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The Evaluation of Asthma Prevention and Educational Strategies Amongst Doctors Working in the Emergency Department

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A Research Report submitted to the Faculty of Health of the University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Medicine in Emergency Medicine

Johannesburg, 2021

DECLARATION

I, Marlize Swart, hereby declare that this research report is my own work and has not been submitted or presented for any other degree or professional qualification at this or any other institution. This research was undertaken in the Division of Emergency Medicine, University of the Witwatersrand, Johannesburg.

Signature of Student: Date: 23 November 2021

Name of Supervisor: Professor Abdullah E. Laher

Signature of Supervisor 1: Date: 23 November 2021

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SUBMISSION FORMAT OF THIS RESEARCH REPORT

As per University of the Witwatersrand Faculty of Health Sciences guidelines, this research report is being submitted in the publication ready format. The article has been submitted to The American Journal of Emergency Medicine and is currently under publication consideration.

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The Evaluation of Asthma Prevention and Educational Strategies Amongst Doctors Working in the Emergency Department

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Asthma prevention and educational strategies are not adequately addressed in the ED

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CONFLICTS OF INTEREST

The authors hereby certify that this submission is not under publication consideration elsewhere and is free from any conflict of interest.

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MS – Primary author, study design, data collection, data analysis, manuscript write up and approval of the final manuscript and corresponding author

AL – Assisted with study design, data analysis, interpretation of results, editing of manuscript and approval of the final manuscript

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ABSTRACT

Background: Exacerbations of acute asthma are frequent presentations to the Emergency Department (ED) and contribute to ED overcrowding and healthcare cost. The purpose of this study was to evaluate whether ED clinicians are implementing secondary asthma prevention measures prior to discharging patients after an acute asthma exacerbation and also to determine whether ED clinicians are able to correctly demonstrate how to use an asthma metered dose inhaler (MDI) device.

Methods: Consenting doctors employed at four EDs situated in the Gauteng province of South Africa were asked to complete a questionnaire and thereafter demonstrate the technique of using an MDI device. Collected data was described using frequency and percentage.

Results: Eighty-six doctors were included in the study. Of these, 18 (20.9%) routinely checked that inhaler technique was correct, 50 (58.1%) routinely enquired regarding adherence to their asthma treatment, 8 (9.3%) routinely informed patients of the side effects of asthma medication, 16 (18.6%) routinely provided patients with a written asthma action plan, 7 (8.1%) routinely evaluated for the presence of concurrent allergic rhinitis and 53 (61.6%) routinely counselled patients regarding smoking cessation. With regards to correctly demonstrating how to use and MDI device, only 23 (26.74%) participants performed all eight steps correctly.

Conclusion: This study indicates that secondary asthma prevention measures are not adequately addressed by clinicians prior to discharging patients from the ED after an acute asthma attack. It is recommended that ED clinicians are educated with regards to the importance of these measures.

Keywords: asthma; acute asthma exacerbation; secondary prevention; MDI technique; ED revisit; ED overcrowding

INTRODUCTION

Asthma affects approximately one in seven of the world's population [1]. The estimated prevalence of asthma amongst South African adults is 7-10% [2], however, due to local health systems being overwhelmed with communicable respiratory diseases such as pneumonia, tuberculosis and HIV-associated lung disease, it is likely that the true prevalence is underestimated [3]. Eighty percent of global asthma-related deaths occur in low- and middle-income countries [1], with South Africa ranking fourth in the world for asthma mortality [2].

An acute asthma exacerbation, which is defined as an acute or sub-acute episode of worsening of asthma symptoms, is a frequent presentation to the Emergency Department (ED). In the United States, acute asthma exacerbations account for 1.6 million ED visits every year, contribute significantly to ED overcrowding and are responsible for a substantial proportion of total healthcare expenditure [4,5].

Among patients with an acute asthma exacerbation being discharged from the ED, up to 25% will re-present within the first week and 35% within three weeks [4]. Prior to discharging patients from the ED after an acute asthma exacerbation, various secondary asthma prevention measures have been shown to reduce the rates of subsequent asthma exacerbations and ED revisits. These measures include checking that patients are correctly using their asthma inhaler device, confirming adherence to prescribed therapy, providing patients with a written asthma action plan, treating concurrent allergic rhinitis, addressing psychosocial issues, arranging a follow-up appointment, and providing patients with education pertaining to the symptoms of

uncontrolled asthma, medication side effects, irritant and allergen avoidance, and smoking cessation [6–8].

There is a paucity of data pertaining to the implementation of secondary asthma prevention measures by ED clinicians. Hence, the aim of this study was to determine whether these measures are being implemented by ED clinicians prior to discharging patients after an acute asthma exacerbation. Also, since educating patients regarding the correct use of an asthma inhaler device requires that the clinician is aware of the correct technique themselves, we also determined whether ED doctors were able to demonstrate the correct technique of how to use an asthma metered dose inhaler (MDI) device.

METHODS

This prospective cross-sectional study was conducted between 08 January and 13 March 2020 at four public hospital EDs situated in the Gauteng province of South Africa. The study population comprised of medical doctors with varying levels of experience that were employed at the EDs of the included hospital. Permission to conduct the study was obtained from the management of the each of the included hospitals, while ethics clearance was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (M190682).

Data was collected by the primary investigator at scheduled times as agreed upon by the head of the respective EDs. Doctors consenting to study participation were taken to an allocated room where they were first requested to complete the study questionnaire after which they were asked to demonstrate the technique of using an asthma MDI device. The research questionnaire

comprised of two sections, the first of which included 12 questions pertaining to secondary asthma prevention measures pertaining to patients who were discharged from the ED after an acute asthma exacerbation. The second section included 4 questions pertaining to medications that were routinely prescribed to patients presenting with an acute asthma exacerbation. Data pertaining to the practical demonstration of how to use an asthma MDI device was recorded on a separate data collection sheet. To limit the risk of study bias, a confidentiality agreement was included as part of the consent form where participants were asked not to disclose details of the study, so as to ensure that participants who were still to be enrolled in the study do not practice the technique of how to correctly use an MDI device.

Data from the research questionnaires and the asthma MDI technique data collection sheets were thereafter captured and analysed in Microsoft® Excel® (Version 16.52). Data was predominantly categorical in nature and presented as frequency and percentage. The mean and standard deviation was used to describe the number of MDI steps that were correctly performed by all the study participants, while the Chi-square test was used to determine whether doctors with more than one-year of ED experience were more likely to correctly perform all four critical steps of using an asthma MDI device than doctors with less than one-year of ED experience. A p-value of less than 0.05 was regarded as significant.

RESULTS

A total of 86 doctors were approached, all of whom consented to study participation and were included in the final study sample. Of these, 37 (43.0%) had ≤1 year of ED experience. Table 1 describes the responses of study participants to the various research questions relating to

secondary asthma prevention after an acute asthma exacerbation. Of note, more than half the number of participants reported that they enquired from all of their patients regarding adherence to current their chronic asthma medications (n=50; 58.1%), educated all of their patients regarding smoking cessation (n=53; 61.6%) and ensured that they have scheduled a follow-up appointment at a primary healthcare provider for all of their patients prior to ED discharge (n=47; 54.7%). More than a third of study participants did not routinely demonstrate correct inhaler technique (n=31, 36.1%), did not routinely provide patient education relating to the side effects of asthma medications (n=45; 52.3%), did not routinely provide patients with a written asthma action plan (n=63; 73.3%), did not routinely prescribe treatment for concurrent allergic rhinitis (n=43; 50%) and did not attempt to address psychosocial problems including family dysfunction and depression (n=53; 61.6%).

Reasons stated for not addressing these secondary prevention strategies included; a large volume of patients (n=40; 46.5%), perception that the patient has poor literacy and would find it difficult to understand instructions (n=12; 14.0%), language barriers (n=9; 10.5%), a belief that patient education should be provided at primary healthcare level (n=6; 7.0%), unavailability of a demonstration inhaler device (n=4; 5.0%), forgetfulness (n=4; 5.0%), and clinician fatigue (n=1; 1.2%). Not all participants provided reasons for failing to address prevention strategies with their patients.

Table 1: Participant responses to research questions relating to secondary asthma prevention measures

	Yes, all patients (n, %)	**Yes, some patients (n, %)**	**No (n, %)**
Checks correct inhaler technique	**18 (20.9)**	**47 (54.7)**	**21 (24.4)**
Demonstrates correct inhaler technique to the patient	10 (11.6)	45 (52.3)	31 (36.1)
Enquires from patients regarding adherence to asthma therapy	**50 (58.1)**	**34 (39.5)**	**2 (2.3)**
Informs patients of symptoms of uncontrolled asthma	28 (32.6)	38 (44.2)	20 (23.3)
Informs patients of side effects of asthma medication	**8 (9.3)**	**33 (38.4)**	**45 (52.3)**
Provides patients with a written asthma action plan	**16 (18.6)**	**7 (8.1)**	**63 (73.3)**
Evaluates for and treats concurrent allergic rhinitis	**7 (8.1)**	**36 (41.9)**	**43 (50.0)**
Educates patients regarding avoidance of ongoing allergen and irritant exposure	30 (34.9)	39 (45.4)	17 (19.8)
Encourages patients to stop cigarette smoking	**53 (61.6)**	**28 (32.6)**	**5 (5.8)**
Addresses patients' psychosocial problems	3 (3.5)	30 (34.9)	53 (61.6)
Schedules a follow-up appointment with a specialist asthma or allergy clinic	17 (19.8)	50 (58.1)	19 (22.1)
Schedules a follow-up appointment with a primary healthcare provider	47 (54.7)	31 (36.1)	8 (9.3)

Medications prescribed by study participants prior to ED discharge are described in table 2. All participants prescribed short-acting bronchodilator inhaler therapy, 79 (91.9%) prescribe a short

course of oral corticosteroids and 67 (77.9%) prescribe long-acting corticosteroid inhaler therapy. Intranasal corticosteroids and oral antihistamines for the treatment of concurrent allergic rhinitis was only prescribed by 10 (8.6%) and 8 (9.3%) doctors respectively, while 29 (33.7%) of participants prescribed oral antibiotics.

Table 2: Medications prescribed to asthmatic patients prior to Emergency Department discharge

	n (%)
Short-acting bronchodilator inhaler therapy	86 (100)
Short course of oral corticosteroid therapy	79 (91.9)
Long-acting corticosteroid inhaler therapy	67 (77.9)
Intranasal corticosteroids	10 (8.6)
Oral antihistamines	8 (9.3)
Oral antibiotics	29 (33.7)

Compliance with each of the eight steps of MDI device use among study participants is described in table 3. The mean number of correctly performed steps was 6.2 (SD 1.6). A total of 23 (26.74%) participants performed all eight steps correctly, while 31 (36.1%) performed the four critical steps correctly. Doctors with more than one-year of ED experience were significantly more likely to perform all four critical steps correctly compared to those with less than one-year of ED experience (p=0.023).

Table 3: Compliance with the 8 steps of metered dose inhaler device use among study participants

	n (%)
1. Removes cap	86 (100)
2. Shakes MDI device well	58 (67.4)
3. Breaths out normally	65 (75.6)
4. Keeps head upright or slightly tilted	86 (100)
5. Seals lips around the mouthpiece	76 (88.4)
6. Inhales slowly while actuating MDI device once during the first half of inhalation	51 (59.3)
7. Continues with slow and deep inhalations	45 (52.8)
8. Holds breath for 5 or more seconds	64 (74.4)
Performed all 8 steps correctly	23 (26.7)
Performed all 4 critical steps correctly	31 (36.1)

MDI – metered dose inhaler

Bold indicates critical steps

DISCUSSION

For a minimal amount of a drug to reach the terminal airways and exert its pharmacological action successfully, the correct use of an inhaler device is essential. Incorrect asthma inhaler technique has been associated with poor asthma control and frequent ED visits [8–10]. It is therefore recommended that clinicians observe and correct inhaler technique at every patient interaction [6]. Hence, it is of concern that only a fifth (20.9%) of study participants routinely

checked correct inhaler technique and only 11.6% demonstrated the correct inhaler technique to their patients. These figures are much lower than that reported in an unpublished study that was conducted by Maepa et al. at two other hospitals in the Gauteng province of South Africa, where 57% of study participants did not check correct inhaler technique and only 60% demonstrated the correct inhaler technique to their patients. Similar to our study, the investigators report that the unavailability of a demonstration inhaler device was a likely reason for these relatively low figures [11]. Multiple studies have shown that healthcare practitioners responsible for instructing and educating patients on the optimal inhaler technique often lack rudimentary skills with these devices [12–14]. In this study, approximately only a quarter (26.74%) of participants performed all eight steps correctly. Comparatively, Maepa et al. reported that only 16% of healthcare practitioners performed the inhaler technique correctly [11].

In general, study participants performed poorly with regards to questions that pertained to asthma education (adherence to therapy, symptoms of uncontrolled asthma, side effects of asthma medication, avoidance of allergen and irritant exposure and cessation of cigarette smoking). In keeping with our findings, a study that enrolled 297 patients reported that 56.4% did not receive asthma education, which was associated with frequent ED visits [15]. Similarly, another study comprising 450 patients reported that not providing asthma education was also associated with frequent ED visits which the authors defined as ≥3 visits per year ($p = 0.0145$) [12].

In this study, 73.3% of participants did not provide their patient with written asthma action plan prior to ED discharge. Guidelines recommend that all patients with asthma should be provided

with a written asthma action plan detailing their management [6,8,16]. A study reported that compared to asthmatics that lacked an asthma management plan, those with a written plan were half as likely to visit an ED for an asthma exacerbation or to require hospitalization [17]. A Cochrane meta-analysis that included 36 randomized trials reported that education in asthma self-management, which included self-monitoring of symptoms and a written asthma action plan. was associated with a significant reduction in ED visits (OR 0.82 95% CI 0.73-0.94) [18].

Concurrent allergic rhinitis may be present in approximately 85% of patients with asthma [19]. According to the united airway disease concept, both asthma and rhinitis affect the respiratory tract mucosa and is part of the same disease process. The presence of concurrent allergic rhinitis has been associated with significantly worse asthma control [20]. It has been recommended that asthmatics should also be evaluated for the presence of allergic rhinitis and treated appropriately prior to ED discharge [6]. In a study that comprised 1031 patients who had visited the ED for asthma, the authors reported that the use of intranasal corticosteroids to treat concurrent allergic rhinitis conferred significant protection against an acute asthma exacerbations requiring a visit to the ED [21]. Hence, it is of concern that the majority of study participants did not evaluate for the presence of concurrent allergic rhinitis.

Although guidelines recommended that antibiotics should not be routinely prescribed following an acute asthma exacerbation [8], a third of study participants reported that they prescribed antibiotics to patients with asthma. A study that analysed the data of close to two-million children from the UK and Netherlands reported that compared to non-asthmatics, antibiotic use

was higher in children with asthma and that antibiotics were frequently prescribed when not indicated [22].

Guidelines recommend that a follow-up appointment be made with the patient's usual primary care provider or an asthma specialist within two weeks of discharge [16]. A follow-up with an asthma specialist or at a specialized asthma clinic is more likely to reduce ED revisits when compared with a follow-up appointment at a primary healthcare provider [16,23]. In this study, approximately only a fifth of study participants routinely scheduled a follow-up appointment for their patients with a specialist asthma or allergy clinic, while approximately half routinely scheduled a follow-up appointment with a primary healthcare provider. A study among adults with asthma reported that regular follow-up visits were associated with a significant reduction in asthma exacerbations requiring an ED visit (OR 0.83, 95% CI 0.79-0.86), admission to the general ward (OR 0.48, 95% CI 0.47-0.50) and admission to the intensive care unit (OR 0.49, 95% CI 0.44-0.54) [24].

Based on the findings of this study, it is recommended that ED doctors are educated with regards to the importance of incorporating secondary asthma prevention measures as an adjunct to acute asthma management protocol. These should also be included in ED clinical protocols. In addition, we recommend that asthma inhaler technique should form part of the skills that are taught and practiced in the ED on a regular basis and that placebo inhaler devices should be made readily available to allow clinicians to demonstrate the correct technique to their patients.

LIMITATIONS

There are some limitations to this study. Firstly, the study population was relatively small, and only included sites that were situated within the same province. Hence, our findings may not be reflective of practices in other regions. Secondly, patients with chronic medical conditions in South Africa are predominantly reliant on care provided at primary health care centres, however, we did not assess the extent to which secondary prevention measures were implemented at these centres. Thirdly, the Hawthorne or observer effect may have influenced our finding, as participants might have altered their questionnaire responses or demonstration of the inhaler technique as they were being observed by the principal investigator. Fourthly, participant integrity was relied upon and participant interaction with actual patients was not observed.

CONCLUSION

This study illustrates that not all secondary asthma prevention measures are routinely being implemented by ED clinicians prior to discharging patients from the ED. Additionally, the majority of clinicians were not able to correctly demonstrate how to use an MDI device. It is recommended that ED clinicians pay more attention to issues beyond acute asthma management protocols and are educated with regards to the importance of secondary asthma prevention measures and their impact on reducing ED revisits and improving overall patient outcomes.

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RESEARCH PROTOCOL

The Evaluation of Asthma Prevention and Educational Strategies Amongst Doctors Working in the Emergency Department

Research protocol in partial fulfilment for the degree of Master of Medicine in Emergency Medicine

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INTRODUCTION

Asthma is the most common chronic disease in children and also affects millions of adults throughout the world, with approximately 1 in 7 of the world's population being affected [1]. The magnitude of the burden of asthma is under-appreciated in South Africa (SA), partly due to health systems that are overwhelmed by communicable respiratory diseases such as pneumonia, tuberculosis, and HIV-associated lung disease. It is estimated that the prevalence of asthma is 7% to 10% amongst adults in SA [2]. Asthma related mortality is high, especially amongst previously disadvantaged racial groups. South Africa ranks fourth in the world for asthma mortality. Despite the availability of medication, asthma remains poorly controlled in many

patients [3]. Collectively, this data indicates that the diagnosis and management of patients with asthma in SA is sub-optimal.

Asthma exacerbations represent an acute or sub-acute worsening in symptoms and lung function from the patient's usual status [4]. Exacerbations of acute asthma are frequent presentations to the Emergency Department (ED). In the United States alone, acute asthma accounts for 1.6 million ED visits per year and represents one of the principal causes of ED attendance, contributes to ED overcrowding, and result in significant healthcare costs [5,6].

In the United States, 80-90% of the patients who present to the ED with an acute asthma exacerbation will be discharged. Of these, up to 25% of patients will relapse and re-present to the ED within the first week, and up to 35% will relapse within three weeks [5]. Secondary prevention strategies and educational interventions delivered to patients reduce the risk of subsequent asthma exacerbations, ED visits, oral corticosteroid use and the need for hospital admission [3]. Factors associated with a greater likelihood of re-presentation include female gender, black race, poor socio-economic status, prior diagnosis of persistent asthma, a previous hospital admission for asthma treatment, multiple asthma triggers, frequent healthcare use within the past year, any ED visit within the past 2 years, the lack of an identifiable primary healthcare physician, not being prescribed an inhaled corticosteroid on discharge, use of a home nebulizer, and not being prescribed a written action plan [5,7,8]

Acute asthma management protocols have been published both locally [9] and internationally [4]. The management of acute asthma is included in undergraduate as well as post-graduate

emergency medicine curricula [10], however, secondary prevention strategies aimed at reducing ED representation is poorly advocated by emergency medicine clinicians who work in an acute care environment [7]. A lack of asthma education is one of the major factors leading to frequent ED visits (three or more visits per year). Educational interventions delivered to patients reduce the risk of subsequent exacerbations, ED visits, and the need for hospital admission [3]. Aspects of asthma education that should be addressed prior to ED discharge include correct inhaler technique, adherence to therapy, symptom education, medication side effects, a written action plan, treatment of concurrent allergic rhinitis (AR), avoidance of ongoing allergen and irritant exposure, cessation of cigarette smoking, addressing psychosocial problems and a plan for ongoing follow-up [7].

Incorrect asthma inhaler use has been associated with poor asthma control and frequent ED visits [11]. It has been recommend that clinicians monitor and correct inhaler technique and impart asthma education at every patient interaction [2]. The eight steps to correctly administering a metered dose inhaler (MDI) comprise; 1) removing the cap off the mouthpiece, 2) shaking the device well, (3) breathing out normally, 4) keeping the head upright or slightly tilted, 5) sealing the lips around the mouthpiece, 6) inhaling slowly while pressing down on the canister once during the first half of inhalation, 7) continuing slow and deep inhalation and 8) holding the breath for five or more seconds thereafter. Removing the cap, shaking the device, and inhaling whilst pressing down on the canister are critical steps, which if performed incorrectly will lead to ineffective or no medication delivery to the lungs [12].

Health care practitioners responsible for instructing and educating patients on optimal inhaler use lack rudimentary skills with these devices, seldom receive formal training on the use of inhalation devices and may not be familiar with newer inhalation devices and techniques [7]. Maepa *et al*. reported that only 16% of healthcare practitioners working within tertiary level hospitals in Gauteng performed the inhaler technique correctly [13].

Patients presenting to the ED with an acute asthma exacerbation may be either non-adherent to their long-acting inhaled corticosteroid therapy or they might not have been initiated on the appropriate therapy at all. In addition to symptom control, long-acting inhaled corticosteroid therapy has been shown to reduce acute asthma exacerbations and decrease ED visits [14]. A short course of oral corticosteroid therapy also needs to be prescribed after an acute asthma exacerbation, which has been shown to be associated with a reduction in an acute asthma relapse [15]. Other medication that need to be prescribed prior to ED discharge include a short acting bronchodilator and appropriate treatment for allergic rhinitis [2,3].

Concurrent allergic rhinitis may be present in approximately 85% of patients with asthma [16]. According to the united airway disease concept, both asthma and rhinitis affect the respiratory tract mucosa and is part of the same disease process. The presence of concurrent allergic rhinitis has been associated with significantly worse asthma control [17]. Hence, it has been recommended that asthmatics should also be evaluated for the presence of allergic rhinitis and treated appropriately prior to ED discharge [7]. In a study that comprised 1031 patients who had visited the ED for asthma, the authors reported that the use of intranasal corticosteroids to treat

concurrent allergic rhinitis conferred significant protection against acute asthma exacerbations requiring a visit to the ED [18].

Guidelines recommend that all patients should be provided with a written asthma action plan appropriate for their level of asthma control and health literacy, so that they know how to recognize and respond to worsening asthma [4,7,9]. This is an effective measure to not only improve patient quality of life, but to also reduce the rate of asthma exacerbations leading to a visit to the ED [19,20]. An observational study performed amongst general physicians and pulmonologists in Zurich found that only 24% of study participants provided a written asthma action plans outlining what actions to take if a patient's asthma symptoms deteriorated [21].

A systematic literature review revealed several randomized controlled trials on the subject of follow-up in patients treated in the ED for an asthma exacerbation and showed that appropriate follow-up is essential to optimize outcomes after an acute exacerbation [19]. Guidelines recommend that a follow-up appointment be made with the patient's usual primary care provider or an asthma specialist within two weeks of discharge [9]. A follow-up with an asthma specialist or at a specialized asthma clinic is more likely to reduce ED revisits when compared with a follow-up at a primary healthcare provider [9,19].

STUDY AIM AND OBJECTIVES

Study aim

To evaluate whether secondary asthma prevention measures are being implemented by ED clinicians prior to discharging patients after an acute asthma exacerbation and to determine

whether ED doctors are able to demonstrate the correct technique of how to use an asthma metered dose inhaler (MDI) device.

Study objectives

1. To determine which secondary asthma prevention strategies are being implemented by doctors working in the ED.
2. To determine which medical treatment are prescribed to patients following an acute asthma exacerbation.
3. To evaluate metered dose inhaler technique of doctors.

METHODS

Study design

This will be a prospective cross-sectional study using a questionnaire as well as observation of the ability to perform a technique.

Study site

The study will take place in the EDs of Charlotte Maxeke Johannesburg Academic Hospital, Helen Joseph Hospital, Chris Hani Baragwanath Academic Hospital, and Tambo Memorial Hospital. All of these EDs are managed by Emergency Medicine specialists and are situated in Gauteng.

Study population

The study population will comprise of medical doctors with varying levels of experience that are employed at the EDs of the included hospitals.

Inclusion criteria

All doctors who are employed at the respective hospitals' EDs.

Sample size estimation

The above EDs employ approximately 100 doctors in total. An attempt will be made to include all doctors.

Data collection

- Data collection will commence once this protocol has been approved by each of the hospitals (Appendix I) and ethical clearance has been obtained.
- The primary researcher will attend the respective hospitals at times agreed upon by the unit Head of Department for data collection. Clinical service delivery will not be compromised at any point during the data collection period.
- Participant information sheets and consent forms will be distributed to the doctors working at the EDs (Appendix II).
- Doctors will be requested to participate in the study voluntarily.
- Once a doctor has agreed and consented to be a participant in the study, they will be taken to an allocated room where data collection will be done privately.

- A confidentiality agreement will be included as part of the consent form. Doctors will be asked not to disclose the content of the questionnaire or that they are asked to demonstrate MDI technique to other doctors working at the ED. This will prevent their colleagues who have not yet partaken in the study from preparing for the technique demonstration, thereby allowing an accurate demonstration of the doctors' true ability.
- Once in the examination room, participant will be asked to complete a questionnaire and to demonstrate asthma MDI technique on themselves using a placebo inhaler (Appendix III). No feedback will be given on how to use the inhaler correctly at the time of data collection.
- Hygiene and sterility will be maintained between study participants by cleaning the inhaler with an alcohol-based cleaning solution and tap water between participants.
- The data will be kept confidential and only the supervisor, a statistician and the primary researcher will have access to the data that will be collected.

DATA ANALYSIS

The data collected will be recorded and analysed using Microsoft® Excel®. Categorical data will be described using frequency and percentage, while continuous data (the number of MDI steps that were correctly performed by all the study participants) will be reported using the mean and standard deviation. The Chi Square test will be used to determine whether doctors with more than one-year of ED experience were more likely to correctly perform all four critical steps of using an asthma MDI device than doctors with less than one-year of ED experience. A p-value of less than 0.05 will be regarded as significant.

ETHICS

Ethical approval for the study will be obtained from the University of Witwatersrand Human Research Ethics Committee. Permission to conduct the study will be obtained from the Chief Executive Officer and the ED Heads of Department of the relevant hospitals (Appendix IV).

TIMING

January-August 2019: Protocol preparation

September-December 2019: Protocol assessment

January-March 2020: Ethics application

April-July 2020: Data collection

August-December 2020: Data Analysis and writing-up of report

FUNDING

The research project will be self-funded. R1000 will be allocated to stationery and printing and R1000 to travelling expenses. The total budget is expected to be approximately R2000.

PROBLEMS

This project is expected to progress uneventfully. Incomplete questionnaires may limit data collection.

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APPENDIX I: LETTER TO HOSPITAL CEO / SUPERINTENDENT / HOD REQUESTING PERMISSION TO CONDUCT THE STUDY

Dear Professor / Doctor / Sir / Madam

Re: **Permission to conduct Master of Medicine (Emergency Medicine) research**

I am an Emergency Medicine Registrar registered at the University of the Witwatersrand for a Master of Medicine degree. I am approaching your humble office to kindly grant me permission to carry out my research at your institution.

My proposed research study is entitled: **Evaluation of asthma prevention strategies and education within Gauteng Emergency Departments**. If granted permission the study will take place at this hospital on all the doctors working in the Emergency Department. I intend to administer a research questionnaire and to observe whether doctors are able to use a placebo asthma inhaler. The study will not interfere with normal service delivery as questionnaires will be administered during times agreed upon by the respective Head of Units. I will ensure that patient care and doctor work schedules are not compromised. Neither the hospital nor the doctors will incur any expenses because of this study. Minor expenses will be borne by me.

Yours faithfully

_____ _____

Dr. Marlize Swart (Researcher) Date

I …… (HOD) hereby grant / do not grant permission to Dr Marlize Swart to carry out the research study as outlined above, pending ethics approval.

Remarks: ……..……

_____ _____

HOD: Emergency Medicine Department (signature) Date

I …… (CEO / superintendent) hereby grant / do not grant permission to Dr. Marlize Swart to carry out the research study as outlined above, pending ethics approval.

Remarks: ……..……

_____ _____

CEO / Superintendent (signature) Date

APPENDIX II: PARTICIPANTS STUDY INFORMATION AND CONSENT SHEET

Study title: The Evaluation of Asthma Prevention and Educational Strategies Amongst Doctors Working in the Emergency Department

Dear Professor / Doctor

I am doing research to evaluate whether clinicians working at the Emergency Departments (ED) of various Gauteng hospitals are providing secondary asthma prevention strategies and education to patients presenting with an acute asthma exacerbation.

I am inviting you to participate in my research study.

The following aspects are involved in the study:

1. **Background and aims of the study**
   The research hopes to evaluate whether doctors working at the Emergency Department are providing secondary asthma prevention strategies and education to patients presenting with acute asthma exacerbations. It will also aim to evaluate whether doctors working in the Emergency Department are able to perform the metered dose inhaler technique.
2. **Why have I been invited to take part?**
   You have been invited because you are involved in the management of patients who present to the Emergency Department with acute asthma exacerbations.
3. **Do I have to take part?**
   No. You can ask questions before the study and then decide whether or not you want to participate. **Participation is voluntary**. You may freely withdraw yourself or the data that was collected from you from the study at any time.
4. **What will happen in the study?**
   You will be asked to complete a specifically designed questionnaire (in hard copy) and then to demonstrate the use of a placebo metered dose asthma inhaler on yourself. Both the completion of the questionnaire and the demonstration of inhaler technique is expected to take no more than 10 minutes.
   I will visit the ED in a time allocated by the Head of Department to perform this study. In a private room, I will hand you the questionnaire, ask you to complete the questionnaire, observe the inhaler technique on yourself, and then collect the completed questionnaire.
5. **Confidentiality agreement**
   You are asked not to disclose the content of the questionnaire or that you are asked to demonstrate metered dose inhaler technique to other doctors working at the Emergency Department. This will ensure that the results obtained from doctors partaking in the study are a true representation of their clinical ability and knowledge. By signing the consent form you are agreeing to this confidentiality agreement.
6. **Expenses and payments.**
   There will be no payments for taking part in this research. The study is funded by the primary researcher.
7. **Risks of being involved in the study?**

There are no anticipated risks in partaking in this study. Hygiene and sterility of the placebo asthma inhaler will be maintained between study participants by cleaning the inhaler with an alcohol-based cleaning solution and tap water between participants.

8. **Benefits of being in the study?**
   There is no direct benefit by partaking in this study. I aim to identify areas of secondary asthma prevention and education that can be improved upon, which have the potential to improve patient care in the future.
9. **What happens to the data provided?**
   Data will be collected anonymously, and any personal information stored confidentially.
10. **Will the research be published?**
    The research results may be published both locally and internationally. Personal information will not be disclosed.
11. **Who do I contact if I have concerns about the study?**
    For any concerns and clarifications please contact the researcher listed below, or the Ethics Committee; University of the Witwatersrand at 011 717 1252.

In this study I aim to identify areas of secondary asthma prevention and education that can be improved by doctors working at the Emergency Department. I hope that the outcome of this study will improve patient care in the Emergency Department, and I will gladly share the study outcome after the study is completed.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za.

Further information and contact details:
Researcher: Dr. Marlize Swart, dieswartste@gmail.com, 083 410 4493
Supervisor: Prof. Abdullah Laher, abdullahlaher@msn.com

Thank you for reading this Study Information Sheet.

I ……..…….. (name) consent to participate in the above study.

_____ _____
Signature Date

APPENDIX III: DATA COLLECTION SHEET

1) QUESTIONNAIRE

Participant serial number: _____

Please indicate the appropriate answer:

Gender:

Male	
Female	

Number of years since qualifying as a medical doctor: _____

ASTHMA EDUCATION

Please indicate which of the following factors you address and how often, in patients who present to the ED with an acute asthma exacerbation, who is stable enough to be discharged home

		Yes	No	If yes, how often?	
				With every patient	Only with some patients
1.	Check correct inhaler technique				
2.	Demonstrate correct inhaler technique to the patient				
3.	Enquire about adherence to asthma therapy				
4.	Inform patients of symptoms of uncontrolled asthma				
5.	Inform patients of side effects of asthma medication				
6.	Provide patients with a written asthma action plan				
7.	Evaluate for and treat concurrent allergic rhinitis				
8.	Educate patients regarding avoidance of ongoing allergen and irritant exposure				
9.	Encourage patients to stop cigarette smoking				
10.	Address patients' psychosocial problems				
11.	Schedule a follow-up appointment with a specialist asthma or allergy clinic				
12.	Schedule a follow-up appointment with a primary healthcare provider				

ASTHMA TREATMENT

Please indicate which treatments you ensure that the patient is receiving prior to ED discharge, following an acute asthma exacerbation:

		Yes	No
1.	Short-acting bronchodilator inhaler therapy		
2.	Short course of oral corticosteroid therapy		
3.	Long-acting corticosteroid inhaler therapy		
4.	Intranasal corticosteroids		

2) ASSESSING METERED DOSE INHALER TECHNIQUE

The following steps will be observed whilst the study participant demonstrates asthma inhaler technique on themselves:

	Steps	Step performed?	
		Yes	No
1	**Remove cap**		
2	**Shake well**		
3	Breath out normally		
4	Keep head upright or slightly tilted		
5	Seal lips around the mouthpiece		
6	**Inhale slowly, actuating once during first half of inhalation**		
7	**Continue slow and deep inhalation**		
8	Hold breath for 5 or more seconds		

Bold indicates steps that are critical, for which incorrect performance would lead to little or no medication reaching the lungs.

ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Marlize Swart

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M190682 MED19-04-015

NAME: (Principal Investigator)	Dr Marlize Swart
DEPARTMENT:	Family Medicine Charlotte Maxeke Johannesburg Academic Hospital Chris Hani Baragwanath Academic Hospital Helen Joseph Hospital Thelle Mogoerane Hospital
PROJECT TITLE:	The evaluation of asthma prevention and educational strategies amongst doctors working in the Emergency Department
DATE CONSIDERED:	28/06/2019
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof Abdullah Laher
APPROVED BY:	Dr C Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	08/11/2019

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed June and will therefore be due in the month of June each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

TURN-IT-IN PLAGIARISM REPORT

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ORIGINALITY REPORT

7%	3%	3%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Sitesh R. Roy, Henry Milgrom. "Managing Outpatient Asthma Exacerbations", Current Allergy and Asthma Reports, 2009 Publication	1%
2	aacijournal.biomedcentral.com Internet Source	1%
3	www.scielo.org.za Internet Source	1%
4	Hamdan AL-Jahdali, Ahmed Anwar, Abdullah AL-Harbi, Salim Baharoon, Rabih Halwani, Abdulllah Al Shimemeri, Saleh Al-Muhsen. "Factors associated with patient visits to the emergency department for asthma therapy", BMC Pulmonary Medicine, 2012 Publication	1%
5	Edmonds, M.L.. "The effectiveness of inhaled corticosteroids in the emergency department treatment of acute asthma: A meta-analysis", Annals of Emergency Medicine, 200208 Publication	1%