Spacer prescription for asthma patients using pMDI at a primary care practice

AUTHORS:

Hellen Jing Yuan PhD MSc BSc
ORCID: 0000-0002-2842-2745

Medical Student, Kent and Medway Medical School, UK.

Keywords
Asthma | Spacer | Prescription | pMDI | Quality Improvement | Primary Care

Abbreviations
BTS - British Thoracic Society
EMIS - Egton Medical Information Systems
HCP - Healthcare Professional
ICS - Inhaled Corticosteroids
NICE - National Institute for Health and Care Excellence
PAAP - Personal Asthma Action Plan
pMDI - pressurised Metered-Dose Inhalers
QOF - Quality and Outcomes Framework
SIGN - Scottish Intercollegiate Guidelines Network
SMS - Short Message Service

All author(s) made substantive intellectual contributions to this study by making substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; and giving final approval of the version to be published.

Accepted for publication: May 5th 2025.

Address correspondence to: Helen Jing Yuan, Kent and Medway Medical School, Canterbury, Kent. CT2 7NT. UK.
E-mail: h.yuan259@kmms.ac.uk

Chief Editor: Dr Ana Oliveira. Current affiliation: Kent and Medway Medical School, Canterbury, Kent. CT2 7NT. UK.
ana.oliveira@kmms.ac.uk
AJPP@kent.ac.uk
https://journals.kent.ac.uk/index.php/ajpp/index

ISSN Number: Online 2059-3198.

FINANCIAL DISCLOSURE: The authors have indicated that they have no financial relationships relevant to this article to disclose.

What this paper adds: This student quality improvement project identified inadequacies in spacer prescription rates for asthma patients in the primary care setting. It then proposed suggestions for improving the practice of spacer prescription, which will improve asthma management in primary care.

Abstract: Clinical guidelines and the best practice for asthma management recommend that all patients use a spacer with pressurised metered-dose inhalers (pMDI). This is a requirement for some sub-groups of patients. However, little data is available on the rate of spacer prescriptions for asthma patients using pMDI. Therefore, a quality improvement project was conducted to evaluate the practice of spacer prescription in one primary care centre. It was found that spacers were markedly under-prescribed; the prescription rates for regular replacement spacers were especially inadequate. Measures can be implemented in primary care settings to bring the spacer prescription practice

closer to guidelines and best practice, and several suggestions were made.

Introduction: Asthma is a common chronic condition affecting about 8% of the population in the UK (Asthma + Lung UK, 2024b). The main tool for asthma management is inhalers (NICE, 2025b), and about 70% of inhalers used in the UK are pressurised metered-dose inhalers (pMDI) (Pernigotti *et al.*, 2021). The various benefits of using a pMDI with a spacer are well established. Firstly, spacers eliminate the need to precisely coordinate pMDI activation with the onset of inhalation (Vincken *et al.*, 2018). Secondly, spacers regulate the inspiratory flow of medication aerosol, thus increasing the deposition of fine medication particles in lower airways while decreasing the oropharyngeal deposition of large aerosol particles (Lavorini *et al.*, 2020). This is particularly important for inhaled corticosteroids (ICS), as oropharyngeal deposition of corticosteroids can increase local side effects and unintended systemic corticosteroid absorption (McIvor, Devlin and Kaplan, 2018).

The use of spacers with pMDI is required for children by asthma management guidelines (NICE, 2024; SIGN, 2024), and is recommended as best practice for patients taking high-dose ICS (McIvor, Devlin and Kaplan, 2018; Vincken *et al.*, 2018). Click or tap here to enter text. Furthermore, a spacer should be used with pMDI in both adults and children when managing acute asthma exacerbations that do not require hospital admission (SIGN, 2024; NICE, 2025a), indicating the need to prescribe spacers to all asthma patients on pMDI in preparation for managing asthma attacks.

Guidelines also require regular replacement of plastic spacers once every 6 or 12 months, depending on manufacturers' specifications (NICE, 2025b).

Many factors determine whether a patient uses pMDI optimally for asthma management. Among them, the appropriate spacer prescription is an initial and necessary step that is fully within the control of primary care providers. However, little data is available on this, suggesting inadequate monitoring of spacer prescription. Therefore, the current quality improvement project evaluates spacer prescription rates for asthma patients on pMDI at a primary care practice and proposes suggestions for improving care quality in this area.

Methods: This quality improvement project was conducted at a single primary care centre in Southeast England (hereinafter referred to as X Practice). Data on the number of asthma patients and their ages and prescriptions were obtained from the EMIS system (the electronic patient record system used by X Practice) on 1st March 2024.

The spacer prescription status was identified for all asthma patients prescribed pMDI within one year of the data collection date and for two sub-groups: (1) those using high-dose ICS and (2) those who were 5-15 years old. This specific age range was used because, at the time of data collection, management guidelines required children aged 5-15 years to always use a spacer with their pMDI (NICE, 2002). This guideline has now been superseded by a version requiring spacer prescription for children without specifying an age range (NICE, 2024).

Results: Among the 10,205 patients registered at X Practice, 8.55% (873) were prescribed pMDI for asthma in the past

year. Eighty asthma patients were prescribed high-dose ICS in the past year, and 79 of them had the ICS via pMDI. Moreover, 58 patients aged 5-15 years were prescribed pMDI for asthma in the past year, accounting for about 80% of asthma patients in this age group (73 in total).

As seen in Figure 1, just over half of all asthma patients using pMDI in the past year were prescribed a spacer at any point. While plastic spacers (all spacers prescribed at X Practice are plastic spacers) should be replaced at least yearly, less than 10% of patients had a new spacer prescribed in the past year, and less than 5% had spacers on a repeat prescription.

The prescription rates for initial and replacement spacers were slightly higher in the two sub-groups described earlier, best for young patients aged 5-15 years. However, even among patients aged 5-15, while nearly 90% were prescribed a spacer at some point, less than a third had a new spacer prescribed within the past year, and only about 10% had spacers on a repeat prescription.

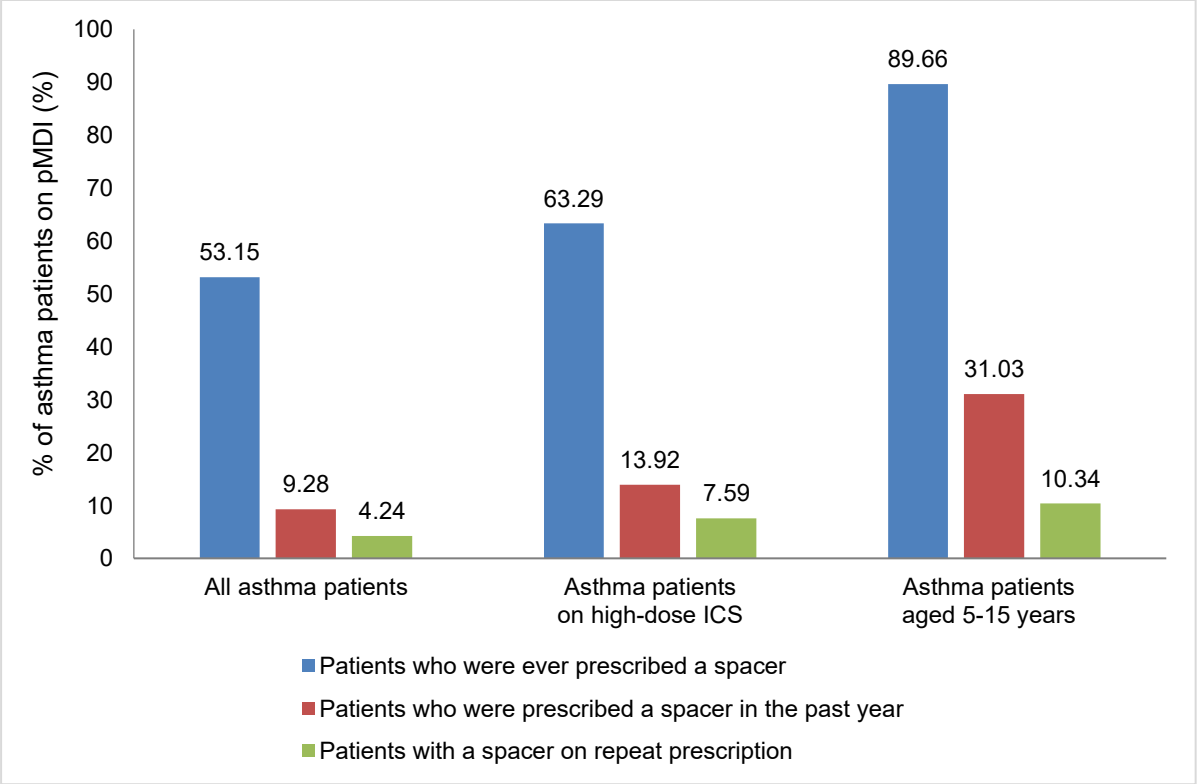

Figure 1: The proportion of patients with various spacer prescription statuses as a percentage of asthma patients prescribed pMDI in the past year

Discussion: The use of a spacer with pMDI is required by asthma management guidelines for children (NICE, 2024; SIGN, 2024) and recommended as best practice for patients on high-dose ICS (McIvor, Devlin and Kaplan, 2018; Vincken *et al.*, 2018), thus setting the target spacer prescription rate to 100%. At X Practice, a relatively high proportion of asthma patients aged 5-15 years were prescribed a spacer with their pMDI, but a substantial proportion of patients on high-dose ICS (~37%) were never prescribed a spacer, considerably below the target of 100% indicated by guidelines.

The spacer prescription rate was even lower for the general population of asthma patients on pMDI, with almost half the patients never prescribed a spacer. Even though guidelines for the daily management of stable asthma in adults do not necessitate the use of spacers with pMDI, spacers still should be prescribed in preparation for managing acute asthma attacks that do not require hospital admission (SIGN, 2024; NICE, 2025a). Moreover, the effective use of pMDI without a spacer relies heavily on correct techniques, but it has been repeatedly shown that most patients use pMDI alone with incorrect or sub-optimal techniques (Sanchis, Gich and Pedersen, 2016; Lavorini *et al.*, 2020), resulting in ineffective asthma control and compromised patient safety (Vincken *et al.*, 2018). Given that spacers increase desired drug deposition while reducing the difficulty of inhaler technique, it is the best practice to instruct patients to always use a spacer with their pMDI to achieve optimum asthma control and minimise side effects (Vincken *et al.*, 2018; Lavorini *et al.*, 2020). Compared to the best practice and guidelines, spacers are substantially under-prescribed at X Practice.

In addition to the general under-prescription of spacers, there is an even more remarkable lack of prescriptions for regular annual or biannual replacements of plastic spacers as required by guidelines (NICE, 2025b). The vast majority of asthma patients had neither a new spacer prescription in the past year nor a repeated prescription for spacers, suggesting that healthcare professionals (HCPs) making prescriptions might not be aware of the need for regularly replacing spacers and thus only prescribing spacers as a one-off. As a result, even if patients were once prescribed a spacer and had been using it correctly, most patients' spacers would have been out of date, and the build-up of electrostatic charge inside the chamber can considerably reduce the dosage of the drug delivered and thus reduce the efficacy of the inhaled therapy (Vincken *et al.*, 2018).

Finally, it must be noted that a vast number of factors affect whether a patient effectively and consistently uses pMDI with a spacer to control their asthma. Barriers between prescription and correct use include, for example, whether the patient receives adequate instructions on how and when to use pMDI with a spacer, whether the patient carries the spacer with their inhalers and consistently uses it, and whether prescribed replacement spacers are ordered and collected at the appropriate renewal intervals. In the face of the many-fold challenges in achieving good compliance, it is crucial for primary care providers to identify and optimise steps within their control, such as always prescribing spacers and replacement spacers for patients on pMDI. As an initial and necessary step, the rate of spacer prescription determines the highest possible rate of effective pMDI use in asthma control, which in turn, can have a major impact on patients' quality of life (McIvor, Devlin and Kaplan, 2018).

To bring the spacer prescription rates in line with guidelines and best practice, X Practice and other primary care providers may consider the suggestions below. Similar quality improvement projects should also be conducted in other primary care practices, and locally appropriate improvement strategies should be developed.

- HCPs at the Practice should be reminded of the need to prescribe spacers for all asthma patients on pMDI and the need to replace spacers every 6 or 12 months, as per manufacturer instructions.
- Currently, X Practice does not code patient records for pMDI, making data compilation for such patients difficult and time-consuming. A code for pMDI in the EMIS system should be created with the aid of databases of UK-licensed inhalers such as RightBreathe (https://www.rightbreathe.com/). Having this code will allow easy identification of patients on pMDI; thus, data on spacer prescriptions for such patients can be compiled easily and monitored regularly.
- When an HCP prescribes pMDI on the EMIS system, an automatic prompt should be presented to remind the HCP (1) to also prescribe a spacer, ideally as a repeat prescription for regular replacement, unless the patient already has such a prescription, and (2) to explain to the patient the need for and benefit of using a spacer and the need for its regular replacement.
- The patient's Personal Asthma Action Plan (PAAP) should contain clear instructions on when to use a spacer and when to replace the spacer.
- For patients with repeat spacer prescriptions, send SMS messages at appropriate intervals to remind patients to order and replace their spacers. In the message, also include a link to an accessible tutorial on correct spacer usage, like the one by Asthma + Lung UK (2024a).
- The patient's compliance with using and replacing the spacer, as well as their technique for using pMDI with a spacer, should be checked at each asthma review appointment.
- Given the prevalence of asthma and the prevalent use of pMDI in asthma management, measures reflecting appropriate spacer prescription and monitoring may be added to the Quality and Outcomes Framework (QOF) to incentivise primary care providers to improve the quality of asthma care.

Conclusions: This quality improvement project evaluated spacer prescription rates for asthma patients on pMDI at one primary care practice and compared them against asthma management guidelines. In general, spacers were under-prescribed compared to guideline recommendations and best practice. A substantial proportion of patients on pMDI were never prescribed a spacer, and the vast majority of patients were not prescribed a replacement spacer in the past year. Major improvements in the practice of spacer prescription are needed, and several suggestions were proposed to improve this aspect of asthma care in the primary care setting.

References:

Asthma + Lung UK (2024a) *Spacers*. Available at: https://www.asthmaandlung.org.uk/symptoms-tests-treatments/treatments/spacers#how-to-use-a-spacer (Accessed: 12 April 2025).

Asthma + Lung UK (2024b) *What is*

asthma? Available at: https://www.asthmaandlung.org.uk/conditions/asthma/what-asthma (Accessed: 12 April 2025).

Lavorini, F., Barreto, C., van Boven, J.F.M., Carroll, W., Conway, J., Costello, R.W., Dahl, B.H., Dekhuijzen, R.P.N., Holmes, S., Levy, M., Molimard, M., Roche, N., Román-Rodriguez, M., Scichilone, N., Scullion, J. and Usmani, O.S. (2020) 'Spacers and Valved Holding Chambers—The Risk of Switching to Different Chambers', *The Journal of Allergy and Clinical Immunology: In Practice*, 8(5), pp. 1569–1573. doi.org/10.1016/J.JAIP.2019.12.035.

McIvor, R.A., Devlin, H.M. and Kaplan, A. (2018) 'Optimizing the delivery of inhaled medication for respiratory patients: The role of valved holding chambers', *Canadian Respiratory Journal*, 2018(1), pp. 1-8. doi.org/10.1155/2018/5076259.

NICE (2002) *Inhaler devices for routine treatment of chronic asthma in older children (aged 5-15 years)*. Available at: www.nice.org.uk/guidance/ta38 (Accessed: 10 April 2024).

NICE (2024) *Asthma: diagnosis, monitoring and chronic asthma management (BTS, NICE, SIGN)*. Available at: www.nice.org.uk/guidance/ng245 (Accessed: 12 April 2025).

NICE (2025a) *Scenario: Acute exacerbation of asthma*. Available at: https://cks.nice.org.uk/topics/asthma/management/acute-exacerbation-of-asthma/ (Accessed: 12 April 2025).

NICE (2025b) *Scenario: Newly-diagnosed asthma and optimising treatment*. Available at: https://cks.nice.org.uk/topics/asthma/management/newly-diagnosed-asthma-optimizing-treatment/ (Accessed: 12 April 2025).

Pernigotti, D., Stonham, C., Panigone, S., Sandri, F., Ferri, R., Unal, Y. and Roche, N. (2021) 'Reducing carbon footprint of inhalers: Analysis of climate and clinical implications of different scenarios in five European countries', *BMJ Open Respiratory Research*, 8(1), pp. 1-11. doi.org/10.1136/bmjresp-2021-001071.

Sanchis, J., Gich, I. and Pedersen, S. (2016) 'Systematic Review of Errors in Inhaler Use: Has Patient Technique Improved Over Time?', *Chest*, 150(2), pp. 394-406. doi.org/10.1016/j.chest.2016.03.041.

SIGN (2024) *British guideline on the management of asthma*. Available at: https://www.sign.ac.uk/our-guidelines/british-guideline-on-the-management-of-asthma/ (Accessed: 12 April 2025).

Vincken, W., Levy, M.L., Scullion, J., Usmani, O.S., Dekhuijzen, P.N.R. and Corrigan, C.J. (2018) 'Spacer devices for inhaled therapy: why use them, and how?', *ERJ Open Research*, 4(2), pp. 1-10. doi.org/10.1183/23120541.00065-2018.