TO WHAT EXTENT MIGHT SPECIALITY TRAINING IN INHALER TECHNIQUE FOR HEALTHCARE PROFESSIONALS OR ACCESS TO REGULAR ASTHMA REVIEWS AND FOLLOW UPS INFLUENCE THE PROPORTION OF PATIENTS WHO ARE BEING PROPERLY TRAINED AND ASSESSED ON APPROPRIATE INHALER TECHNIQUE?

[1]KAOTAR AZOUI, [2]ESRA KARAKASLI, [3]LORNA EYRE, [4]ANP PAULA SPOONER

E-mail: um13ka@leeds.ac.uk, um14ek@leeds.ac.uk

Abstract -

BACKGROUND/AIMS:

Poor inhaler technique has been linked to poor Asthma management[1]. Thus, there is a need to identify factors that contribute to improper inhaler technique. This study investigates the association between the level of speciality training of clinicians and the access to Asthma clinics on inhaler technique in patients registered at Stanley Health centre.

METHODS:

This study follows a retrospective and service evaluation design. Once ethical approval was granted, questionnaires were distributed to patients with Asthma at Stanley Health Centre. The questionnaires investigated influential factors, including patient demographics, education background, awareness on inhaler technique and number of Asthma attacks in order to identify critical errors. Patients were then formally assessed on inhaler technique by their respective clinician.

RESULTS:

64.3% of patients from the study population observed correct inhaler technique: 83.3% of these patients were seen by a specialist Nurse who was adequately trained in Asthma management. The remaining 16.6% of these patients were seen by other clinician's void of specialist Asthma training. Patients with access to Asthma clinics accounted for 77.7% of those who demonstrated correct inhaler technique. However, 70% of the 35.7% patients who failed to meet the criteria of correct inhaler technique were seen by healthcare professionals who did not have additional training in Asthma management.

CONCLUSIONS:

Patients who were seen by specialist trained Asthma nurses with regular access to Asthma clinics were most likely to acquire proper inhaler usage. There is a correlation between inhaler technique and Asthma control, hospital admissions and quality of life (QOL). Thus, Asthma management should target inhaler training to reduce key critical errors.

I. INTRODUCTION

Asthma is an inflammatory condition of the airways, characterised by chest tightness, wheezing and shortness of breath [1]. In prevalence, 5.4 million people in UK are currently being treated for Asthma respectively [1], [2]. As per Global Initiative for Asthma (GINA) guidelines, correct inhaler competence ensures effective deposit of medication throughout the lungs which is the mainstay for symptom control [3]. However, if the patient is void of proper device technique, the delivery of required dose to the lungs will reduce respectively [3]. Sequentially, this will attenuate the therapeutic functioning of inhalers [3]. Existing literature state that the commonest causes of uncontrolled Asthma are: improper inhaler usage in 80% of patients and poor adherence in 50% of patients in the UK [4], [5].

Despite the National Institute for Health and Care Excellence (NICE) issuing a quality statement that all Asthma patients must be provided with specific training and monitoring in inhaler usage, poor inhaler technique still remains a major hindrance to optimal Asthma care [6], [7].Although there is an abundance of literature concluding that inhaler incompetencies is prevalent amongst Asthma patients, there have only been a limited number of studies investigating factors that have a direct and definitive impact on inhaler technique [8]–[10].Thus, it is imperative for further research to be conducted in this field of Respiratory Medicine in order to ascertain critical errors in Asthma device practicality and patient understanding of inhalers, which this study sets out to achieve.

II. AIMS & OBJECTIVES

-Explore the extent in which access to regular Asthma reviews and specialist training may influence the proportion of patients being properly assessed and trained on correct inhaler technique.

-To determine factors contributing to inhaler incompetence.
-To put forward strategies that can be implemented to improve inhaler education.

III. METHODS

This study design was a service evaluation given that the GPs (Stanley Health Centre) current Asthma management was being measured against exiting guidelines (NICE and Care Quality Commission groups). The study explored what standards the service delivered by the primary care organisation achieved and how improvements can be made to safeguard optimal Asthma care, if any. The study was also retrospective as the questionnaires assessed patient's prior knowledge on inhaler technique and previous Asthma management through parameters such as number of Asthma attacks in the patients past medical history.

Ethical approval was necessitated by this study primarily because patients were consenting to participate first-hand in the research and to complete questionnaires, which explored personal information such as post-codes (for index of deprivation scores) and profession. The process of applying for ethical approval proved to be long and complex: an online Integrated Research Application System (IRAS) was completed followed by awaiting contact from relevant personnel. A formal meeting was then arranged with the Research Governance Team from West Yorkshire Research and Development, in which the study proposal was discussed at length. Ethical approval was officially granted on the 16th November 2017, reference number: 001_16_11_17_0000.

Inclusion criteria:

- Patients must have read the information sheet and completed the consent form to ensure they were fully informed of the study aims.
- Patients must have been formally diagnosed with Asthma in a clinical setting, with documented evidence on their medical records.
- Patients must be on a metered dose inhaler (MDI) which encompassed both Clenil Modulite and Salbutamol (Ventolin). MDI was the choice of device because they are the most commonly prescribed inhalers and are most associated with practical errors [11], [12].
- Exclusion criteria:
- Children aged 5 years or younger as they are not competent in medicines administration; the assessment of inhaler technique will reflect the level of Asthma education as opposed to the child.
- Individual's dependent on caregivers to administer inhalers for reasons including any impairments, learning difficulties, memory loss, disabilities, blindness and deafness. Dependants rely on caregivers to administer their medications and thus would be a direct assessment of the caregiver's knowledge of inhaler technique as opposed to the patient with Asthma themselves.
- All other forms of inhalers, including dry-powdered inhalers, were excluded. This was due to the widespread range of inhaler devices, each requiring their own instruction manuals, would only amount to complexity and time constraints in the study.

Data governance was practiced throughout the methodology and data collection process. The availability, integrity and security of data was maintained through a series of strict measures. First and foremost, transfer of completed questionnaires between stakeholders or any third party was prohibited. Access was only granted to the Supervisors and the students directing the study project. The hardcopy questionnaires were enclosed in a secure folder and kept in one secure vicinity at the Practice. This location had strict access via a smart-key in the possession of secretaries only. These set procedures were paramount in maintaining patient confidentiality as well as integrity of the data. Data collection involved the distribution of patient questionnaires which were completed whilst they awaited their appointment. At the end of the appointment, patients were assessed on inhaler technique by the overseeing clinician against a standardised definition of correct inhaler technique which was extracted from the NICE guidelines. This ensured that all patients were assessed on inhaler technique in the same, standardised way. Completed questionnaires were analysed to retrieve both quantitative and qualitative data, inputted into excel, followed by conducting numerical graphs and correlations between exposures and outcomes. Given that the outcome is binary (Yes, correct inhaler technique or No, incorrect technique), an adjusted multivariable logistic regression model was performed. Incompetent inhaler technique holds public health implications in that it gives rise to uncontrolled Asthma, which remains a frequent cause for Emergency Department admissions [2], [3]. Thus, it is obligatory to improve the standard of care delivery in the field of Asthma.

IV. RESULTS

A total of 1000 patients were enrolled in the study. The mean age of patients was 62.34 $\pm$ 10.5 years. Females constituted 55% of the total sample cohort. The median duration of Asthma in the study

population was 360 months. 64.3% of the participants demonstrated correct inhaler technique, 83.3% of whom had been seen by an Asthma specialist nurse, and 77.7% of which had regular access to Asthma clinics and follow-ups (Table 1). 35.7% of the participants demonstrated incorrect inhaler technique, in which 70% and 50% of these patients were seen by "other" (either a General Practitioner, Nurse or HCA) and had access to Asthma clinics respectively. Thus, improper inhaler technique was observed in patients who were overseen by a clinician void of any Asthma training and had substantially less contact with Asthma clinics in comparison to patients observed with proper Asthma device use.

Table 1: Comparison between patients who demonstrated correct and incorrect inhaler technique and the proportion of these patients exposed to each variable respectively

		Proportion of patients displaying correct inhaler technique	
		Yes	No
		64.30%	35.70%
Exposure 1 Speciality training	**Asthma Nurse**	83.30%	30%
	Other (Doctor/Nurse/HCA)	16.60%	70%
Exposure 2 Access to asthma clinics	**Yes**	77.70%	50%
	No	22.20%	50%

Females constituted 67% of the patients who acquired correct inhaler technique in comparison to 33% of males who also produced the same result. There was an equal gender split in patients observed with poor inhaler competencies, as seen in Fig. 1.

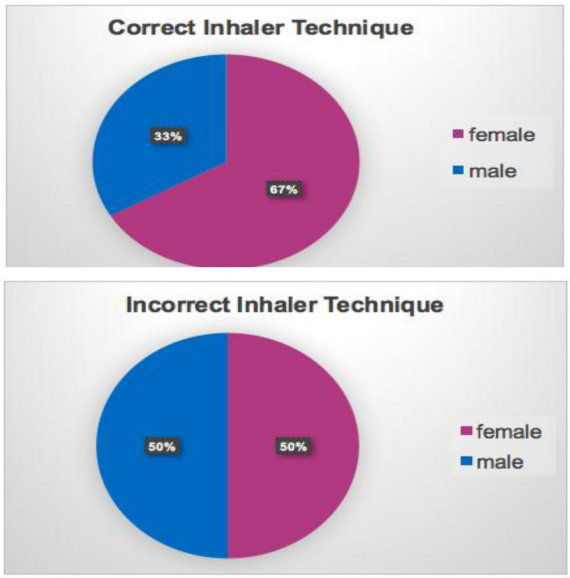


Fig. 1: Female to male ratio as per inhaler technique demonstration

Fig. 2: Age of participants demonstrating correct and incorrect inhaler technique

The age of participants ranged from 20 to 90 years of age. Fig. 2 displays a unimodal and normal distribution amongst patients demonstrating poor inhaler technique, with a maximum of 30% patients aged 51-70. The correct inhaler technique category follows a bimodal distribution with 2 peaks, 1 at the 20-30 age mark and the next at 61-70 age mark. 100% of patients aged < 40 showed good inhaler use.

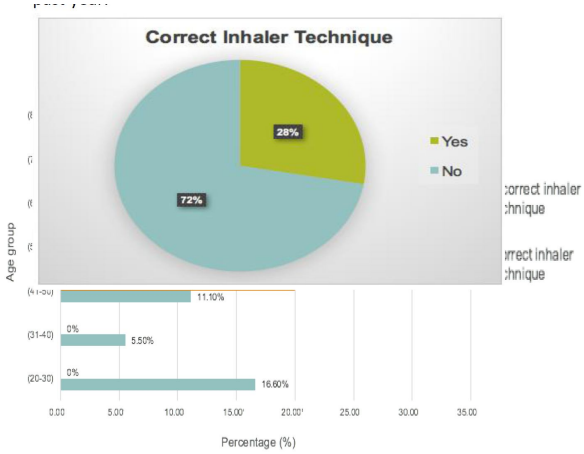


Fig. 3 measures the number of Asthma attacks the patients sustained in the past year. 28% of patients with a correct inhaler technique reported to have an Asthma attack in the past year compared to 70% who lacked adequate inhaler technique who also had an Asthma attack in the past year.

Fig. 3: Percentage of patients from both categories who had an Asthma attack in the past year

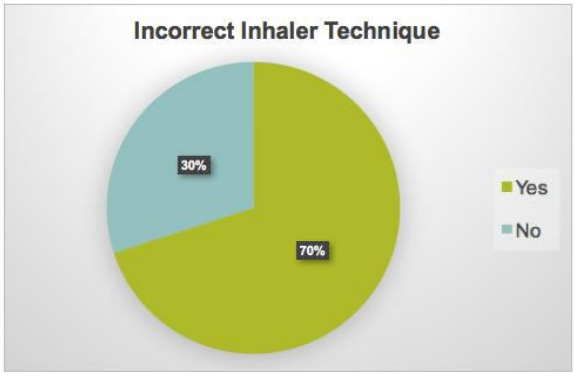
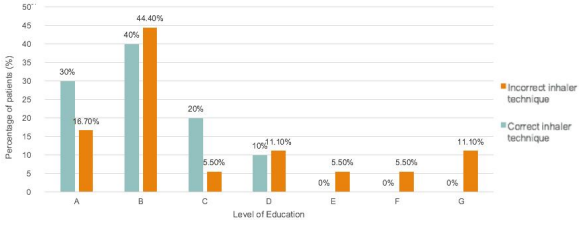


Fig. 4: Education and qualifications of the patients



Patient education backgrounds were measured, as shown in Fig. 4 (key in Table 2), whereby an even distribution of varying qualifications is seen in patients observed with poor inhaler use, with the

exception of class B (GCSE/ BTEC/ A-Levels) which accounted for 44.4% of these patients.

Table 2: Key for Fig. 4

Key	Education
A	No formal qualification
B	GCSE / BTEC / O Levels / A Levels
C	Higher national certificate of diploma /NVQ Level 4
D	Degree
E	Post graduate certificate/ Diploma
F	Masters
G	PhD

Proper inhaler technique was defined by a standardised definition issued by NICE in which every patient was assessed against by the overseeing clinician. This was coupled by a series of True and False statements surround inhaler use answered by the patients in the questionnaires. As seen in Fig. 5, patient's whose overseeing clinician was an Asthma specialist consistently out-performed those who were seen by a clinician void of Asthma training. Step 1, 3 and 4 in particular exhibited poor performance rates with only 10%, 8% and 3% correctly answered by participants seen by a non-Asthma-specialist respectively.

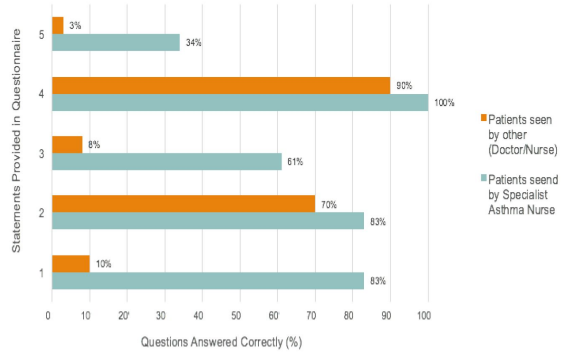


Fig. 5: Patient knowledge of inhaler technique

Stage	Inhaler Use Statements
1	You should shake your inhaler before use
2	You should breath out first before using inhaler
3	Once you have placed the mouthpiece in your mouth, you should breathe in rapidly
4	You should hold your breath after taking your inhaler for at least 10 seconds
5	You should wait at least 50 seconds between doses

Table 3: Key for Fig. 5

DISCUSSION

Patients who were seen by an Asthma specialist and had a regular follow-up status were more likely to demonstrate correct inhaler technique and perform the inhaler steps properly in comparison to those who did not see an Asthma specialist nor had frequent access to Asthma clinics and follow-ups. A previous study that further support these findings state that only 45% of healthcare professionals across all disciplines, excluding Asthma specialist nurses, cannot use inhalers appropriately [9]. This reinforces the need to either train all healthcare professionals on inhaler usage or to involve Asthma nurses in the management of every patient that has been diagnose with Asthma in the UK. Asthma specialists have a very focused and clear understanding of Asthma, acquired through their additional Asthma training and thus can provide efficient one to one inhaler training to patients, a quality that most other clinicians potentially lack.

An important finding of this study was that patients with poorly controlled asthma indicated by those who had Asthma attacks in the past year or had any hospital admissions related to Asthma compared to those with adequately controlled Asthma (in the absence of any Asthma attacks) had a significant association with inhaler technique and were more likely to use it improperly. Similar findings have been reproduced by other studies which concluded that patients with poorly controlled Asthma, indicated by the number of Asthma attacks in the patients past medical history, had a faulty inhaler technique and that inhaler misuse overall correlated with poor Asthma outcomes [6], [7].

This finding has a dual interpretation as not only can this parameter of previous Asthma attacks act as a prognostic assessment of poor inhaler technique: on the tail-end, it can also be interpreted in that patients using inhalers inappropriately are more likely to have an Asthma attack primarily because they are not making maximum use of the functioning of their Asthma devices.

Thus, what can be derived from this study is that Asthma attacks can act as a prognostic assessor in determining level of Asthma control and quality of inhaler technique. It is important to highlight significant predictors of improper inhalation technique in order address these individually and rectify them so that any outside influence on inhaler technique is minimised. From this, it is reasonable to suggest that patients should be flagged up on the GP records as having had a previous Asthma attack, thus warranting further investigation into their inhaler

technique to prevent further exacerbations and hospital admissions.

In terms of the direct assessment of patient's knowledge of inhaler techniques via the True or False statements on the questionnaire, patients deemed incompetent inhaler users scored lowest with respect to all the domains in comparison with those observed with good inhaler practice. Step five ("You should wait at least 50 seconds between doses") was the erroneous step in the use of inhalers for both categories of patients (correct and incorrect inhaler technique), with only 34% and 3% answering this question correctly, respectively. This was the most common step scored incorrectly in the study. In addition, it is considered as one of the crucial steps of asthma device technique [11]. Hence, a need to focus on this particular step during inhaler education and demonstrations is paramount. The use of dummy devices assists the patients understanding and provides them with a visual aid which is deemed more effective than a list of instructions, as reported by the patients from this study population.

Outside of the two exposures measured in this study, other factors were explored in the questionnaire to establish any associations, if any, with inhaler technique. These included patient demographics and clinical characteristics of participants. As displayed by Fig. 3, patients aged ≥40 years had a higher risk of improper inhalation technique as opposed to patients aged <40 years, which revealed 100% patients from the study population observed with adequate inhaler use. Similar findings have been produced by other studies exploring Asthma management against age of subjects [3].

The reasoning behind improper inhaler technique in older age groups could be attributed to poor cognition, memory impairments and compromised vision. In particular, maximum errors and poor technique belonged to the age range 50-70 years, with a combined 60% of patients. Thus, it is obligatory to address why incorrect inhaler technique predominates in this subset of patients. Measures to overcome this includes education and regular reinforcement in elderly patients through invitation to Asthma clinics to continually monitor inhaler technique overtime.

A previous study investigating relationships between age (paediatrics and elderly) and inhaler technique suggested that the former should be provided with additional supplemental instructions to assist in their administration of inhalers [3].

Unlike the age covariant, education did not show any significant association with improper inhaler use. The absence of an obvious linear regression or any positive correlation between education and inhaler technique in this research implies that education backgrounds do not play an integral part in determining ones' inhaler technique and awareness in this particular GP setting. However, given the small sample size, education cannot be confidently eliminated as a potential prognostic assessor of inhaler technique, and thus requires more thorough research in this domain.

One of the limitations encountered in this study was that it was restricted to one GP in Wakefield, for feasibility and time availability reasons. This sets the study back as the findings produced are not representative of West-Yorkshire as a whole. If provided an opportunity to repeat this research, a multicentric study on a wider scale is the requisite.

Another limitation this study posed was the ethical approval delays. Given the lengthy process of applying for ethical approval, the data collection process could not be commenced which created a backlog in the progress of the study. The sample size was reduced as a result. The majority of Asthma patients present in winter, as do Asthma exacerbations [1]-[3]. Simultaneously, ethical approval was being obtained, which resulted in missing a large intake of Asthma related presenting complaints. A learning point from this to take further into future research is to apply for ethical approval early and plan study timelines in advance.

The patient questionnaires themselves proved as limitations in certain areas. For instance, there was a substantial amount of 'missing data'. Patients reported that questions about their occupation was irrelevant and intrusive, for which they refused to answer. This resulted in the elimination of this questions as a covariate in this study. Other questions that did not generate a high response rate included patients post-code. For this reason, post-code lottery and indices of deprivation scores could not be measured against inhaler technique to establish a correlation. Health inequalities have been commonly found to affect health behaviours and uptake of healthcare services in existing literature [12].

CONCLUSION

Inhaler incompetencies amongst patients with Asthma is still prevalent and remains a major hindrance to optimal Asthma management and health outcomes. It is evident that Asthma control remains

sub-optimal, which necessitates the need for further research and interventions. The functional properties of inhalers are no longer exploited due to the incorrect usage, handling and dexterity of the device. Subsequently, Asthma attacks become imminent, exacerbations arise, NHS costs are incurred and patient's quality of life is impinged. Thus, it is of utmost importance that public health measures are made, particularly focusing on specialist training of clinicians and access to Asthma clinics, as found in the study to be of significance in ensuring the delivery of proper inhaler technique. Instituting public health programmes and repeated monitoring of inhaler use at regular intervals is a prerequisite to effective treatment and improving health and wellbeing of the public.

REFERENCES

[1] AsthmaUK. Using your inhalers. [Internet] 2016 (Accessed on 14/09/2018) Available from: https://www.asthma.org.uk/advice/inhalers-medicines-treatments/using-inhalers/

[2] Haughney J, Price D, Kaplan A, et al. Achieving asthma control in practice: Understanding the reasons for poor control. Respir. Med. 2008;102:1681-1693.

[3] Bharti C, Sadhana H, Magazine R, Kamath A.. Evaluation of relationship of inhaler technique with asthma control and quality of life. Indian J Pharmacol. 2017;49(1): 110-115

[4] Melani AS, Bonavia M, Cilenti V, Cinti C, Lodi M, Martucci P, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. Respir Med. 2011;105:930–8.

[5] Boulet LP, Vervloet D, Magar Y, Foster JM. Adherence: The goal to control asthma. Clin Chest Med. 2012;33:405–17.

[6] NICE. Inhaler devices for routine treatment of chronic asthma in older children (aged 5-15 years). [Internet] 2002 (Accessed on 14/09/2018) Available from: https://www.nice.org.uk/guidance/ta38

[7] NICE Guidelines. Asthma. February 2013 (Accessed on 13/09/2018) https://www.nice.org.uk/guidance/qs25/chapter/Quality-statement-4-Inhaler-technique

[8] Gupta R, Sheikh A, Strachan D, Anderson H. Burden of allergic disease in the UK: secondary analyses of national databases. Clin Exp Allergy 2004; 34:520-526.

[9] Thomas RM, Locker ER, Woo DM, Nguyen EHK, Press VG. Inhaler Training Delivered by Internet-Based Home Videoconferencing Improved Technique and Quality of Life. Respiratory Care Journal, 2017.

[10] Price DB, Roman-Rodriquez M, McQueen RB, Bosnic-Anticevich S, Carter V. Inhaler Errors in the CRITIKAL Study: Type, Frequency and Association with Asthma Outcomes. J Allergy Clin Immunol Pract, 2017; 5:1071-1081.

[11] Deerojanawong J, Promsaka na Sakolnakorn V, Prapphal N, Hanrutakorn C, Sritippayawan S. Evaluation of metered-dose inhaler administration technique among asthmatic children and their caregivers in Thailand. Asian Pac J Allergy Immunol. 2009; 27(2-3):87-93.

[12] Lenney W, Clayton S, Gilchrist F, Price D, Small I, Smith J et al. Lessons learnt from a primary care asthma improvement project. NPJ Prim Care Respir Med. 2016;26:15075.

★★★