

# Prescribing emergency oral steroids in asthma clinics

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Received 27 November 2018  
Revised 13 May 2019  
Accepted 14 May 2019

## ABSTRACT

We retrospectively reviewed children who had been prescribed emergency oral corticosteroids (OCS) in a routine tertiary paediatric respiratory clinic appointment. We subsequently assessed adherence from prescription uptake of inhaled corticosteroids or combination inhalers in the 6 months prior to the episode. In 2 years, 25 children received 32 courses of prednisolone. Median adherence was 33%, but 28% for those with repeated OCS prescriptions. Prescribing acute OCS in a routine clinic is a red flag for potential poor adherence to preventer therapies, and may also indicate the child has poor perception of the severity of their symptoms. An assessment of adherence should be carried out and help given to the child and their family to improve poor adherence when detected.

## INTRODUCTION

It is known that poor adherence to asthma treatments are associated with worse outcomes and even death from an acute attack.<sup>1</sup> Poor perception of symptoms is also a factor in poor asthma control. We were aware that we have occasionally prescribed a short course of oral corticosteroids (OCS) to a child who had simply come to our tertiary paediatric respiratory clinic for a routine review, but who was in fact very wheezy. The aim of this study was to see how often this had happened and assess if this was associated with poor adherence.

## METHODS

This was a retrospective case note review conducted in a large tertiary paediatric respiratory unit in London. Our paediatric pharmacy database was searched for all outpatient prescriptions of OCS over a 2-year period (2016–2017). Data were extracted from the medical records of these children. Exclusion criteria included no evidence of asthma; and cases when prescriptions were for long-term steroid use, trials of steroid-responsiveness or in exceptional circumstances for an emergency pack to be kept at home. The children's general practitioners (GPs) were contacted (by fax and telephone) and prescription uptakes of inhaled steroids or combination inhalers requested for the 6-month period leading up to the date oral steroids had been prescribed. We also looked at the clinic attendance rate for the year prior to the incident. The study was deemed a Service Evaluation by our Trust Audit department so formal ethics approval and consent were not required.

## RESULTS

We were unable to ascertain the total number of asthmatic children seen by the seven different

## What is already known on this topic?

- ▶ Inhaled corticosteroids are the main form of preventive treatment for chronic childhood asthma, but adherence to them is often low and leads to poor asthma control.
- ▶ Poor adherence is a risk factor for death due to asthma.

## What this study adds?

- ▶ Prescribing oral corticosteroids for acute symptoms in a routine follow-up clinic may be a red flag for poor adherence to inhaled corticosteroids.
- ▶ It may also signify the child has a poor perception of their symptoms.
- ▶ Objective measures of adherence should be assessed in these circumstances.

consultants or their trainees in clinics during this 2-year period. There were 25 children prescribed a short course of OCS for symptoms; mean age was 12.1 years (range 6.25–16.3 years); 15 (60%) were boys and 10 (40%) girls. Eighteen (68%) were atopic and had comorbidities including allergic rhinitis (n=14), eczema (n=9) and food allergies (n=5). Other comorbidities (n=11 children) included gastro-oesophageal reflux, mild bronchiectasis, right middle lobe volume loss, ex-preterm chronic lung disease, mild immunodeficiency (eg, low IgA with low IgG, low mannose-binding lectin),  $\beta$ -thalassaemia trait, low vitamin D levels, dysfunctional breathing, autistic spectrum disorder and behavioural issues; 14 children had none. Concern was documented by the clinician about the child's poor perception of symptoms in only 6 cases, with no comment made in 19 (but this did not mean they had good perception). Lung function, bronchodilator responsiveness and exhaled nitric oxide at the time OCS were prescribed are given in [table 1](#).

A total of 32 courses of prednisolone were prescribed; 20 children had one prescription, 4 had two and 1 child had four prescriptions. Median dose of prednisolone was 40 mg (range 20–40 mg) for a median 3 days (range 3–10 days). For the repeat prescriptions, median interval between courses was 3 months (range 2–9 months). An upper or lower respiratory tract infection precipitated 13/32 (41%) episodes. Details of inhaled steroids or combination inhalers the children were supposed to be taking at the time OCS were prescribed are given in [table 2](#); montelukast was prescribed to 22 children.



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**To cite:** Willson R, Makhecha S, Moore-Crouch R, *et al*. *Arch Dis Child* Epub ahead of print: [please include Day Month Year]. doi:10.1136/archdischild-2018-316609

**Table 1** Lung physiology measures (prebronchodilator) in clinic at the time of oral corticosteroid prescription

	n	Median	IQR	Range
FEV <sub>1</sub> %	32	62	50–73	33–90
FVC %	32	71	59–84	33–105
FEV <sub>1</sub> /FVC %	32	73	67–83	49–98
BDR %	24	18	7–42	0–80
FeNO (ppb)	15	64	44–82	14–134

FEV<sub>1</sub> and FVC are % predicted for gender, age and ethnicity using Rosenthal equations.<sup>7</sup> BDR was calculated from change in FEV<sub>1</sub> after 1000 µg salbutamol inhaled via a spacer. FeNO was measured using the Niox Vero analyser (Aerocrine, Stockholm, Sweden).

BDR, bronchodilator responsiveness; FeNO, fractional exhaled nitric oxide; FEV<sub>1</sub>, forced expiratory volume in 1 s; FVC, forced vital capacity.

Prescription (ICS or combination inhaler) uptake data were not returned by three GPs (for four episodes). For the other 28 episodes, uptake over the previous 6 months ranged from 0% to 100%, with a median (IQR) of 33% (16%–79%); in only 8/28 (29%) episodes was uptake  $\geq 75\%$  expected. In the 4/5 children who had repeat OCS prescription and in whom we had uptake data, adherence prior to the 10 episodes was worse, with a median 28% uptake and just 10%  $\geq 75\%$ . Analysis of clinic attendance in the year prior to the incident showed that 22/25 children attended 100% appointments; 3 children did not attend all (58%, 67% and 75%), and their ICS uptake was 77%, 0% and 100%, respectively. There were no deaths in the children at least 1 year after the study period ended.

## DISCUSSION

The main finding was that among the 25 children who required an emergency course of oral steroids prescribed in a routine tertiary paediatric respiratory appointment, adherence to their ICS or combination inhalers was poor. There was only a median 33% prescription uptake in the 6 months before the episode; and in less than a third of episodes was the uptake  $\geq 75\%$  expected. It has been found that exacerbation rates are significantly lower when patients take  $\geq 75\%$  prescribed ICS dose.<sup>2</sup> Of course this is the maximum they might have taken, picking up the prescription from the GP or hospital pharmacy does not necessarily mean the drug is inhaled. In reality, the doses taken would be even lower, and we now regularly monitor the patients using a Smartinhaler to measure actual doses taken (or sprayed into the room).<sup>3</sup> Although we are a tertiary referral centre and our patients are skewed to those with more severe asthma on high doses of ICS, some of our patients were direct GP referrals and would be more typical of those seen in District General Hospitals. The UK confidential enquiry—National Review of Asthma Deaths (NRAD) 2014 stressed that not all the deaths were in those with severe asthma, so we believe our message is relevant for all children with asthma.<sup>1</sup>

**Table 2** Daily doses (µg) of inhaled corticosteroid in 'preventer' inhalers children had been prescribed at the time oral corticosteroids were given

	n	Median	IQR	Range
Beclometasone	1	200	-	-
Seretide <i>Fluticasone/salmeterol</i>	19	500	350–500	100–1125
Symbicort <i>Budesonide/formoterol</i>	12	800	550–1300	400–1600

The NRAD also found that in those aged <20 years who had died, 17/28 (61%) failed to take appropriate medication that had been prescribed.<sup>1</sup> We believe that prescribing an acute course of OCS in clinic should be a red flag for poor adherence, and should be followed by an enquiry of prescription uptake followed by use of Smartinhaler monitoring if available. Inevitably, a frank and honest discussion needs to take place with the child and carers of the dangers of not taking their preventer therapy, alongside re-education about their condition, treatment effects and inhaler technique. Improving medication adherence is a huge challenge but potential interventions are outlined in the SIGN/British Thoracic Society 2016 guideline on the management of asthma ([www.brit-thoracic.org.uk/standards-of-care/guidelines/btssign-british-guideline-on-the-management-of-asthma/](http://www.brit-thoracic.org.uk/standards-of-care/guidelines/btssign-british-guideline-on-the-management-of-asthma/)). We find that carers are often surprised at the poor uptake figures and we encourage them to watch the child taking the medicine (whatever their age) and to not just ask them if they have taken it.

Any prescription of OCS for an acute exacerbation, whether from the GP or Accident and Emergency Department should count as a red flag, as it indicates a failure of chronic asthma treatment and a risk of a subsequent attack. Indeed, NRAD recommended that patients who require more than two courses of OCS in a year must be referred for specialist care.<sup>1</sup> Furthermore, a systematic enquiry that included 12 studies of 2855 patients (adults and children), found that use of OCS was associated with an increased risk (OR 2.3, 95% CI 1.1 to 4.7) of near-fatal and fatal asthma.<sup>4</sup> Other risk factors (from 27 studies published 1960–2004) included increased use of  $\beta_2$ -agonists and theophylline, history of hospitalisation, need for intensive care and need for mechanical ventilation.<sup>4</sup> A more recent systematic review, limited to children aged 5–12 years, looked at risk factors for having an asthma attack (not necessarily a fatal one).<sup>5</sup> They found previous attacks were the greatest risk, followed by persistent symptoms and poor access to care; among a number of other factors was included a suboptimal drug regimen.

Clearly, the children and/or carers had failed to realise the child's symptoms were severe enough to seek emergency review yet we felt they needed an immediate course of OCS. While some may have delayed seeking medical help as they knew they were due to see their specialist in clinic (something we discourage), in some cases the child may have had poor perception of their symptoms (this was recorded in the clinic letters of six children). In the NRAD survey, for those who died under 20 years of age, 12/28 (43%) had a delay/failure in seeking medical advice and 17/28 (61%) had a delay/failure in responding to symptoms.<sup>1</sup> The mechanisms behind poor perception of symptoms of breathlessness and other symptoms of bronchoconstriction are not well understood.<sup>6</sup>

In conclusion, prescribing emergency OCS to a patient being seen in a routine secondary or tertiary care asthma clinic should be a red flag for potential poor adherence to preventer therapy, particularly when it happens repeatedly. This should initiate a structured asthma evaluation including medication monitoring to help address the challenge of adherence, and safeguarding concerns may need to be considered.

**Acknowledgements** The authors would like to thank Professor Andrew Bush, Professor Sejal Saglani, Dr Mark Rosenthal, Dr Louise Fleming, Professor Claire Hogg and Dr Huileng Tan for allowing their patients to be included in this study. The authors would like to thank Louise Fleming for reviewing the manuscript. The authors would also like to thank Irene Omo-Alege for providing data on clinic attendance.

**Contributors** RW gathered all the data, with the help of SM from the Pharmacy database. RM-C gathered the adherence data from the general practitioners. IMB-L designed, supervised, analysed data and wrote the paper.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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