Characterization of Oral Dexamethasone for Acute Asthma Exacerbations in the Pediatric Emergency Department

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Background

- Asthma is a major cause of hospitalizations in pediatric patients
- When administered in the emergency department (ED) for asthma exacerbations, systemic corticosteroids may reduce the rate of hospitalizations and necessity for short-acting beta$_2$-adrenergic agonist therapy
- Initiation of dexamethasone within 1 hour of arrival to the ED has been associated with lower rates of hospitalizations, particularly in moderate to severe patients
- Compared to oral prednisone and prednisolone, dexamethasone has a longer duration of action, is less likely to cause vomiting and is favoured amongst parents due to its once daily dosing regimen
- Currently, there is a lack of consensus on the optimal initial dose of oral dexamethasone:
  - Studies comparing dexamethasone to prednisone and prednisolone
    - 0.3 mg/kg (max. 12 mg)
    - 0.6 mg/kg (max. 16 and 18 mg)
  - 2015 Canadian Thoracic Society (CTS) and Canadian Pediatric Society (CPS) joint guidelines
    - 0.15 mg/kg – 0.3 mg/kg OR
    - 0.6 mg/kg (max. 10 mg)
  - Surrey Memorial Hospital (SMH) pre-printed order for pediatric asthma exacerbations in the ED
    - 0.2 mg/kg (max. 10 mg)
- There are currently no comparative studies evaluating the various initial dosing regimens for oral dexamethasone

Objectives

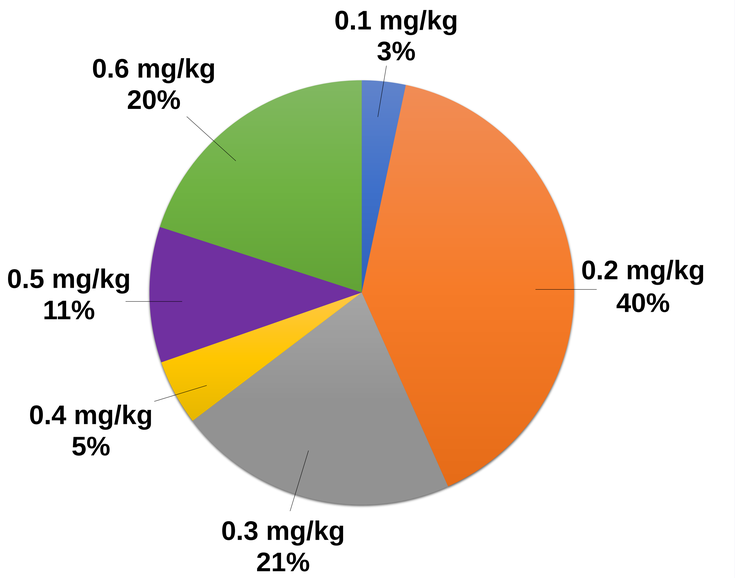
- To characterize oral dexamethasone use in the pediatric ED for asthma or reactive airway disease
  - **Primary outcome**
    - To determine the three most frequently received initial oral dexamethasone doses (mg/kg) for asthma or reactive airway disease (RAD) in the pediatric emergency department at SMH from January 2015 to December 2016
  - **Secondary outcome**
    - To compare initial oral dexamethasone doses of 0.2 mg/kg and 0.6 mg/kg on the following:
      - Hospitalizations, pediatric intensive care unit (PICU) transfers and ED revisits within 7 days
      - Length of ED stay
      - Additional therapies received
      - Adverse drug reactions

Methods

- **Design**
  - Retrospective chart review at SMH from January 2015 to December 2016
- **Inclusion criteria**
  - 45 weeks post menstrual age to 16 years, inclusive AND
  - Physician diagnosis of asthma or reactive airway disease AND
  - Received oral dexamethasone in the emergency department of SMH
- **Sample size**
  - Convenience sample of 300 patients
    - 75 patients per 6 month period
- **Analysis**
  - Descriptive statistics

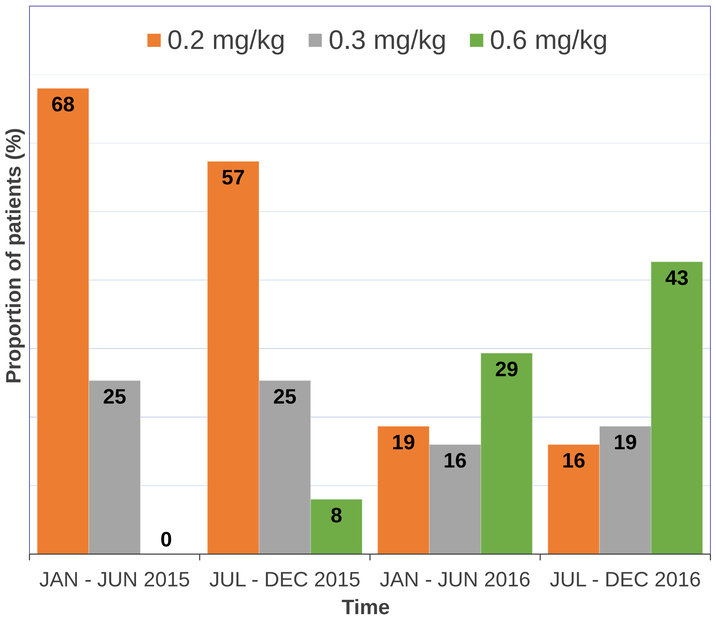
Results

Figure 1. Initial Oral Dexamethasone Doses (N = 300)



96/300 (32%) received ≥ 10 mg

Figure 2. Dosing Trends



Results

Table 1. Baseline Characteristics Of Patients Receiving Oral Dexamethasone 0.2 and 0.6 mg/kg

	0.2 mg/kg N = 120	0.6 mg/kg N = 60
Age, year, mean ± SD*	5.8 ± 3.3	2.9 ± 1.3
Female, no. (%)	40 (33.3)	13 (21.7)
Weight, kg, mean ± SD*	25.4 ± 14.0	14.5 ± 3.2
Pediatric respiratory assessment measure (PRAM) score on arrival to ED, mean ± SD	5.9 ± 2.2	6.2 ± 2.2
Mild: 0 to 3, n/N (%)	16/101 (15.8)	4/45 (8.9)
Moderate: 4 to 7, n/N (%)	57/101 (56.4)	29/45 (64.4)
Severe: 8 to 12, n/N (%)	28/101 (27.7)	12/45 (26.7)
Dexamethasone received in ED ≤ 1 hour of arrival, no. (%)	70 (58.3)	33 (55.0)
Medical history		
Asthma/RAD, no. (%)	102 (85.0)	47 (78.3)
Intubation, anytime, no. (%)	5 (4.2)	2 (3.3)
Hospitalization ≤ 365 days for asthma/RAD, no. (%)	13 (10.8)	3 (5.0)
Hospitalization or ED visit ≤ 30 days for asthma/RAD, no. (%)	11 (9.2)	6 (10.0)
ED visit ≤ 365 days for asthma/RAD, no. (%)	50 (41.7)	26 (43.3)
≥ 3 ED visits ≤ 365 days for asthma/RAD, no. (%)	12 (10.0)	3 (5.0)

**Statistically significantly different by univariate analysis ($p < 0.05$)*

Table 2. Secondary Outcomes

	0.2 mg/kg N = 120	0.6 mg/kg N = 60
Hospitalization, no. (%)	20 (16.7)	12 (20.0)
Length of hospitalization, hours, mean ± SD	46.4 ± 38.1	38.9 ± 24.6
Transfer to PICU, no. (%)	1 (0.8)	1 (1.7)
ED revisit within 7 days, no. (%)	8 (6.7)	1 (1.7)
Length of ED stay post-oral dexamethasone, hours, mean ± SD	2.8 ± 2.3	2.7 ± 2.0
Additional daily dexamethasone doses received and/or prescribed, n/N (%)*	67/119 (56.3)	9/59 (15.3)
Additional daily dexamethasone, doses, mean ± SD*	1.3 ± 1.9	0.3 ± 1.0
Therapies received in ED post-oral dexamethasone		
Salbutamol, doses, mean ± SD	2.1 ± 2.0	1.8 ± 1.5
Ipratropium, doses, mean ± SD	1.3 ± 1.1	1.2 ± 1.1
Methylprednisolone, no. (%)	3 (2.5)	1 (1.7)
Magnesium sulfate, no. (%)	2 (1.7)	1 (1.7)
Aminophylline, no. (%)	0 (0.0)	0 (0.0)
Ketamine, no. (%)	1 (0.8)	0 (0.0)
Continuous salbutamol nebulization, no. (%)	1 (0.8)	2 (3.3)
Oxygen, no. (%)	5 (4.2)	1 (1.6)
Adverse drug reactions		
Vomiting, no. (%)	1 (0.8)	0 (0.0)
Hyperglycemia, no. (%)	1 (0.8)	0 (0.0)

**Statistically significantly different by univariate analysis ($p < 0.05$)*

Limitations

- Retrospective, single-center study with a small sample size
  - Potentially underpowered to detect differences in rate of hospitalizations and ED revisits within 7 days
  - Baseline differences may confound results
- Unable to account for ED visits to non-Fraser Health sites
- Adverse drug reactions likely under-reported and/or incompletely measured

Conclusions

- Most frequently received initial oral dexamethasone dose in 2015 and 2016 were 0.2 and 0.6 mg/kg respectively
- No clinically important differences between 0.2 and 0.6 mg/kg detected; either dose may be considered for the initial management of acute asthma exacerbations in pediatric patients presenting to the ED

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