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Research Article

The Effectiveness of Video Education How to Use Diskus® *Dry-Powder inhaler* on Out-Patients Copd In Mojokerto, Indonesia

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ABSTRACT

COPD therapy aims to prevent and overcome acute exacerbation on COPD which could be fatal and even lead to death. Thus, it must be prevented with optimum medication during stable condition. Bronchodilator in the form of inhalation are preferred in COPD medication because systemic bronchodilator has many side effects compared to that of topical bronchodilator (inhalation). DPI (*dry-powder inhaler*) has been developed and introduced to the market since 1967 as a solution or choice concerning MDI (*metered-dose inhaler*) setbacks where patients felt difficult in coordinating hands and lungs. Evidences suggested that *multi-unit dose* DPI such as Diskus® offered most reliable and consistent performance and it is preferred by patients. The improper using of inhaler is one of the main causes holding up asthma control since it can affect patients dosage intake which is not optimal. This research aimed to know the efficacy of Diskus® preparation usage education given to COPD patients. Method used in this research was *one study group pre-test dan post test*. The number of respondents involved in this research was 55 respondents. The result of t-test suggested that t-count is fewer than p-value (0.05) suggesting that there was difference between pre and post test score as a result of oral or motor evaluation. It is then concluded that Diskus® usage education affected the patients in the improvement of inhaler usage accuracy based on oral and motor evaluation. This research only reviewed COPD patients skill in using Diskus®, thus it is required to conduct further research to dig the understanding in the usage of Diskus® like drug indications, interval, how to notice side effects and how to overcome them. Also, this research only reviewed knowledge increase, but yet described *outcome* improvement from the using of COPD therapy itself.

Keywords: Education, Video, Diskus, COPD.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic disease marked with progressive exacerbation in the limitation of flow and related with abnormal pulmonary inflammation response on dangerous particles or gases[1].[1] COPD is classified as chronic disease and it has various complications but generally preventable and curable[2,3,4,5]. COPd also lead to the increase of direct cost up to $ 18 billion and indirect cost as much as $14.1 billion in combating COPd in Europe.[2] Indonesia, a country with high number of smokers, is estimeated to have high COPd prevalence, but accurate data concerning COPD prevalence is not owned by Indonesia.[2] Based on the survey conducted by Basic Health Research in 2013 suggested that COPD prevalence aged above 30 years in Indonesia is 3.7% per thousand[6].

The objectives of COPD therapy is to prevent and overcome accute exacerbation on COPD could have fatal outcome and even lead to death, that it must be prevented with optimal medication during stable conndition.[1] Main choices of COPD treatment in stable conditions bronchodilator and corticosteroid. The use of bronchodilator is a main therapy for COPD symptoms. It could be given if necessary or regularly, depending on patient's condition[1,7]. Corticosteroid group is often combined with beta agonist group to increase effectiveness and decrease side effects compared to that of single usage[1,8].

The handling of chronic COPD is conducted with regular medication, because COPD is one of the chronic diseases, and its nature is progressive and not fully reversible. Medication is required to decrease the rate of this disease progress. However, there are many factors that could lead to exacerbation for COPD patients, one of which is lacking of understanding concerning how to take the drugs properly since they must be deposited in the right place[1,7]. Inhalation preparation form is preferred in COPD treatment with bronchodilator because systemic bronchodilator has many side effects compared to that of topical bronchodilator (inhalation)[1]. DPI (*dry-powder inhaler*) has started to be developed and introduced to the market around 1967 as a solution or option regarding MDI

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(*metered-dose inhaler*) shortage, where the patient got difficulties in coordinating hands and lungs[9,10]. MDI is the most common inhaler used for asthma therapy, but due to its limitedness it can decrease the effectiveness of medication and lead to poor asthma control. DPI became second choice of most often used inhaler for asthma because it is easy to use[9,11]. Ideal DPI is the DPI providing consistent dosage and is easy to use. Evidences suggested that *multi-unit dose* DPI such as Diskus® offered most reliable and consistent performance and it is preferred by patients[9,11.]

NAC (*National Asthma Council Australia*, 2006)[12] said that inhaler technique has important clinical impact related to symptoms control, including asthma and COPD. The improper using of inhaler is one of the main causes holding up asthma control since it can affect patient's dosage intake which is not optimal. However, many researches suggest that patients were unable to show proper inhaler usage technique[13].

COPD treatment is a long term treatment that patient's compliance in taking asthma medicine is highly required. Hence, like in asthma medication, pharmacists' role is very important in providing informational suggestion through education for patients with mild or even chronic condition[14,15,16,17]. Education can be given by using current technology to directly demonstrate how to use inhaler, e.g. by video[18,19,20]. There have been many educational videos regarding how to use Diskus®, but there have not been many researches studying the effectiveness of the video and use Indonesian as its language of instruction. This research aimed to know the efficacy of Diskus® preparation education given to COPD patients, to increase their ability in using Diskus® to be more optimal.

METHOD

Research Design

This research, conducted by the researchers, was a *pre-experimental.* This research used *one study group pre-test and post test* method. There is no control group in this design but initial observation has been conducted with *pre-test*.

Research Variables

The variable of this research is the completeness of the demonstration regarding how to use Diskus® which will be valued with *checklist* adopted from previous research conducted by Osman *et al*. (2012)[20].

Population and Samples

The population was all COPD patients in Mojokerto hospitals. Research sample (research subject) was all COPD patients in Mojokerto hospital meeting research inclusion and exclusion criteria. Inclusion criteria of research sample are: (a.) Adult COPD patients (>40 years old);[1] (b.) COPD patients that have been diagnosed >3 months; (c.) Patients currently using Diskus® and have been using it for at least 1 month; (d.) COPD Patients *stage* I-III[1]. Exclusion criteria of research sample are:[21] (a.) Patients requiring manual ventilation; (b.) Patients having serious comorbidity (renal filure, liver failure, and heart failure); (c.) Patients suffering from malignant disease; (d.) Other conditions or diseases causes the patients unable to participate (e.g.: dementia or delirium). Withdrawal criteria is the patient unwilling to participate the program to the end or disappearing or hard to contact patient.

Subject Selection Techniques

Sampling technique in program aplication stage of the research is *consecutive sampling*, since no sample framework is gotten, sampling is conducted for samples meeting inclusion and exclusion criteria. *Consecutive sampling* was conducted by determining research samples quota from each site where the research took place[22]. Based on *Medical* Statistic formula,[23] to calculate the size of unknown samples with prevalence data of COPD in East Java as much as 3.7% taken from Basic Health Research Year 2013,[24] the big formula for research sample is:

$$n = \frac{(Z^2 . P . Q)}{d^2}$$

If: Z= 1,96; P= 0,037; Q= 1-P = 1-0,037 = 0,963; d= 0,05 (precision)

The size of samples for this research (n) for each group is 54,75 ~ 55 respondents.

Course of Research

The research was conducted by seeking for research samples (subjects) at outpatient pulmonology in 4 (four) hospitals in Mojokerto. Research approval letter was issued by each of four hospitals where the research was conducted, among others: (1) No. 028/RSIS-NU/Dir/2016; (2) No .445/1165/417.407/2016; (3) No. 423.4/575/416-211/2016; and (4) No. 070/226/418-206/2016.

Checklist validation and educational video on how to use Diskus®.

Selection of research subjects i.e. COPD patients meeting research criteria and willing to sign *informed consent.*

Subject was asked to demonstrate how to use Diskus® (*pre-test*), then they would be educated on how to use Diskus® available at: https://youtu.be/2JYww3RAXZI and the re-evaluated after two weeks because on the average most COPD patients will have their next follow-up visit after two weeks (*follow-up-test*). Evaluation was conducted by *rater* by using *checklist* as in table 1.

RESULTS OF RESEARCH

The number of respondents involved in this research was 55 respondents, most were male COPD patients, their age range was mostly 40-65 years old, and their latest education was mostly senior high school (Table 2).

Reliability of Rater Rating the Demonstration of Asthma Inhaler Usage Technique

The reliability of both *raters* used in the research was determined by using *intraclass corelation coefficient*. Reliability scale is displayed in the form of *cronbach alpha*, with expected value of >0.7. The result of rater reliability test can be seen on table 3, suggesting that both *raters* were reliable.

Improvement on the Completeness of Diskus® Usage by Respondents

Table 1: Checklist on How to Use Diskus® adopted from Osman *et al*. (2012).[20]

No.	Steps on How to Use Diskus® based on Osman *et al*. (2012)	Oral Evaluation		Motor Evaluation	
		Evaluation Told by Subject	Value: (circle)	Evaluation Demonstrated by Subject	Value: (circle)
1.	Holding diskus horizontally	Hold diskus horizontally	1	holding diskus horizontally	1
		Hold diskus	0.5	Not holding diskus horizontally (improper)	0.5
		Said nothing	0	Did nothing	0
2.	Place the thumb on thumbgrip and slide to the right	Place the thumb on thumbgrip and slide to the right until you hear click	1	Demonstrating thumb positioning on thumbgrip and sliding direction to the right	1
		Place the thumb on thumbgrip (but not explaining until click sound)	0.5	Demonstration is incomplete	0.5
		Said nothing (silent)	0	Did nothing (silent)	0
3.	Full exhalation through mouth	Full exhalation through mouth and keep the item away	1	Exhalation fully through mouth and keep the item away	1
		Exhale (without saying how to exhale through mouth or the importance of keeping the item away)	0.5	Exhaling ordinary breath through mouth (without demonstrating how to exhale through mouth properly or to keep the tool away)	0.5
		Said nothing	0	Did nothing	0
4.	Place diskus in the mouth properly between teeth and lips	Place diskus in the mouth properly between teeth and lips	1	- Demonstrating clasped mouth between teeth and lips and - Getting the mouth close to *mouthpiece* (pointing the *mouthpiece*-nya)	1
		Place diskus in the mouth (but not explaining it in detail)	0.5	- Demonstrating clasped mouth between teeth and lips or - Getting the mouth close to *mouthpiece* (pointing the *mouthpiece*-nya)	0.5
		Said nothing (silent)	0	Did nothing (silent)	0
5.	Take off diskus mouthpiece from mouth and hold deep breath for 5-10 seconds	- Take off diskus mouthpiece from mouth - Hold the breath for at most 10 seconds, - If unable to hold breath for 10 seconds, hold it as long as you can	1	- Getting *mouthpiece* away from mouth - Holding breath - Demonstrating while in standing position	1
		Hold the breath (explaining but incomplete/improper)	0.5	Only taking off mouthpiece and not holding breath (incomplete)	0.5
		Said nothing (silent)	0	Did nothing (silent)	0
6.	Exhale and breathe slowly	Exhale and breathe slowly through mouth	1	exhaling and breathing slowly through mouth	1
		Exhale (without saying slowly)	0.5	exhaling (but not slowly)	0.5
		Said nothing (silent)	0	Did nothing (silent)	0
7.	Place the thumb on *thumbgrip* and slide back to the left until you hear click	Place the thumb on *thumbgrip* and slide back to the left until you hear click	1	- Demonstrating how to place thumb on *thumbgrip* and - Demonstrating how to slide back to the left	1
		place the thumb on thumbgrip or only explain until sound click	0.5	Demonstrating how to place thumb on thumbgrip	0.5
		Said nothing (silent)	0	Did nothing (silent)	0

Table 2: Respondents Characteristics.

Characteristics		Frequency (n: 55)	Percentage (%)
Gender:	Male	41	74.5
	Female	14	25.5
Age (years old)[25]	40-65 (adult)	28	50.9
	> 65 (geriatrics)	27	49.1
Latest Education	SD (Elementary School)	6	10.9
	SMP (junior high school)	12	21.8
	SMA (senior high school)	32	58.2
	S-1 (bachelor)	5	9.1

Table 3: Rater Reliability Test on Diskus® Demonstration by Respondents.

Method	Value	Conclusion
Intraclass corelation coefficient	0,909	reliable
Kappa agreement	0,767	reliable

The result of normality test on *pre-test*, *post-test*, and *follow-up* was tested with Kolmogorov-smirnov and the result of P value suggested 0,055; 0,078; and 0053 consecutively. It means those three groups had normal distribution and that the next test can be conducted, paired t-test.

In oral evaluation, improvement on step 2 ("place the thumb on thumbgrip and slide it to the right") and step 4 ("Place diskus properly in the mouth between teeth and lips") were the most visible improvement compared to those of other steps. While in motor evaluation, the improvement of step 2 was the most visible compared to those of other steps (Table 4).

Based on table 5, in oral evaluation data on the completeness of the explanation on how to use Diskus® by respondents by comparing the data before education (*pretest*) and after education (*post-test*), it was suggested that there was an improvement on the accuracy of Diskus® usage based on oral evaluation suggested by score average increase. The result of t-test suggested that sig (0.000) is lower than p-value (0.05) suggesting that there was difference between pre and post test score as a result of oral evaluation. Thus, it is concluded that Diskus® usage education affected the patients in the improvement of inhaler usage accuracy based on oral evaluation. While in motor data evaluation it was known that there was an improvement on the accuracy of diskus usage based on motor evaluation suggested with score average increase. The result of t-count suggested that t count (0.025) is lower than p-value (0.05) suggesting that there was difference between pre and post test score as a result of motor evaluation. Thus, it is concluded that Diskus® usage

Table 4: *Pre-test* and *Post-test* Evaluation on the Completeness of Diskus® Usage Steps by Respondents

No.	Steps on How to Use Diskus® based on Osman *et al*. (2012)	*Pre-test*						*Post-test*						*Follow-up*					
		Oral Evaluation			Motor Evaluation			Oral Evaluation			Motor Evaluation			Oral Evaluation			Motor Evaluation		
	The number of respondents getting score (n):	1	0.5	0	1	0.5	0	1	0.5	0	1	0.5	0	1	0.5	0	1	0.5	0
1.	Holding diskus horizontally	32	14	9	32	14	9	30	25	0	29	23	3	31	14	10	32	18	5
2.	Place the thumb on thumbgrip and slide to the right	12	19	24	12	19	24	16	32	7	14	32	9	12	22	21	11	24	20
3.	Full exhalation through mouth	6	23	26	6	22	27	9	20	26	10	19	26	6	26	23	6	23	26
4.	Place diskus in the mouth properly between teeth and lips	9	17	29	6	17	32	11	22	22	10	10	25	9	28	18	6	18	31
5.	Take off diskus mouthpiece from mouth and hold deep breath for 5-10 seconds	6	27	32	2	9	44	6	19	30	2	13	40	6	23	26	5	10	40
6.	Exhale and breathe slowly	12	14	29	3	5	47	13	17	25	6	6	43	12	18	25	3	10	42
7.	Place the thumb on *thumbgrip* and slide back to the left until you hear click	8	9	38	8	7	40	16	13	26	8	6	41	38	9	8	8	9	38

Table 5 Fixing the Completeness of the Explanation on Steps of How to Use Diskus® by Respondents with Education

	Pre-test		*Post-test*				*Pre-test* compared with *Post-test*		*Pre-test* compared with *Follow-up*		*Post-test* compared with *Follow-up*	
	Oral Evaluation	Motor Evaluation	Oral Evaluation	Motor Evaluation	Oral Evaluation	Motor Evaluation	Oral Evaluation	Motor Evaluation	Oral Evaluation	Motor Evaluation	Oral Evaluation	Motor Evaluation
Average	2.5727	2.1000	3.1818	2.5182	2.8000	2.3091						
Standard Deviation	1.0904	1.0202	1.0513	0.9717	0.9699	0.9598	0.82040	0.91674	0.42837	0.39312	0.53544	0.67145
CI 95%	2,2779-2,8675	1,8242-2.3758	2,8976-3,4660	2,2555-2.7809	2.5378-3.0622	2,0496-2,5686	-0,83088) to (-0,38730)	-0,66601) to (-0,17035)	-0,34308) to (-0,11147)	-0,31537) to (-0,10281)	0,23606 to 0,52657	0,2757 to 0,39061
t count value							**-5.506**	**-3.383**	**-3.935**	**-3.944**	**5.288**	**2.309**
Sig							**0.000**	**0.001**	**0.000**	**0.000**	**0.000**	**0.025**

education affected the patients in the improvement of inhaler usage accuracy based on motor evaluation.

DISCUSSION

Step 1 of the usage of Diskus® is one of the *critical steps* aimed to open outer *slider* which can be slided to open or close with the help of *thumbgrip*. The slide functions to protect lever and *mouthpiece* from humidity and other environmental factors. *Mouthpiece* is an area directing the flow of medicine particles into oral cavity in order to flow into the lungs. This is designed as convenience as possible[9,20,26]. This step is relatively easy and clear, according to *pre-test* and *post-test* data most have been able to explain and demonstrate it.

Step 2 is one of the *critical steps* on Diskus® preparation which is necessary to be mentioned in every explanation. *Lever liding* functions to open upper blister *foil* of each dosage to rise onto *mouthpiece* and the new dosage is ready to be used. Blister *foil* is the wrapping of each medicine dosage (60 dosages) *functions to protect dry powder* from environmental humidity and other conditions to keep it always dry. When the lever is pulled down, a small hole in the *mouthpiece* opens, this small hole is a path for medicinal particles to get into oral cavity when inhaled. Besides, click sound can be heard and indicator wheel can be felt that it moves to show the amount of remaining dosages through dosage *counter* enabling the patient to monitor the remaining amount of the dosage. When five last dosages have been reached, a red number shall appear on dosage *counter* to notify the patient of remaining dosage[9,10,20,26,27].

Step 3 must be initiated by breathing deeply and exhaling the breath away from the *mouthpiece* of Diskus®. The purpose of this *step* is to help us preparing ourselves to breathe as deep and strong as possible to create good inspiration air flow and to be capable of inhaling medicinal dosage optimally. Normal exhalation but not too close from the *mouthpiece* of Diskus® because medicinal dosage can be blown away that it brings humidity into Diskus® and *the dry powder* eventually clot, makes it hard to be inhaled[9,20,26].

Step 4 will prevent the patient from losing dosage if their mouth position is tight on the *mouthpiece*. If the dosage is gone, it will decrease inhalation dosage that medicine effectiveness becomes not optimal[20,26]. It is then continued with step 5 i.e. exhalation after taking off the *mouthpiece* of Diskus® from mouth and hold the breath deeply for 5-10 seconds. This gives enough contact time that the medicine will be optimally deposited into bronchioles. New research suggested that the patient is not obliged to hold their breath until 10 seconds because the medicine will directly be dissolved into membrane mucous[20,26].

Step 6 is the closing, it aimed to close the upper protecting cover in order that the *mouthpiece* will stay clean and dry and will automatically reset to initial position and is ready to be re-used. If this step is not performed, it is worried that humidity and environmental conditions could affect the stability of *dry powder*[9,20,26,27,28].

CONCLUSION

Based on the result of the research, it can be concluded that educating the way how to use Diskus® to COPD patients gave significant increase on patients' knowledge to it decreased several weeks later. Therefore, continuous education is required to improve and maintain COPD patients' knowledge.

SUGGESTION

This research only reviewed COPD patients skill in using Diskus®, thus it is required to conduct further research to dig the understanding in the usage of Diskus®, like drug indications, drug interval, how to notice side effects and how to overcome them. Also, this research only reviewed knowledge increase, but yet described *outcome* improvement from the using of COPD therapy itself.

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