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Background

- Acute asthma exacerbations are a frequent reason for admission to BC Children's Hospital
- Initial management includes inhaled salbutamol and ipratropium, systemic corticosteroids, and IV magnesium
- If initial management is not successful, then inhaled salbutamol is continued and second-line IV therapies such as aminophylline, ketamine, or salbutamol are given in an attempt to lengthen the inhaled salbutamol dosing interval and prevent need for invasive ventilation
- Choice of medication is based on clinician preference, experience, and drug availability within the institution
- There is little evidence of safety of these agents in children who do not respond to first-line therapies

Objectives

- Characterize second-line drug therapy management used to treat acute asthma exacerbations

Methods

- Clinical research ethics board approved
- Design:** Retrospective chart review
- Population:** Pediatric patients who received IV aminophylline, ketamine, or salbutamol between January 2006 and August 2017
- Inclusion:** Aged 2-17 years, admitted to the pediatric intensive care unit (PICU) for management of acute severe asthma exacerbation
- Statistics:** Sample size of convenience, descriptive statistics
- Adverse Events:** All events with a Naranjo score of ≥ 4 were reported (possible to definite likelihood)

Outcomes

- Prevalence of each second-line drug therapy
- Occurrence of tachycardia, hypokalemia, hypersalivation, seizures, vomiting; doses of ondansetron
- Theophylline serum concentrations

Results

Table 1. Patient Characteristics

	N = 64
Age, years [median (IQR)]	6 (3-9)
Weight, kg [median (IQR)]	20 (15.1-31.2)
ED admits ≥ 1 in past year [n (%)]	31 (48)
ICU admits ≥ 1 in lifetime [n (%)]	7 (11)
PRAM* score at admission [median (IQR)]	9 (7.5-10)
PRAM score after salbutamol/ipratropium [median (IQR)]	8 (6.3-9.8)
Length of ICU admission, days [median (IQR)]	1 (1-2.1)
Length of hospital admission, days [median (IQR)]	5 (3-6)

*PRAM = Pediatric Respiratory Assessment Measure

Table 2. Drug Therapy Management

	N = 64
Initial Management	
Salbutamol + ipratropium [n (%)]	42 (66)
Systemic steroids*	60 (94)
Dose, mg/kg/day [median (IQR)]	2.19 (1.4-3)
IV Magnesium sulphate [n (%)]	44 (69)
Dose, mg/kg/dose [median (IQR)]	41.7 (28.5-50)
Second-line Management	
Aminophylline IV [n (%)]	64 (100)
Dose, mg/kg/hr [median (IQR)]	1 (0.9-1)
Ketamine IV [n (%)]	3 (5)
Dose, mcg/kg/min [median (IQR)]	10 (7.5-10)
Salbutamol IV [n (%)]	1 (2)
Dose, mcg/kg/min [median (IQR)]	1 (n/a)
Patients who received > 1 drug [n (%)]	4 (6)

*In prednisone equivalents

Table 3. Adverse Effects

	Aminophylline alone N = 60	Ketamine N = 3	Salbutamol N = 1	All N = 64
Nausea or vomiting [n (%)]	21 (58)	3 (100)	1 (100)	25 (39)
Arrhythmia [n (%)]	2 (3)	0	0	2 (3)
Seizures [n (%)]	1 (2)	0	0	1 (2)

Table 4. Theophylline Serum Concentrations

	N = 60
Patients with ≥ 1 serum concentration [n (%)]	51 (85)
Serum concentration, mcmol/L [median (IQR)]*	64 (55-75)

*Target concentrations: 55-110 mcmol/L

Figure 1. Median Time until Inhaled Salbutamol Interval Lengthened for Patients Receiving Aminophylline

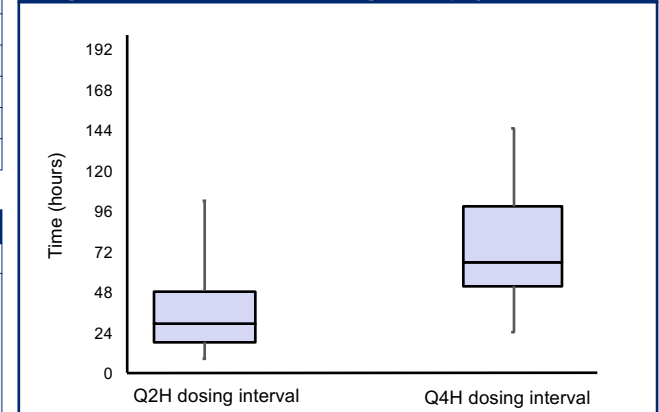


Table 5. Respiratory Interventions

	N = 64
Nasals prongs or mask [n (%)]	50 (78)
Non-invasive positive pressure ventilation [n (%)]	45 (70)
Intubation & ventilation [n (%)]	5 (8)
> 1 type of respiratory support [n (%)]	37 (58)

Limitations

- Fewer than expected patients received first line management
- Fewer than expected patients received second line management making it difficult to evaluate outcomes
- Diagnostic criteria for preschool asthma changed during study period

Conclusions

- Aminophylline was the most frequently used second-line therapy and was well tolerated
- Unable to evaluate ketamine and salbutamol due to low usage