Montelukast inappropriate dosing and risk for asthma exacerbations

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BACKGROUND

- Over 3 million children reported having at least 1 asthma attack over the course of the year in 2017 with nearly 50% of children uncontrolled on current therapy
- Montelukast, a leukotriene receptor antagonist (LTRA), is recommended for use in children with persistent asthma at step 2 and beyond either as monotherapy or add-on therapy where daily low-dose inhaled corticosteroids (ICS) are not effective or otherwise contraindicated
- LTRAs work by inhibiting cysteinyl leukotriene receptors, reducing further smooth muscle contraction, airway edema, and altered cellular activity that are all associated with the inflammatory processes causing the signs and symptoms of asthma
- Literature has demonstrated that montelukast provides control of day-time asthma symptoms, more symptom free days, less need for rescue medications, improvement in FEV1 and reduced airway inflammation
- Montelukast is the only medication where the pediatric dose is based on age instead of weight
- Montelukast dose recommendations based on age instead of weight is an area where community pharmacists can have an impact on ensuring the patient is on the appropriate dose.

OBJECTIVE

- To assess the appropriateness of montelukast dosing based on age.
- To identify if inappropriate montelukast dosing is related to asthma exacerbations.

METHODS

Study Design

- Retrospective cohort

Inclusion Criteria

- Aged 12 months to 18 years
- Self-reported asthma
- Reported filling a prescription for montelukast during the period studied

Study Measures: Dependent Variables

- **Primary Outcome:** rate of experiencing an asthma attack within the last 12 months while on appropriate vs. inappropriate dose of montelukast
- **Secondary Outcome:** rescue inhaler use in last 3 months and additional inhaled corticosteroid use while on appropriate vs. inappropriate dose of montelukast

Study Measures: Independent Variables

- Race/ethnicity, poverty level, prescription insurance status, asthma attack in the last 12 months, rescue inhaler use in the last 3 months, and additional inhaled corticosteroid use for asthma control

Data Analysis

- Chi-square test to assess the difference in asthma exacerbations based on montelukast dosing appropriateness.

RESULTS

Table 1: Demographic information

Demographics	Children with asthma who were prescribed montelukast Unweighted n= 210 Weighted N = 548,472 n (weighted %) or weighted mean (95% CI)
Age (Years)	9.6 (8.8 to 10.3)
Sex, Male	139 (64.5)
Race/ Ethnicity	
Non-Hispanic White	63 (47.3)
Non-Hispanic Black	72 (23.8)
Non-Hispanic Other	24 (13.2)
Hispanic	58 (15.7)
Poverty Category	
Poor/ Near Poor	98 (24.9)
Low Income	41 (17.5)
Middle Income	53 (34.7)
High Income	25 (22.8)
Prescription Medication Insurance, Yes	69 (48.4)
Health Insurance, Yes	216 (99.3)
Asthma attack in last 12 months, Yes	105 (43.0)
Rescue inhaler used in last 3 months, Yes	129 (56.4)
Correct dose of montelukast, Yes	160 (77.4)
Inhaled corticosteroid used, Yes	110 (50.1)

Table 2: Asthma outcomes stratified by montelukast dosing appropriateness

	Montelukast Dose		
	Appropriate N=160	**Inappropriate N=57**	**P-value**
Asthma attack in last 12 months, Yes	78 (72.1)	27 (27.9)	0.153
Rescue inhaler used in last 3 months, Yes	92 (70.6)	37 (29.4)	0.025
Inhaled corticosteroid used, Yes	77 (72.8)	33 (27.3)	0.189
Chi-square test			

DISCUSSION

- The results of our study showed no statistical difference in asthma attacks in the last 12 months or additional corticosteroids being used by patients
- Results were statistically significant for rescue inhalers being used in the previous 3 months between the two groups but could potentially be skewed as these data were not specific on the amount of uses or the reason for its use (SOB vs wheezing)
- Specific strengths for our study include a database with data points that were strictly yes or no, a large sample size, and a large time frame of collected data
- Some limitations in our study were that the study was retrospective, the data did not include patients who did not visit the doctor or enroll in the survey questionnaire, and that the surveys conducted through the database were subjective and may not have been completely accurate
- Our study was the first of its kind to look at montelukast dosing appropriateness and evaluate the impact on asthma control and exacerbations
- To potentially find more relevant information regarding our study topic, we could have evaluated more patients in a greater time range while also digging into the information that was available to us more to look into specific reasons for rescue inhaler usage and time frame
- Patient weight is another potential factor that could impact the dosing, even though montelukast is not weight based, there are patients who are smaller and therefore on smaller doses (due to side effects) and patients who are larger on higher doses (due to lower doses not being effective)
- Further studies in this topic could also evaluate missed school days, montelukast adherence, and which other specific therapies the patient was on to evaluate the impact of appropriate dosing

CONCLUSION

- Maximizing asthma medication therapy can help control asthma-related symptoms and reduce exacerbations, leading to lowered rescue-inhaler usage, emergency department visits, and less concomitant asthma therapies
- The impact of our study was expected to play a role in the way community pharmacists evaluated montelukast prescriptions based on age appropriateness and our role in maximizing therapy
- Our results showed that appropriate dosage of montelukast based on age had statistical significance for rescue inhaler usage in the prior 3 months, but no significance in asthma exacerbations or inhaled corticosteroid usage
- Further studies are warranted assessing the importance of children being prescribed the appropriate age-based dosage of montelukast