5-2024

Variation in systemic corticosteroid prescribing during asthma-related hospitalizations across children's hospitals

Sian Best

Matt Hall

Jessica L. Bettenhausen

Shelby Chesbro

Nicholas Clark

See next page for additional authors

Creators

Sian Best, Matt Hall, Jessica L. Bettenhausen, Shelby Chesbro, Nicholas Clark, Megan Collins, Adrienne G. DePorre, Jonathan Ermer, Bridgette Jones, Leah Jones, Jessica Markham, Elisha McCoy, Maria Newmaster, Laura Plencner, Henry T. Puls, Smit Shah, and Kathryn Kyler

Variation in Systemic Corticosteroid Prescribing During Asthma-Related Hospitalizations Across Children's Hospitals

Siân Best, MD; Matt Hall, PhD; Jessica Bettenhausen, MD; Shelby Chesbro, MD; Nicholas Clark, MD; Megan Collins, MD, MPH; Adrienne DePorre, MD; Jonathan Ermer, MD; Bridgette L. Jones, MD, MSCR; Leah Jones, MD; Jessica Markham, MD, MSc; Elisha McCoy, MD; Maria Newmaster, MD; Laura Plencner, MD; Hank Puls, MD; Smit Shah, MD, MS; Kathryn E. Kyler, MD, MS

Children's Mercy KANSAS CITY
UMKC School of Medicine
KU School of Medicine The University of Kansas


The Author Allows
This Content To Be Shared

Disclosure

Siân Best

Has documented no financial relationships to disclose or Conflicts of Interest (COIs) to resolve.

PAS
Pediatric Academic Societies

Background

- Asthma is the third-leading cause of non-injury related hospitalization among children less than 15 years of age
- Systemic steroids are the mainstay of treatment

Dexamethasone in Asthma Care

Systematic reviews found dexamethasone to be non-inferior to prednisolone

Potential practical benefits with the use of dexamethasone

High-quality studies in the ED found no difference in hospitalization outcomes

Studies in hospitalized children found no difference in hospitalization outcomes

Little mention of dexamethasone in national guidelines

Children's Mercy KANSAS CITY

Study Questions

- What are the current prescribing practices for systemic steroids in pediatric acute asthma?

- Have there been any changes in prescribing practices since the publication of the Cochrane reviews?

Objectives

- To describe variability and trends in inpatient systemic corticosteroid prescribing during acute asthma exacerbation hospitalizations

- To determine differences in hospitalization outcomes between children prescribed dexamethasone versus prednisone/prednisolone

Study Design

- Multicenter, retrospective, cross-sectional study utilizing PHIS database from 2016-2023

Inclusion Criteria	Exclusion Criteria
• Children aged 2-18 years • Primary discharge diagnosis of asthma exacerbation • Received one of the following steroids: dexamethasone, prednisone, prednisolone, methylprednisolone	• Transfers from outside facilities • Diagnoses of bronchiolitis, bacterial pneumonia, COVID-19, complex chronic conditions • Children receiving other steroids • Severe illness: LOS > 5 days, mechanical ventilation, NIV, ECMO, or CPR

Children's Mercy KANSAS CITY

Outcomes

- Primary
  - Percentage of hospitalization encounters with any dexamethasone ordered/prescribed within a hospital-year
- Secondary
  - Readmission rates at 7 days and 30 days post-discharge
  - ED revisits at 7 days and 30 days post-discharge
  - Hospital LOS

Covariates

Demographic Variables

- Age
- Sex
- Race/ethnicity
- Primary insurance payor

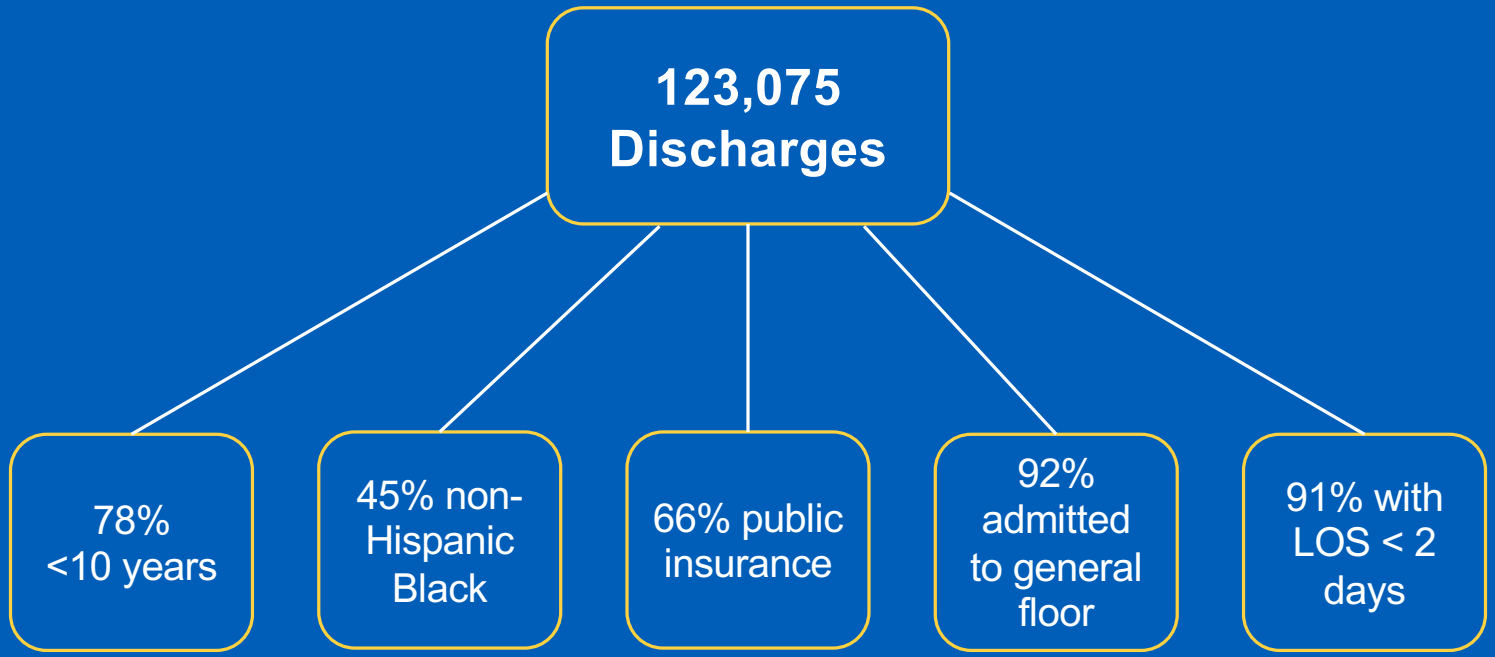
Clinical Characteristics

- Illness severity
- PICU stay
- Admission source
- LOS

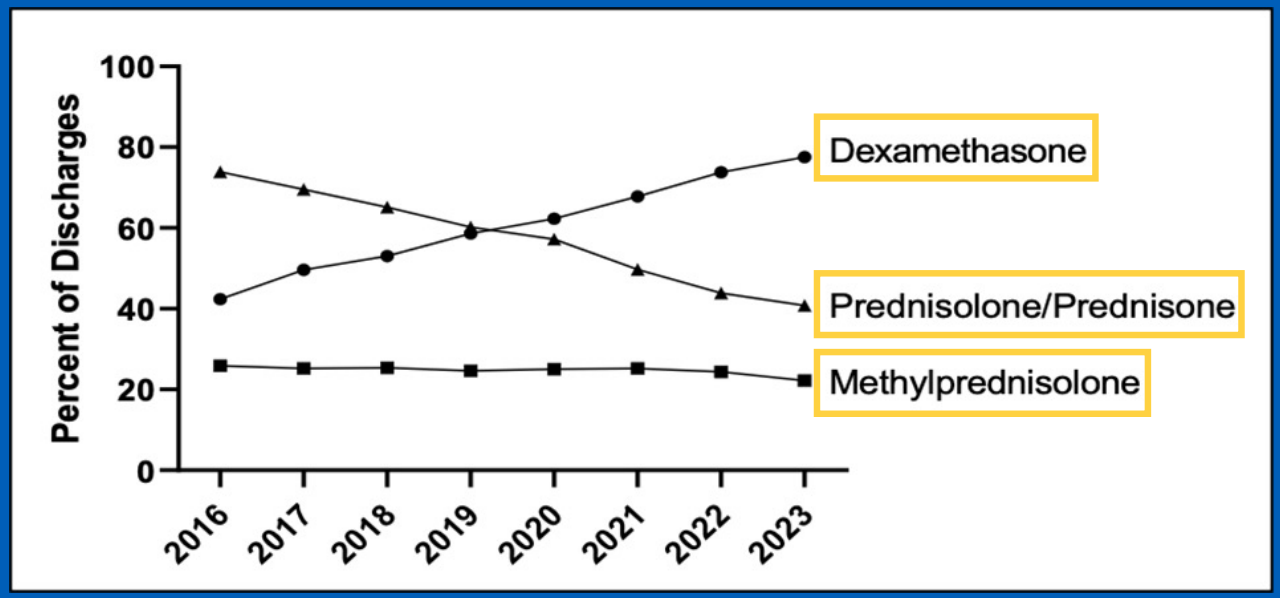
Statistical Analysis

- Hospitals were grouped into quintiles based on dexamethasone use
- Generalized estimating equations used to analyze the association of annual hospital level dexamethasone use with hospitalization outcomes
- Sub analysis performed to investigate hospitalization outcomes for encounters with dexamethasone only versus prednisone/prednisolone only

Cohort Description

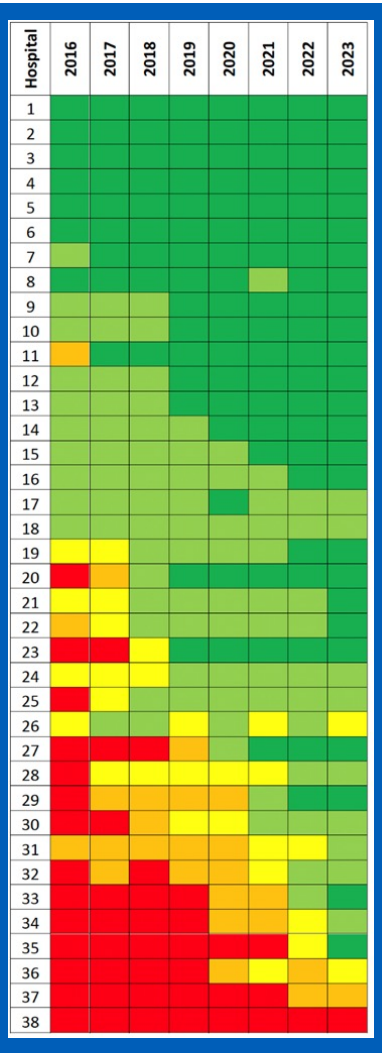


Results – Trends in Steroid Use



Results – Hospital-Level Variation

- Proportion of hospitals prescribing dexamethasone for >80% of encounters increased from **7** hospitals to **25** hospitals in 2023
- **Eight** hospitals exhibited no change in prescribing practices
- Only **four** hospitals prescribed dexamethasone for <60% of asthma encounters in 2023



	% Dexamethasone Use
	<20%
	20-40%
	41-60%
	61-80%
	81-100%

Results – Dexamethasone & Hospitalization Outcomes

- No difference in readmission, ED revisits, or LOS across hospitals when grouped by dexamethasone-use quintiles

- No difference in readmission, ED revisits, or LOS in encounters only receiving dexamethasone versus only prednisone/prednisolone

Limitations

- Lack of patient- and provider-level characteristics
- Medication prescription details and discharge medication data
- Focus on children's hospitals
- Direct admissions included
- PICU versus floor steroid administration

Conclusions

- Dexamethasone use is increasing during hospitalizations for acute asthma exacerbation
- Substantial variability in steroid prescribing practices between hospitals
- No differences in LOS, ED revisits or hospital readmission rates between dexamethasone versus prednisone/prednisolone

Future Directions/Next Steps

- Need for randomized controlled trials or comparative effectiveness studies assessing dexamethasone versus prednisone/prednisolone for hospitalized children
- Analysis of prescribing practices in the PICU versus general inpatient floors
- Dexamethasone dosing variability
- Potential updates to national guidelines and institution-specific practice pathways to decrease variability

References

- Cai KJ, Su SQ, Wang YG, Zeng YM. Dexamethasone Versus Prednisone or Prednisolone for Acute Pediatric Asthma Exacerbations in the Emergency Department: A Meta-Analysis. *Pediatr Emerg Care*. 2021;37(12):e1139. doi:10.1097/PEC.0000000000001926
- Hemani SA, Glover B, Ball S, et al. Dexamethasone Versus Prednisone in Children Hospitalized for Acute Asthma Exacerbations. *Hosp Pediatr*. 2021;11(11):1263-1272. doi:10.1542/hpeds.2020-004788
- Hoefgen ER, Huang B, Schuler CL, et al. Dexamethasone Versus Prednisone in Children Hospitalized With Asthma Exacerbation. *Hosp Pediatr*. 2022;12(3):325-335. doi:10.1542/hpeds.2021-006276
- Kirkland SW, Cross E, Campbell S, Villa-Roel C, Rowe BH. Intramuscular versus oral corticosteroids to reduce relapses following discharge from the emergency department for acute asthma. *Cochrane Database Syst Rev*. 2018;2018(6):CD012629. doi:10.1002/14651858.CD012629.pub2
- Normansell R, Kew KM, Mansour G. Different oral corticosteroid regimens for acute asthma. *Cochrane Database Syst Rev*. 2016;2016(5). doi:10.1002/14651858.cd011801.pub2
- Paniagua N, Lopez R, Muñoz N, et al. Randomized Trial of Dexamethasone Versus Prednisone for Children with Acute Asthma Exacerbations. *J Pediatr*. 2017;191:190-196.e1. doi:10.1016/j.jpeds.2017.08.030
- Parikh K, Hall M, Mittal V, et al. Comparative Effectiveness of Dexamethasone versus Prednisone in Children Hospitalized with Asthma. *J Pediatr*. 2015;167(3):639-644.e1. doi:10.1016/j.jpeds.2015.06.038
- Qureshi F, Zaritsky A, Poirier MP. Comparative efficacy of oral dexamethasone versus oral prednisone in acute pediatric asthma. *J Pediatr*. 2001;139(1):20-26. doi:10.1067/mpd.2001.115021

Thank You!

- **Kathryn E. Kyler, MD, MS**

- Matt Hall, PhD
- Jessica Bettenhausen, MD
- Shelby Chesbro, MD
- Nicholas Clark, MD
- Megan Collins, MD, MPH
- Adrienne DePorre, MD
- Jonathan Ermer, MD
- Bridgette L. Jones, MD, MSCR
- Leah Jones, MD
- Jessica Markham, MD, MSc
- Elisha McCoy, MD
- Maria Newmaster, MD
- Laura Plencner, MD
- Hank Puls, MD
- Smit Shah, MD, MS

Children's Mercy KANSAS CITY

Siân Best, MD
Children's Mercy Kansas City
scbest@cmh.edu

Extra – Steroid Trends

	Overall	2016	2017	2018	2019	2020	2021	2022	2023	p (Trend)
Dexamethasone	74199 (60.3)	7567 (42.4)	8416 (49.6)	8917 (53)	9256 (58.6)	4402 (62.3)	9061 (67.8)	13566 (73.8)	13014 (77.5)	**<.001**
Methylprednisolone	30396 (24.7)	4618 (25.9)	4272 (25.2)	4269 (25.4)	3892 (24.6)	1768 (25)	3366 (25.2)	4482 (24.4)	3729 (22.2)	**<.001**
Prednisolone/ Prednisone	71073 (57.7)	13196 (73.9)	11793 (69.5)	10968 (65.1)	9517 (60.2)	4039 (57.2)	6635 (49.7)	8077 (43.9)	6848 (40.8)	**<.001**

Extra – Analysis Results

	Annual Hospital-Level Dexamethasone Use					
	<20%	20-40%	41-60%	61-80%	81-100%	P-value
Readmission 7 day	0.8 (0.6, 1)	0.5 (0.3, 0.8)	0.5 (0.4, 0.6)	0.6 (0.5, 0.8)	0.6 (0.6, 0.8)	**0.200**
Readmission 30 day	2.7 (2.2, 3.3)	2.5 (2, 3.1)	2.1 (1.8, 2.6)	2.4 (2, 2.8)	2.4 (2, 2.8)	**0.426**
ED Revisit 7 day	0.7 (0.7, 0.8)	0.6 (0.5, 0.8)	0.6 (0.4, 0.9)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	**0.701**
ED Revisit 30 days	3.1 (2.7, 3.6)	2.8 (2.5, 3.3)	2.8 (2.3, 3.4)	2.7 (2.5, 3)	2.9 (2.6, 3.3)	**0.812**
LOS	1.4 (1.3, 1.4)	1.3 (1.2, 1.4)	1.4 (1.3, 1.5)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	**0.344**

Extra – Sub Analysis Results

	Annual Hospital-Level Dex Use					
	<20%	20-40%	41-60%	61-80%	81-100%	p
Readmission 7 day	0.7 (0.5, 1)	0.6 (0.4, 0.9)	0.4 (0.3, 0.5)	0.7 (0.6, 0.9)	0.7 (0.6, 0.8)	**0.085**
Readmission 30 day	2.6 (2, 3.3)	2.6 (2.1, 3.2)	1.9 (1.6, 2.3)	2.3 (2, 2.7)	2.2 (1.9, 2.7)	**0.228**
ED Revisit 7 day	0.8 (0.7, 0.9)	0.7 (0.5, 0.9)	0.7 (0.4, 1.1)	0.7 (0.6, 0.9)	0.8 (0.7, 0.9)	**0.902**
ED Revisit 30 days	3.2 (2.7, 3.7)	2.9 (2.4, 3.4)	2.7 (2.2, 3.5)	2.8 (2.4, 3.3)	3 (2.6, 3.5)	**0.742**
LOS	1.3 (1.2, 1.4)	1.2 (1.2, 1.3)	1.3 (1.2, 1.3)	1.2 (1.2, 1.3)	1.2 (1.1, 1.2)	**0.116**