonstrated proper technique of INCS using the Hospital Putrajaya INCS spray delivery technique. (Table 2).

**Table 2: Improvement of INCS usage technique during each visit after education given to patients.**

Visit improvement in technique		No	Percentage (%)
V1	No	-	-
	Yes	-	-
V2	No	96	100.0
	Yes	0	0.0
V3	No	70	72.9
	Yes	26	27.1
V4	No	14	14.6
	Yes	82	85.4
V5	No	0	0.0
	Yes	96	100.0

Abbreviations: V (visit).

Baseline TNSS on V1 showed that 69 patients (71.9%) came with severe symptoms. These group of patients had not been on any INCS. There was statistically significant association between ARIA classification and severity of TNSS during V1-V3. Majority of patients with MSP AR had severe TNSS during V1 and subsequently improved to moderate symptoms during V2 and mild/very mild during V3 (Table 3).

**Table 3: Association between ARIA classification and severity of TNSS during each visit.**

TNSS		ARIA		X <sup>2</sup>	P
		MSP (%)	Others (%)		
TNSS_V1	Mild	6 (6.3)	5 (5.2)	24.049	<0.001
	Moderate	12 (12.5)	3 (3.1)		
	Severe	69 (71.9)	1 (1.0)		
TNSS_V2	Very Mild	11 (11.5)	5 (5.2)	11.435	0.010
	Mild	40 (41.7)	3 (3.1)		
	Moderate	22 (22.9)	1 (1.0)		
TNSS_V3	Severe	14 (14.6)	0 (0.0)	7.850	0.049
	Very Mild	22 (22.9)	6 (6.3)		
	Mild	37 (38.5)	3 (3.1)		
TNSS_V4	Moderate	20 (20.8)	0 (0.0)	1.989	0.575
	Severe	8 (8.3)	0 (0.0)		
	Very Mild	31 (32.3)	4 (4.2)		
TNSS_V5	Mild	40 (41.7)	5 (5.2)	1.349	0.718
	Moderate	8 (8.3)	0 (0.0)		
	Severe	8 (8.3)	0 (0.0)		
TNSS_V5	Very Mild	44 (45.8)	4 (4.2)	1.349	0.718
	Mild	35 (36.5)	5 (5.2)		
	Moderate	4 (4.2)	0 (0.0)		
TNSS_V5	Severe	4 (4.2)	0 (0.0)	1.349	0.718
	Very Mild	44 (45.8)	4 (4.2)		
	Mild	35 (36.5)	5 (5.2)		



**Table 4: Improvement in nasal resistance before and after a different method of nasal spray teaching using rhinometry.**

Variables	B- E1	B- E2	B- E3	B- E4	E1- E2	E1- E3	E1- E4	E2- E3	E2- E4	E3- E4
<b>Z</b>	-2.929	-4.916	-6.621	-6.545	-3.455	-5.195	-5.905	-3.270	-4.841	-2.259
<b>P</b>	0.003	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.024

a. Wilcoxon Signed ranks test, b. Based on positive ranks. Abbreviations: E (education), B (baseline).

**Table 5: Improvement in TNSS before and after a different method of nasal spray teaching.**

Variables	TNSS E1_B	TNSS E2_B	TNSS E3_B	TNSS E4_B	TNSS E2_E1	TNSS E3_E1	TNSS E4_E1	TNSS E3_E2	TNSS E4_E2	TNSS E4_E3
<b>Z</b>	-8.281	-8.329	-8.474	-8.517	-5.044	-6.085	-7.171	-2.405	-4.878	-4.314
<b>P</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.000

Wilcoxon Signed ranks test. Abbreviations: TNSS (total nasal symptoms score), E (education), B (baseline).

The objective assessment of improvement of symptoms and INCS technique after each education method was done using rhinomanometry score. A baseline rhinomanometry was done on V1 and compared between scoring of the other consecutive visits (V2-V4). These Rhinomanometry scoring were done to compare nasal resistance before and after all 4 methods of INCS nasal spray teaching technique. There was statistically significant difference ( $p < 0.05$ ) in nasal resistance when compared with baseline, also before and after each different method of teaching (Table 4) of the other consecutive visits (V2-V4).

The subjective assessment of improvement in nasal symptoms after each method of patient education was done using the TNSS. All the 4 methods of education were compared with baseline and shown to be statistically significant ( $p < 0.05$ ) (Table 5).

**DISCUSSION**

Education and monitoring of patient’s nasal spray application technique are fundamental elements in the treatment compliance especially for patients with persistent rhinitis. It is important to establish patient’s compliance especially when evaluating those who failed to respond to therapy. We have found that patient’s symptoms improved by objective test (rhinomanometry) and subjective (TNSS) with each education methods implemented on each visit.

**Nasal spray applicator tip position and adverse effects**

In AR, nasal obstruction is due to the swelling of nasal mucosa especially the middle and inferior turbinate. The

inferior turbinate is the main site of swelling. Therefore, the topical steroid must be targeted at this area.<sup>10</sup>

Individual nasal anatomy and the method of INCS spray application potentially affect the delivery and distribution of intranasal steroid. Several spray application methods have been described in the various literatures. A number of studies have investigated the intranasal distribution of steroid using an intranasal steroid spray with different application techniques.<sup>5</sup> Some techniques contributed more adverse effects than benefit e.g., epistaxis and septal perforation.<sup>11</sup> Michael et al conducted on a survey of 30 consecutive patients who had been using an INS for longer than 3 consecutive months and who had experienced at least 1 nosebleed in the preceding 2 months.<sup>12</sup> They have concluded that, to prevent epistaxis the recommendation is to point the nozzle outwards, away from the nasal septum.<sup>7,11</sup> None of the studies demonstrated or stressed on how much to tilt the applicator.

On the second visit (V2), after being taught by hospital pharmacist, our observation revealed that patients tend to over point the nozzle laterally from the septum, causing the tip to touch the alar wall, resulting in dripping of the medication from the nose causing discomfort to the patients. This poor administration technique causes reduced efficacy of INCS which leads to persistence of the symptoms. However, as the tip was away from the septum, none of our patients experienced adverse effect such as epistaxis or septal perforation throughout the study.

**Head position and arm positioning during nasal spray application**

Beginner and Chong et al. recommended that patient’s head is kept in a neutral position when using INCS spray because when the head is tilted back, the intranasal corticosteroid could flow down the throat and cause

throat irritation as well as absorption into the gastrointestinal tract.<sup>9,12</sup>

Another research, Ganesh et al suggested the contralateral hand technique (for example right hand for left nostril) reduces the adverse effects of INCS spray while increasing patient compliance.<sup>5</sup>

Similar method was taught by our hospital pharmacist but there was not much improvement in patients TNSS and Rhinomanometry score.

### ***Improving compliance by educating patients***

Another most important issue in treating AR is patient's compliance towards INCS. Compliance has been shown to be poor for INCS use, even in very symptomatic patients. In tropical country, most of the patients have persistent AR and symptomatic throughout the year. They need long-term treatment and ensuring total compliance to treatment can be difficult. The compliance towards INCS improves by educating patient. Effectiveness of topical intranasal steroid may also be limited by lack of patient education on the correct application technique.<sup>12</sup> Many studies focused on finding the correct method of using the nasal spray but none looked at the importance of patient education on the nasal spray technique to help to control AR symptoms. In this study, we have implemented the method of educating the patients with demonstration by the researcher and also by audio-visual technique. With this, we have achieved symptom improvement especially after 2<sup>nd</sup> visit (V2) onwards and 100% compliance by the end of the study.

### ***Improvement of nasal resistance***

In this study, we evaluated the impact of different modes of educating patients on nasal spray application technique through objective and subjective assessment. There is a statistically significant association between rhinomanometry score with severity of TNSS. Majority of the patients with severe TNSS had higher rhinomanometry score compared to patients with mild and moderate symptoms. When the patients were educated on the technique of INCS usage and re-evaluated on each visit, we have noted significant improvement in nasal resistance. Nasal resistance proportional to nasal symptoms, hence improvement in TNSS. The highest increment in rhinomanometry score was seen when comparing education technique E4 (researcher and video) with E1 (pharmacist). This concluded that the education method on INCS technique by ORL clinic hospital Putrajaya successfully improved the nasal resistance and symptoms of the patients.

### ***Re-instruction of technique on each visit***

In this study, patients slowly learnt to use the ORL hospital Putrajaya INCS spray delivery technique following V2 onwards. By visit 4-(24 weeks), after

education of technique by researcher and pamphlet, 80% were able to demonstrate the hospital Putrajaya INCS spray delivery technique. Finally, on the final assessment (V5)-30 weeks, after education of technique by researcher and video, all (100%) patients were able to demonstrate the hospital Putrajaya INCS spray delivery technique.

This study also shows that regardless of age or gender, patients were able to use the INCS correctly after receiving proper patient education. We cannot deny that after INCS prescribed, the regular follow up with assessment of the techniques and repetitive educations of the techniques has impacts on the improvements of the rhinomanometry scores and TNSS. We also observed that patients must be re-instructed regularly on the correct technique of using INCS spray to obtain optimal benefit. Patients showed improvement in signs and symptoms of AR after they were trained on the technique of nasal sprays on every visit by researcher, along with the help of education tools such as pamphlet and video. To date, there are no reports in the literature on educational interventions to teach patients about proper technique of nasal spray application, unlike the education of inhaler technique for asthmatic patients.

### ***Role of pharmacist on education of spray technique***

Axtell et al emphasized on pharmacists' role is utmost important in achieving a successful asthma treatment as they are the last providers to encounter patients before medication treatment initiated.<sup>2</sup> Study by Basheti et al demonstrated a statistically significant difference when comparing direct pharmacist instruction on proper inhaler technique to having subjects watch a video or read an inhaler pamphlet.<sup>13</sup> They suggest that a brief 2.5-minutes counselling session conducted by a pharmacist can significantly improve a patient's MDI inhaler technique. Pharmacists should spend time explaining and demonstrating proper INCS technique as well as observing patient's technique. Direct instructions and demonstration on techniques shown to be significantly more effective. As revealed by our research, the sign and symptoms, TNSS and rhinomanometry score does not show much of improvement after 1<sup>st</sup> visit (V1).

Pharmacist and the ORL team of Hospital Putrajaya should implement same education method on INCS usage. With this modification, we can definitely see improvement in signs and symptoms of AR in future. As suggested by Basheti et al pharmacists should spend brief counselling sessions to demonstrate the techniques on 1st visit and re-evaluated by the clinicians on each visit.<sup>12</sup>

### ***Pamphlet and video education***

The aim of this study by giving out pamphlet and video is so that patients can always refer to it whenever needed. There are pros and cons of these education methods. The disadvantage of using pamphlet is that it is easily

misplaced by the patients. The video demonstration has advantage of being paperless and patient always can refer to the technique at any time especially those who failed to master even after direct counselling.<sup>14</sup> The best form is probably video as it can be understood even if there is language barrier. Thus, it would be beneficial to the patients by giving out pamphlet and video demonstration where clear instructions were given.

### Limitations

There is improvement seen in TNSS and rhinomanometry after each visit. Ideally, they should be compared with someone with same severity who has not received the same patient education at the end of the same duration of treatment. Therefore, there is a possibility that the improvement seen is secondary to a longer treatment duration rather than correct technique alone.

Patients were aware that they were being assessed and probably would have made the extra effort to learn the technique correctly during the consecutive visits leading to a bias in the study.

### CONCLUSION

In conclusion, our study showed the importance of educating patient regarding the use of INCS. Both objective and subjective assessment of improvement after each method of patient education showed statistically significant outcome. Hence, we strongly advocate that patients are effectively counselled about proper INCS spray application technique when they receive a nasal spray. Patients must be given clear instructions for correct administration. Patient education is often neglected in clinical practice because it is often time consuming especially in a busy outpatient clinic. Nonetheless, the aftermath of poor patient education should not be underestimated. Continued education by the clinicians and pharmacists that the patient can be convinced of the important benefits of continued treatment in this often-underestimated disease. It is also very important to avoid confusion by synchronizing patient education between doctors and pharmacist.

Although less thorough research has been done about the best application technique, these recommendations can lead to a structural, standardized protocol for administration of topical intranasal steroid.

Every effort should be made to instruct first-time users on the technique. Multiple teaching methods or media use helps patients to understand better. Education with video demonstration had highest impact on INCS usage. Therefore, by using our education methods, especially video demonstration, we are expecting improvement in the treatment of patients with allergic rhinitis.

Thus, we strongly recommend on usage of education tools such as video demonstration in near future to

combat the disease. Perhaps videos of the INCS spray application technique can be made available in all well-equipped pharmacies and outpatient clinics in the near future. The new ARIA guideline has explored the use of mobile app use to assess speed of onset of rhinitis medications. Perhaps the app could incorporate the education materials that could enhance the improvement in symptoms due to correct usage of nasal spray.

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### REFERENCES

1. Anolik R. Clinical benefits of combination treatment with mometasone furoate nasal spray and loratadine vs monotherapy with mometasone furoate in the treatment of seasonal allergic rhinitis. *Ann Allergy Asthma Immunol.* 2008;100(3):264-71.
2. Axtell S, Haines S, Fairclough J. Effectiveness of Various Methods of Teaching Proper Inhaler Technique: The Importance of Pharmacist Counsellin. *J Pharm Pract.* 2017;30(2):195-201.
3. Loh CY, Chao SS, Chan YH, Wang DY. A clinical survey on compliance in the treatment of rhinitis using nasal steroids. *Allergy.* 2004;59(11):1168-72.
4. Asha'ari ZA, Yusof S, Ismail R, Che CM, Path M. Clinical Features of Allergic Rhinitis and Skin Prick Test Analysis Based on the ARIA classification: a preliminary study in Malaysia. *Ann Academy Med Singapore.* 2010;39(8):7.
5. Ganesh V, Banigo A, McMurran AEL, Shakeel M, Ram B. Does intranasal steroid spray technique affect side effects and compliance? Results of a patient survey. *J Laryngol Otol.* 2017;131(11):991-6.
6. Price D, Bond C, Bouchard J, Costa R, Keenan J, Levy ML et al. International Primary Care Respiratory Group (IPCRG) Guidelines: Management of allergic rhinitis. *Prim Care Respir J.* 2006;15(1):58-70.
7. Clement FG. Standardisation Committee on Objective Assessment of the Nasal Airway, IRS, and ERS. Consensus report on acoustic rhinometry and rhinomanometry. *Rhinol.* 2005;43:169-79.
8. Bousquet J, Van Cauwenberge P, Khaltaev N, Aria Workshop Group, World Health Organization. Allergic Rhinitis and Its Impact on Asthma. *J Allergy Clin Immunol.* 108(5):S147-334.
9. Chong LY, Head K, Hopkins C, Philpott C, Schilder AG, Burton MJ. Intranasal steroids versus placebo or no intervention for chronic rhinosinusitis. *Cochrane*

- ENT Group, editor. *Cochrane Database Syst Rev.* 2016;4:CD011996
10. Merkus P, Ebbens FA, Muller B, Fokkens WJ. The 'best method' of topical nasal drug delivery: comparison of seven techniques. *Rhinol.* 2006;44(2):102-7.
  11. Rollema C, Van Roon EN, De Vries TW. Inadequate quality of administration of intranasal corticosteroid sprays. *J Asthma Allergy.* 2019;12:91-4.
  12. Benninger MS, Hadley JA, Osguthorpe JD, Marple BF, Leopold DA, Derebery M.J et al. Techniques of Intranasal Steroid Use. *Otolaryngol Neck Surg.* 2004;130(1):5-24.
  13. Basheti IA, Reddel HK, Armour CL, Bosnic-Anticevich SZ. Improved asthma outcomes with a simple inhaler technique intervention by community pharmacists. *J Allergy Clin Immunol.* 2007;119(6):1537-8.
  14. McElnay JC, Scott MG, Armstrong AP, Stanford CF. Audiovisual Demonstration for Patient Counselling in The Use of Pressurised Aerosol Bronchodilator Inhalers. *J Clin Pharm Ther.* 1989;14(2):135-44.
  15. Bousquet J, Schunemann HJ, Togias A, Bachert C, Erhola M, Hellings PW et al. Next-generation Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines for allergic rhinitis based on Grading of Recommendations Assessment, Development and Evaluation (GRADE) and real-world evidence. *J Allergy Clin Immunol.* 2019;145(1):70-80.e3.

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