



Letter

Dexamethasone for inpatient childhood asthma exacerbations is as effective as short-acting corticosteroid treatment

Acute asthma exacerbations result in over 130,000 childhood hospitalizations in the United States annually.¹ Systemic corticosteroids (SCS) are a fundamental component of exacerbation management and reduce relapse rates after hospital discharge.² Use of prednisolone or other short-acting SCS during hospitalization may require continuation of this medication after hospital discharge, yet a recent study demonstrated that only about half of these prescriptions are filled within 3–7 days of discharge.³

Dexamethasone has a half-life of 36–72 hours and a greater affinity for the glucocorticoid receptor compared with short-acting corticosteroids.⁴ Investigations comparing relapse rates after emergency department (ED) treatment of exacerbations have consistently demonstrated no difference between children treated with 1 or 2 doses of dexamethasone and those treated with a 5-day course of prednisone/prednisolone.^{5–8}

Despite those findings, there is limited knowledge of the comparative effectiveness of dexamethasone and short-acting SCS for children hospitalized with exacerbations. In a recent study by Parikh et al, children hospitalized for exacerbations had shorter length of stay (LOS) and comparable 7- and 30-day readmissions after dexamethasone treatment when compared with children given short-acting SCS.⁹ Their study did not report dexamethasone dosing regimens or whether the children in the dexamethasone group received discharge SCS prescriptions. Our objective in this study was to examine relapse and readmission rates among children hospitalized with exacerbations treated with short-acting SCS compared with those treated with exclusive inpatient dexamethasone.

We performed a retrospective analysis of data for children 2–18 years of age who presented to our academic children's hospital ED and were hospitalized for acute asthma exacerbations between January 1, 2012 and March 31, 2015. We used data from the Pediatric Health Information System database (Children's Hospital Association, Overland Park, Kansas) to identify children hospitalized with a principle diagnosis of asthma (*International Classification of Diseases, 9th Revision*, 493.xx). We merged the data with institutional pharmacy data for inpatient medication administration and prescription production. Patients' characteristics included age, gender, insurance type, and complex chronic condition.¹⁰ Exacerbation severity was defined as the mean relative cost weight for each All Patient Refined Diagnosis-related Group and severity-of-illness level for each cohort. The project was approved through our institutional review board (protocol #151380).

We categorized patients into those who received exclusively short-acting SCS, dosed at 1 to 2 mg/kg per day for 5–7 days, and those who received exclusively dexamethasone, dosed at 0.6 mg/kg

(maximum 16 mg per dose) and administered in the ED with a second dose 48 hours later or before discharge, whichever occurred first. We excluded children who received no SCS or both a short-acting SCS and dexamethasone, those who required intensive care unit (ICU) care, and those who were treated with dexamethasone and received a prescription for any SCS at discharge.

Our primary outcome was 30-day asthma readmission rate. Secondary outcomes included hospital LOS, 7-day readmission rate, and 7- and 30-day relapse rates. We defined readmission as a repeat asthma hospitalization at our institution, and relapse was defined as a return to our ED for an exacerbation.

Descriptive statistics are presented as median (interquartile range) or as proportion. The χ^2 , Wilcoxon rank sum, and Kruskal-Wallis tests were used to determine univariate associations. We used multivariable regression models to examine the adjusted associations between relevant covariates (age, gender, asthma exacerbation severity, insurance type, and SCS preparation) and 30-day relapse, readmission, and hospital LOS. Multivariable analysis was not performed for the outcomes of 7-day relapse or readmission, as there were too few patients for a stable model. $P < .05$ was considered statistically significant. Stata version 14.1 (StataCorp LLC, College Station, Texas) was used for all analyses.

There were 1,257 children hospitalized for asthma exacerbations during the study period. Of these, 346 were cared for in the ICU, 108 received both short-acting SCS and dexamethasone, 11 received no SCS during their hospitalization, and 30 received dexamethasone but also received an SCS prescription at discharge and were all excluded, leaving a total study population of 762. Among the 762 children, 263 (34.5%) received only dexamethasone and 499 (65.5%) received only short-acting SCS. The short-acting SCS group had higher median severity scores (*Table 1*). In univariate analyses there were no differences in 30-day readmissions ($P = .78$) or relapses ($P = .95$) or in 7-day readmissions ($P = .95$) or relapses ($P = .90$) (*Table 1*). In the multivariable logistic regression analysis, there were no differences between the 2 corticosteroid groups in 30-day readmission (adjusted odds ratio for short-acting SCS, 1.06; 95% confidence interval [CI], 0.36–3.14) or relapse (adjusted odds ratio for short-acting SCS, 0.94; 95% CI, 0.48–1.85) rates, after adjustment for the relevant covariates. However, in multivariable linear regression there was an adjusted association of increased LOS with short-acting SCS (increase of 0.17 day; 95% CI, 0.06–0.29) and with increasing severity (increase in 1.6 days; 95% CI, 1.21–2.00) after adjustment for the relevant covariates.

This research suggests that inpatient-only administration of dexamethasone for children hospitalized with acute asthma exacerbations is associated with similar readmission and relapse rates and a reduction of LOS compared with a 5- to 7-day course of short-acting SCS. In this regard, we were able to ascertain discharge

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Table 1

Demographics and Univariate Associations for Outcomes of Interest in Patients Aged 2–18 Years Who Were Hospitalized With Acute Asthma Exacerbations and Received Dexamethasone or Short-acting SCS

	Dexamethasone: 263 (34.5)	Short-acting steroids: 499 (65.5)	P value
Demographics			
Median age, years (IQR) ^a	5.5 (3.8–8.8)	5.9 (3.7–10.0)	.37
Male gender ^b	177 (67.3)	340 (68.1)	.81
Complex chronic condition ^b	14 (5.3)	42 (8.4)	.12
Median severity (IQR) ^{c,d}	0.6 (0.6–0.6)	0.6 (0.6–0.8)	.02
Insurance type (n) ^b			
Government-sponsored (497)	174 (66.2)	323 (64.7)	.30
Commercial (237)	76 (28.9)	161 (32.3)	
Other (28)	13 (4.9)	15 (3.0)	
Outcomes of interest			
30-day readmission ^b	5 (1.9)	11 (2.2)	.78
30-day relapse ^b	14 (5.3)	26 (5.2)	.95
7-day readmission ^b	2 (0.8)	4 (0.8)	.95
7-day relapse ^b	4 (1.5)	7 (1.4)	.90
Median LOS, days (IQR) ^a	1.0 (0.8–1.4)	1.2 (0.8–1.6)	.003

Abbreviations: IQR, interquartile range; LOS, length of stay; SCS, systemic corticosteroids.

NOTE. Values are expressed number (%) unless noted otherwise.

^aWilcoxon rank sum test.

^b χ^2 test.

^cKruskal-Wallis test.

^dMean relative cost weight for each All Patient Refined Diagnosis-related Group and severity-of-illness level for each cohort.

prescription data for each patient as a means to identify patients who received only dexamethasone; to our knowledge, this has not been reported in previous investigations.⁹ Exclusive inpatient use of dexamethasone may circumvent the challenges families face in filling prescriptions for short-acting SCS after hospital discharge.

One limitation to our study is that we used coding data. Second, providers may have chosen SCS based on perceived severity of illness, using short-acting SCS for more ill-appearing patients. Finally, some patients may have presented to other facilities for relapses or readmissions; however, our hospital is the primary pediatric facility in the region and patients in both treatment groups may be expected to present to other facilities with equal frequency.

Our findings suggest that dexamethasone is a safe and effective alternative to traditional 5- to 7-day short-acting SCS treatment for inpatient management of acute asthma exacerbations. Completing a 2-dose dexamethasone course before discharge benefits families by eliminating compliance barriers of prescription-filling. Further studies are warranted to determine whether dexamethasone can also be used in patients with more severe asthma exacerbations, such as those admitted to the pediatric ICU.

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