

DRUG-RELATED PROBLEMS AMONG PAEDIATRIC ASTHMA PATIENTS IN THE UNIVERSITY OF NIGERIA TEACHING HOSPITAL, ITUKU-OZALLA, ENUGU STATE, NIGERIA

Kosisochi Chinwendu Amorha^{*}, Nwamaka Theresa Ene, Azubuike Amos Ekwuofu

All authors are of the Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka (UNN), PMB 410001, Enugu State

* **Corresponding Author:** Kosisochi Chinwendu Amorha; Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, PMB 410001, Enugu State

Email: kosisochi.amorha@unn.edu.ng

Abstract

Background: Drug-related problems (DRPs) in asthma management can lead to deterioration in health, increased hospitalization and costs. The general objective of this study was to investigate the drug-related problems among paediatric asthma patients in the University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu State.

Methods:

This study was conducted during eight clinical visits in the paediatric respiratory unit of UNTH and also utilized the medical records of paediatric asthma patients from 1st January, 2001 to 31st December, 2016. Interventions were made, when necessary. Data were collected with the DRP-PCNE V. 7.0; MMAS-8; ACTTM; the Bryantet *al.* Checklists, and analyzed using the IBM Statistical Products and Service Solutions (SPSS) for Windows, Version 21.0. Descriptive statistics were used to summarize the data.

Results:

About 59.5% of the paediatric patients were between 11 to 16 years old. Majority of the drug-related problems (DRPs) were manifest and patient-related, with salbutamol being most implicated (59.2%). The most common DRP was the effect of drug treatment not optimal (73.6%). About half (52.1%) of the patients were unable to use their drugs as directed by failing to correctly demonstrate all the eight steps correctly. Interventions were mainly through patient counselling (88.4%). All the patients on pMDI plus spacer demonstrated good inhaler techniques, with about half demonstrating good device techniques for the pMDI and accuhaler. Only one patient was on the turbuhaler and demonstrated good technique.

Conclusion:

There are different categories of drug-related problems among paediatric asthma patients with the effect of drug treatment not optimal being the most common in this study. Most DRPs were patient-related and interventions were majorly on patient/care giver level. Most of the problems were totally solved. Some patients were unable to use their drugs, including inhalers, as directed. Health professionals, especially pharmacists, have huge roles to play in identifying and resolving DRPs. Pharmacists in both hospital and community settings should use dummy inhalers to demonstrate proper inhaler techniques to patients at times of refill. Pharmacists who are deficient in the knowledge to provide pharmaceutical care to asthma patients should be trained through seminars, conferences and update lectures.

Keywords: adherence, asthma, drug-related problem, inhalers

INTRODUCTION

Asthma is a chronic inflammatory disease of the airways, characterized by a reversible obstruction of airflow, with or without specific therapy.¹ It contributes significantly to the global health burden, affecting more than 300 million people and causing more than 250,000 deaths annually.^{2,3} The prevalence of asthma in Nigeria has been estimated to be 5.4%.² Asthma affects all age groups and its prevalence is increasing, particularly among children.²

A drug-related problem (DRP) describes an event or circumstance involving drug therapy that actually or potentially interferes with desired outcomes.⁴ Undetected DRPs may result in drug-related morbidity which may lead to death. In addition, DRPs can have substantial impacts on the economy.

Helper and Strand classified DRPs into eight general categories: untreated indication, treatment without indication, improper drug selection, too little drug, too much drug, non-adherence, reported adverse drug reaction and interaction.⁵ Any deviation from the intended beneficial effect of a medication results in a DRP.⁶ Some DRPs can be associated with significant morbidity and mortality, even though many of them can be resolved without major impact on patients' health.⁷ The detection of DRPs is vital for identifying causes and types of problems, as well as developing strategies for improvement.

A study conducted in Nigeria, reported that about 48% of the doctors had never attended any form of update training on asthma management, whereas, only 16.3% attended update training on asthma within the last year preceding the study. Also, the awareness of the international guidelines on asthma treatment was poor, among the doctors, with only 16.4% being able to mention any correct guideline on asthma management.⁷ In addition, the study also found out that other agents like antibiotics, antihistamines, and



mucolytics, which were not routinely recommended for acute exacerbations of asthma were also prescribed by a quarter of the doctors. These agents increased the cost of prescription, produced unwanted adverse effects, and could delay the use of appropriate therapy.¹

Adherence is defined as the patient's behaviours regarding recommendations from a health care provider.⁸ Good adherence to asthma medications is associated with low risk of severe exacerbation. On the contrary, it has been demonstrated that poor adherence to asthma controller therapy is a risk factor for admission to the hospital, near fatal asthma exacerbation and death from asthma.⁹

Inhaled therapy is the cornerstone for the management of asthma with pressurized metered dose inhalers (pMDIs) and dry powder inhalers (DPIs), as the most frequently used inhaler devices.¹⁰ Adherence to inhaled corticosteroid is a prerequisite for long-term asthma management. Unfortunately, less than 50% of children adhere to this treatment.¹¹ In a study conducted in Nigeria, approximately 70% of the study population had uncontrolled asthma and there was a strong association between uncontrolled asthma and

lack of adherence to inhaled corticosteroids.¹²

Difficulties with inhaler techniques are well recognized in children. Although both pMDIs and DPIs are relatively simple devices to operate, their proper use are not entirely intuitive and each has technical limitations that can limit their effectiveness.¹³ Hence, an accurate use of these devices in administering the drugs has a direct relationship with the delivery and efficacy of the medications.¹⁴

Up to 94% of patients with asthma and chronic obstructive pulmonary disease (COPD) do not use their inhalers correctly and require multiple education sessions to maintain their technique.¹⁵ In a study conducted during paediatric asthma visits, it was found that 87% of children reported a problem in using their asthma medication; 31% of caregivers reported that their children were bothered by medication side effects; and 29% of caregivers were not sure if their children were using their inhalers the way that they should.¹⁴ This is important because patients who report problems with medications, like side effects, tend to be less adherent to their medications.¹⁶

In well-controlled asthma, there is no

hospitalization or emergency visits from asthma; no limitation of activities; no day or night-time symptoms of asthma.¹⁷ Drug-related problems among asthma patients impede good asthma control. There is paucity of data on DRPs among asthma patients in Nigeria. Thus, the general objective of this study was to investigate the drug-related problems among paediatric asthma patients in the University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu State.

METHODS

Study Setting

This study was conducted in the paediatric respiratory unit of University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu State, Nigeria. The hospital is a large referral centre that serves South-Eastern Nigeria and environs.

Study Design

The study was conducted during eight clinical visits in the paediatric respiratory unit of UNTH and also utilized the medical records of paediatric asthma patients from 1st January, 2001 to 31st December, 2016. Asthmatic patients not more than 16 years old were defined as paediatrics. Interventions were made, when necessary.

Sample Size and Selection

All paediatric asthma patients available during the eight clinic visits and who gave their consent (through their parents or caregivers) to participate were included. Parents or caregivers of the children assisted with their questions. The folders for asthmatic patients who had no co-morbid respiratory disorder; 16 years and below and within the specified time frame, 1st January, 2001 to 31st December, 2016, were utilized for the

study.

Data Collection

The DRP-PCNE V. 7.0 instrument was employed to investigate the drug-related problems amongst the paediatric asthma patients and to extract data from the patients' folders.

⁴ For each of the folders, the DRP_s experienced within three (3) years from discharge or within three (3) years from last clinic visit were identified. The DRP-PCNE V 7.0 has 3 primary domains for problems, 8 primary domains for causes and 5 primary domains for interventions. It also has a section called "Acceptance of the Intervention Proposals" which has 3 domains. On a more detailed level, there are 7 grouped sub-domains for problems, 35 grouped sub-domains for causes, 16 grouped sub-domains for interventions and 10 sub-domains for intervention acceptance. The sub-domains are explanatory for the principal domains.⁴

Adherence to treatment was assessed using the eight-item Morisky Medication Adherence Scale (MMAS-8).¹⁸⁻²⁰ The checklist by Bryant and colleagues was used to assess the inhaler techniques demonstrated by the patients.²¹ The level of asthma control was measured using the appropriate Asthma Control Test (ACT) for paediatrics less than 12 years or 12 years and older.²²

Data Analysis

Data were analyzed using the IBM Statistical Products and Service Solutions (SPSS) for Windows, Version 21.0 (IBM Corp, Version 21.0, Armonk, NY, USA). Descriptive statistics, were used to summarize data.

Ethical Approval

Ethical approval was obtained from the Health Research and Ethics Board of the University of Nigeria Teaching

Hospital (UNTH), Ituku-Ozalla, Enugu State (NHREC/05/01/2008B-FWA00002458-1RB00002323), prior to conducting the study.

Willingness to participate was taken as consent and patients were informed that they were free to withdraw from the study, at anytime. Their utmost confidentiality was maintained throughout.

RESULTS

A total of 121 drug-related problems were identified from the 39 patients who participated from the clinic visits, and the 52 folders utilized. The results are presented in the tables and figures below.

Patient/drug details

In table 1 below, close to 60% of the paediatric patients were between 11 to 16 years old. Majority of the drug-related problems were manifest (83.5%) and salbutamol was most implicated (56.2%).

Table 1: Patient/Drug details

Variables	n (%)
Gender	62 (51.2)
Male	59 (48.8)
Female	12 (9.9)
Age (in years)	16 (13.2)
5-7	21 (17.4)
8-10	41 (33.9)
11-13	
14-16	31 (25.6)
Type of medication	
Prescription	118 (97.5)
Over-the-Counter	3 (2.5)
Class of drug	
New	113 (93.4)
Refill	8 (6.6)
Problem discovered by	
Patient	36 (29.8)
Pharmacist	33 (27.3)
Physician	52 (43.0)
Drugs involved with Drug- related Problems	
Salbutamol	68 (56.2)
Salmeterol/Fluticasone	33 (27.3)
Formoterol/Budesonide	9 (7.4)
Methylprednisolone	4 (3.3)
Budesonide	4 (3.3)
Loratidine	2 (1.7)
Ciclesonide	1 (0.8)
Type of Problem	
Potential	20 (16.5)
Manifest	101 (83.5)

Type of drug-related problem

The effect of drug treatment not optimal was the most common (73.6%) drug-related problem, as shown in Figure 1.

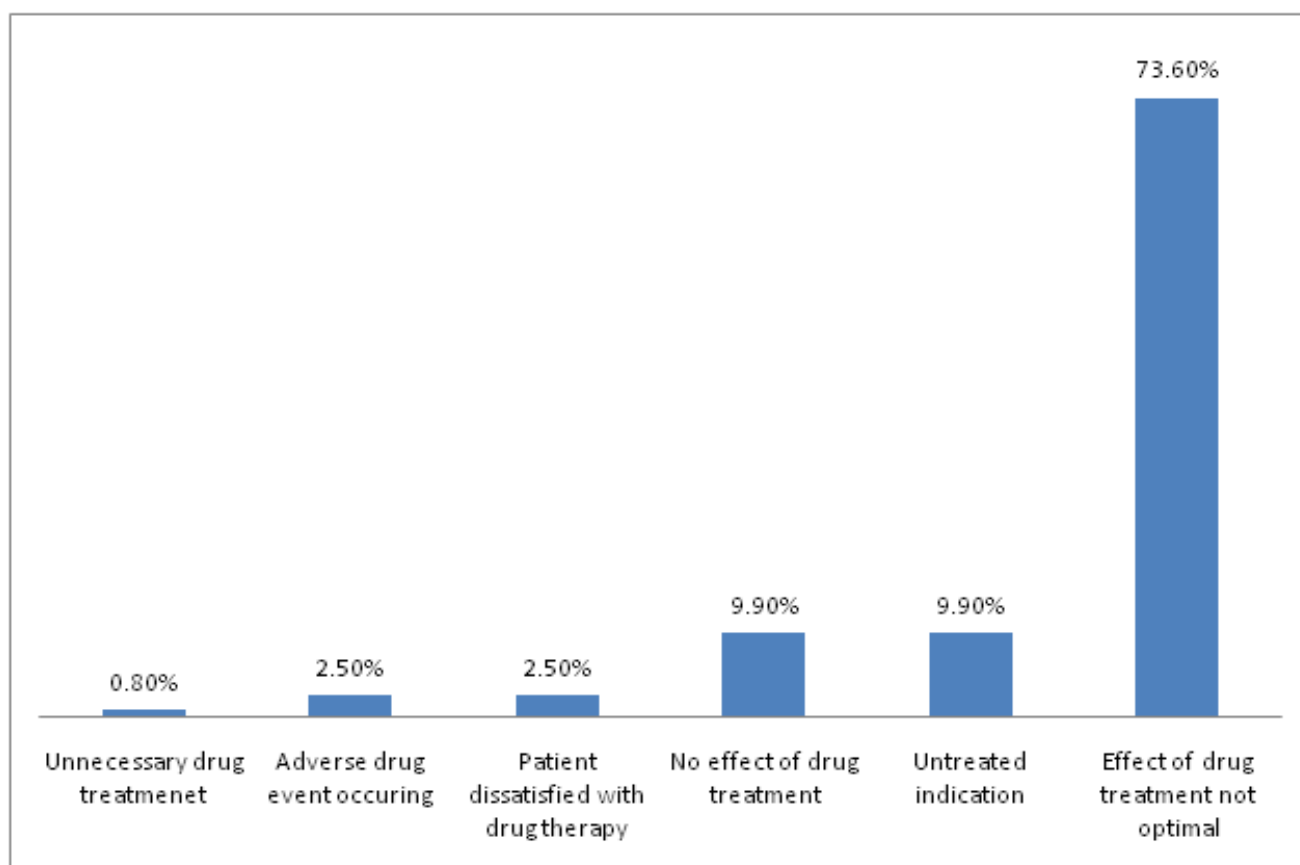


Figure 1: Type of drug therapy problem

Causes of drug-related problem

Majority of the drug-related problems were patient-related. About half (52.1%) of the patients were unable to use their drugs as directed. See Table 2.

Table 2: Cause of drug-related problems

Variables	Yes (%)
Drug Selection	
Too many drugs prescribed for indication	2 (1.7)
Synergistic or preventive drug required and not given	2 (1.7)
New indication for drug treatment presented	2 (1.7)
Drug Form	
Inappropriate drug form	7 (5.8)
Dose Selection	
Drug dose too low	4 (3.3)
Dosage regimen not frequent enough	1 (0.8)
Treatment duration	
Duration of treatment too short	3 (2.5)
Dispensing	
Prescribed drug not available	3 (2.5)
Prescribing error (necessary information missing)	3 (2.5)
Dispensing error (wrong drug or dose dispensed)	7 (5.8)
Drug Use Process	
Inappropriate timing of administration and/or dosing intervals	4 (3.3)
Drug under- administered	7 (5.8)
Drug not administered at all	7 (5.8)
Wrong drug administered	6 (5.0)
Patient-related	
Patient forgets to use/take drug	17 (14.0)
Patient administers/uses drug in a wrong way	53 (43.8)
Patient cannot afford drug	10 (8.3)
Patient unable to use drug/form as directed *	63 (52.1)

*The patients were unable to use drug/form as directed by failing to correctly demonstrate all the eight steps correctly.

Interventions

Interventions were majorly on the patient/caregiver level. These patients were usually counseled by the pharmacist researcher. In some instances, family members or care givers were given the necessary drug information. Majority (91%) of the proposed interventions were accepted and fully implemented. See Table 3.

Table 3: Interventions by pharmacist researcher

Variables	Yes (%)
Patient/care giver level	
Patient (drug) counseling	107 (88.4)
Patient referred to prescriber	1 (0.8)
Spoken to family member/caregiver	48 (39.7)
Drug Level	
Drug changed	11 (9.1)
Dosage changed	5 (4.1)
Formulation changed	2 (1.7)
Instructions for use changed	7 (5.8)
Drug stopped	4 (3.3)
New drug started	9 (7.4)
Interventions	
Percentage implementation (%)	
Intervention accepted by prescriber and fully implemented	91
Intervention accepted by prescriber but not implemented	4
Intervention accepted by prescriber but implementation unknown	3
Interventions accepted by prescriber but partially implemented	1

Demonstration of inhaler techniques

More than half of the patients correctly demonstrated the three essential steps for the pMDI and the pMDI plus spacer. For accuhaler, only a quarter inhaled forcefully and deeply. The patient on turbuhaler neither exhaled to residual volume nor away from the mouthpiece, Table 4.

Table 4: Paediatric asthma patients' demonstration of asthma devices assessed against the eight steps for correct use in the checklists.^{23,24}

Steps for asthma devices	Yes (%)
pMDI	
1. Remove the cap from the inhaler	27 (100.0)
2.* Shake the inhaler	21 (77.8)
3. Hold inhaler upright	8 (29.6)
4. Exhale to residual volume	4 (14.8)
5. Place mouthpiece between lips and teeth to seal the mouthpiece	27 (100.0)
6.* Inhale slowly and simultaneously and activate the canister	22 (81.5)
7.* Continue slow and deep inhalation	22 (81.5)
8. Take inhaler out of mouth and hold breath for 5-10 seconds	22 (81.5)
Accuhaler	
1. * Hold Accuhaler horizontally	3 (75.0)
2.* Push the lever away from the mouthpiece until you hear the 'click'	4 (100.0)
3. Exhale as much as you can	2 (50.0)
4. Exhale away from the mouthpiece	15 (24.2)
5. Place mouthpiece between lips and teeth to seal the mouthpiece	1 (25.0)
6.* Inhale forcefully and deeply	1 (25.0)
7. Remove Accuhaler from the mouth	4 (100.0)
8. Hold breath for 5-10 seconds	4 (100.0)
Turbuhaler	
1. Remove the cap from inhaler	1 (100.0)
2.* Keep inhaler upright	1 (100.0)
3.* Rotate grip anti-clockwise then back until a click is heard	1 (100.0)
4. Exhale to residual volume	0 (0.0)
5. Exhale away from mouthpiece	0 (0.0)
6. Place mouthpiece between teeth and lips	1 (100.0)
7. * Inhale forcefully and deeply	1 (100.0)
8. Hold breath for 5-10 seconds	0 (0.0)
pMDI + Spacer	
1. * Shake the inhaler well	7 (100.0)
2. Fit the inhaler into the opening at the end of the spacer	7 (100.0)
3. Place mouthpiece between lips and teeth to seal mouthpiece	7 (100.0)
4. Breathe out gently	6 (85.7)
5.* Press the inhaler once only	6 (85.7)
6. Take 5–10 slow breaths in and out through the mouth	5 (71.4)
7. * Do not remove the spacer from the mouth between breaths	6 (85.7)
8. Remove spacer from the mouth	7 (100.0)

pMDI = pressurized metered dose inhaler; * Essential steps

Device Technique Scores

Overall, the patients demonstrated good device techniques for the turbuhaler and pMDI plus spacer, with about half demonstrating good device techniques for the pressurized metered dose inhalers pMDI and accuhaler. See Table 5.

Table 5: Device technique scores for different inhaler devices

Type of inhaler/device	*Good technique n (%)	*Poor technique n (%)
1. pMDI	15 (55.6)	12 (44.4)
2. Accuhaler	2 (50.0)	2 (50.0)
3. Turbuhaler	1 (100.0)	0 (0.0)
4. pMDI plus Spacer	7 (100.0)	0 (0.0)

* Good technique was defined as having at least five out of eight steps correct, including all three essential steps on the checklist for inhaler techniques.²¹ Poor technique was defined as not reaching the standard defined as good technique. pMDI=pressure metered dose inhaler

Asthma Control Test

Table 6 shows the asthma control for the paediatric patients using the Asthma Control Test (4 to 11 years) and the Asthma Control Test (ACT) (12 years and older).

More than half of the patients had well-controlled asthma.

inhalers, available as the Diskus[®] and Evohaler[®].²³

The effect of drug treatment not optimal was the most common type of DRP. This contrasts that obtained in a study on asthma therapy related problems in adult Mediterranean Croatian patients where about 40% of the drug therapy problems was due to

Table 6: Asthma Control, n = 34

Age (in years)	Poorly controlled asthma n (%)	Well controlled Asthma n (%)
4 – 11	5 (31.2)	11 (68.8)
12 – 16	4 (22.2)	14 (77.8)

Adherence

Using the Morisky Medication Adherence Scale (MMAS-8-Item),¹⁸⁻²⁰ more than half of the patients had low adherence level, Table 7.

non-adherence to medication (66%).²⁴ Other reported DRPs were untreated indication, no effect of drug treatment, dissatisfaction with drug therapy, adverse drug event, and unnecessary drug treatment.

Table 7: Adherence level, n = 34

Adherence Level	(%)
Low	20 (58.8)
Medium	13 (38.2)
High	1 (2.9)

DISCUSSION

Salbutamol was the most implicated drug for the drug-related problems. This might be because they are commonly used as rescue inhalers.² Salmeterol/fluticasone was also highly responsible for the DRPs as they are the major drugs in controller

Dissatisfaction with drug therapy was mainly from the cost of drugs for asthma, especially the controller inhalers.²⁵ Unnecessary drug treatment was reported when a mother reported that she gives her child salbutamol (pMDI) as a controller medication.

Poor prescriber knowledge of asthma

treatment might have led to the unnecessary drug treatment or untreated indication, as a study conducted in Nigeria, showed that about 48% of the doctors had never attended any form of update training on asthma management, with only 16.4% being able to mention any correct guideline on asthma management.⁷

Majority of the problems were patient-related with about half unable to use their drugs as directed, as they could not demonstrate all the eight steps correctly, leading to under-dose or the drugs not administered at all. Under-administration of the drugs was majorly from poor inhaler techniques. The interventions were principally on the patient/caregiver level with more than half of the patients counseled on drug use by the pharmacist researcher. For instance, a mother was administering salbutamol to her child, as a controller medication instead of rescue inhaler. On clinic visit, the attending physician was informed and he changed the instruction to, "Use only when child has an attack". Frequent use of rescue inhaler implies poorly controlled asthma.²⁶ Also, some children used only salbutamol, administered by the pMDI, but treatment was not optimal until the parents were advised to use with spacer devices to ensure the enough drug gets to the lungs.²⁷ Another instance was for a patient who was on oral salbutamol as rescue medication, but was instructed to use the salbutamol inhaler which is more effective because it settles directly in the lungs and has minimal side effects.²⁷ Almost all interventions by the pharmacist researcher during the clinic visits were accepted and fully implemented by the prescribers/patients. DRPs were only identified from the folders as no interventions could be made retrospectively. In device technique scores with the Bryant *et al.* checklist,²³ for pMDI plus spacer and pMDI, more than half of the

patients got the three essential steps. For accuhaler technique, only a quarter of the patients could demonstrate step 6 correctly (inhale forcefully and deeply) but the other two essential steps were demonstrated well. The only patient on turbuhaler demonstrated all essential steps correctly. Demonstration of inhaler techniques to asthma patients should not be one-off. A study showed that 15% of the subjects who were using metered dose inhalers had poor technique despite repeated instructions on correct usage.²⁸ Thus, health professionals should continually demonstrate the correct inhaler techniques to asthma patients during asthma reviews and when they go for drug refills as this might improve their techniques.

It was found that the inhalation technique scores with both Diskus[®] and Turbuhaler[®] were significantly reduced when used in combination with pMDI. When inhaling with a DPI the patient has to inspire forcefully, while pMDI requires slow inhalation and in co-ordination with actuation. This basic difference might be confusing for patients.²⁸ The possibility of confusion between devices exists, as each inhaler device has unique operating instructions.^{29,30}

The level of asthma control was assessed using the Asthma Control Test (ACT). For ACT score, more than half of the patients had well controlled asthma. This result was similar to a study conducted in sub-Saharan African where asthma was well controlled in 58.7% of the patients; partly controlled in 22.4% and poorly controlled in 18.9% of patients.²⁴

LIMITATIONS OF THE STUDY

Some of the patients were not cooperative claiming that they had participated in several studies and did not have the time to spare. Many of the patients' folders that were made available lacked sufficient information, stressing the need for proper documentation. Based on the

hospital policy, only folders that were pulled out by the medical records officer were utilized for the study.

CONCLUSION

Many drug-related problems were identified, with the effect of drug treatment not optimal being the most common. Most DRPs were patient-related with about half unable to use drug as directed. The interventions were majorly on patient/care giver level, and most of the problems were totally solved. Although more than half of the patients had low adherence level, a similar proportion had well-controlled asthma.

Health professionals, especially pharmacists, have huge roles to play in identifying and resolving DRPs. Pharmacists in both hospital and community settings should use dummy inhalers to demonstrate proper inhaler techniques to patients at times of refill. Pharmacists who are deficient in the knowledge to provide pharmaceutical care to asthma patients should be trained through seminars, conferences and update lectures.

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