Asthma Diary: Empowering Children and Caregivers to Improve Asthma Outcomes

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ABSTRACT

Background: Asthma is a leading cause of pediatric admissions, with an average of 50 cases monthly. Between September 2024 and February 2025, 188 children under 1 year presented with acute bronchiolitis; 107 (57%) were readmitted and prescribed Metered Dose Inhalers (MDIs). Readmissions within 2 to 10 months were frequent, linked to poor inhaler technique, limited caregiver knowledge, and delayed symptom recognition.

Objective: To evaluate the effectiveness of a "**Asthma Diary**" in reducing readmissions and improving caregiver performance.

Methods: A prospective observational study compared pre- and post-intervention outcomes. The diary contained inhaler instructions, trigger guidance, and a traffic-light symptom system. Caregivers received nurse-led education, demonstration, and follow-up. Failure Mode and Effects Analysis (FMEA) guided risk prioritization.

Results: Post-intervention readmissions declined to 13.7%, a 49% relative reduction. Main causes were missed doses (37%), incorrect inhaler use (32%), and delayed recognition of wheeze/tachypnea (31%). Inhaler errors decreased markedly.

Conclusion: The "**Asthma Diary**" is a low-cost tool that improved adherence, trigger awareness, and symptom recognition, leading to fewer readmissions.

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INTRODUCTION

Asthma is a major cause of pediatric hospital admissions. At Columbia Asia Hospital (CAH) Setapak, an **average of 50 asthma-related cases per month** were recorded between September 2024 and February 2025. In this period, **188 children under 1 year presented with acute bronchiolitis**, and **107 (57%) were readmitted** and prescribed with Metered Dose Inhalers (MDIs).

Readmissions within 2 to 10 months of discharge were common, often linked to poor inhaler technique, limited caregiver knowledge, inconsistent adherence, and environmental triggers. A caregiver survey confirmed these gaps: 49% had difficulty recognizing early symptoms, 27% lacked awareness of asthma triggers, and 24% expressed low confidence in managing acute episodes at home.

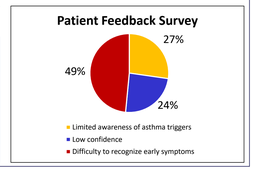
Analysis of baseline data and Failure Mode and Effects Analysis (FMEA) identified deficiencies in caregiver knowledge, symptom recognition, and adherence. In response, the "**Asthma Diary**" was designed to strengthen monitoring, trigger awareness, and treatment consistency.

Aim

To evaluate effectiveness of the "**Asthma Diary**" with focus on symptom control, quality of life, adherence to treatment programs, and reducing readmissions.

Table 1: Readmission of asthma patients (age <1 year) requiring treatment with a Metered Dose Inhaler (MDI) from September 2024 to February 2025

Month	Number of Acute Bronchiolitis	Number of readmission	%
Sep 2024	30	15	**50%**
Oct 2024	24	15	**63%**
Nov 2024	20	10	**50%**
Dec 2024	48	18	**38%**
Jan 2025	36	22	**61%**
Feb 2025	30	12	**40%**
Total	**188**	**92**	



METHODS AND MATERIALS

Study Design: A prospective observational approach was used with structured quality improvement methods.

Population:

- Inclusion criteria: Pediatric asthma patients (<1 year old) prescribed with MDI.
- Exclusion criteria: Pediatric asthma patients with comorbidities or not requiring inhaler therapy.

Data Collection: Data were gathered in two phases:

- **Pre-intervention (September 2024 to February 2025):** Pediatric admission records for respiratory disorders were reviewed and caregiver survey was conducted.
- **Post-intervention (March to August 2025):** Admissions, readmissions, and caregiver performance were monitored.

Intervention: The **"Asthma Diary"** was created with guidance on common asthma triggers, inhaler techniques, and a traffic-light system (**green = stable, yellow = worsening, red = severe**), supported by illustrations and simple language for accessibility.
The diary was given to patients on admission and guided by nurse until discharge. Caregivers were required to demonstrate to ensure understanding. Progress was further monitored through follow-up calls and outpatient visits.

Quality Improvement Tools: FMEA to identify risks in asthma care and guide targeted interventions.

Data Analysis: Data were analyzed using **descriptive statistics** (frequencies, percentages). Pre and post intervention readmission rates were compared to assess the impact of the **"Asthma Diary"** .

RESULTS

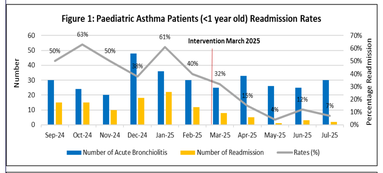
Failure Mode & Effect Analysis

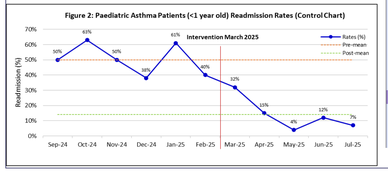
Failure Mode	Failure Cause	Failure Effect	Occurrence (O)	Detection (D)	Severity (S)	Risk Profile Number (RPN)	Actions to Reduce Occurrence	Responsible	Timeline
Poor inhaler technique	No structured training	▪ Inadequate drug ▪ Uncontrolled asthma ▪ Readmission	6	6	8	**288**	▪ Bedside teach ▪ Teach-back method	Nurse Educator	Immediate
Low caregiver knowledge	▪ Limited health literacy ▪ Inadequate discharge education	Delayed recognition of deterioration	7	5	7	**245**	▪ Standardized illustrated education (leaflet/diary); ▪ Teach-back method	Ward Nurse Manager, Paediatrician	Immediate
Inadequate symptom monitoring at home	No simple monitoring tool	▪ Missed worsening ▪ Late hospital arrival	5	5	9	**225**	Introduce traffic light diary chart	Ward Nurse Manager, Paediatrician	1 month
Multiple caregiver	Not all caregivers trained	▪ Inconsistent treatment ▪ Missed doses	6	5	7	**210**	Train all family caregivers	Nurse	1 month
Poor adherence to inhaler regimen	▪ Forget ▪ Lack of dose tracking	▪ Exacerbations ▪ Frequent attacks	6	4	8	**192**	Logbook added to diary	Nurse	2 months
Unrecognized environmental triggers	Lack of trigger education	Frequent exacerbations	5	4	6	**120**	Trigger checklist in diary	Ward Nurse Manager, Paediatrician	2 months

GRAPHS AND TABLES

Table 2: Paediatric Asthma (<1 year old) Readmission

Month	Number of acute Bronchiolitis	Number of readmission	%
Mar 2025	25	8	**32%**
Apr 2025	33	5	**15%**
May 2025	26	1	**4%**
Jun 2025	25	3	**12%**
Jul 2025	30	2	**7%**
Total	**139**	**19**	





Asthma Diary



RESULTS

Following implementation of the "**Asthma Diary**" for <1 year old asthma patients and caregiver, the readmission rate decreased to **13.7% (49% relative reduction).**

Analysis of readmission causes indicated improvements but not complete elimination of risks. Post-intervention readmissions were primarily linked to missed doses (37%), incorrect inhaler use (32%), and delayed recognition of wheezing/tachypnea (31%). Compared to baseline, the frequency of inhaler-related errors declined, reflecting better technique retention from nurse demonstrations and diary reinforcement.

FMEA confirmed that the intervention addressed high-risk failure modes such as poor inhaler technique (RPN 288) and inadequate symptom monitoring (RPN 225). Post-intervention monitoring showed measurable caregiver improvements in inhaler adherence, trigger awareness, and symptom recognition, supported by structured follow-up calls and outpatient reviews.

Overall, the "**Asthma Diary**" proved effective as a low-cost, structured educational tool, contributing to reduced readmissions and enhanced caregiver competence in pediatric asthma management.

DISCUSSION

Between September 2024 and February 2025, 2 to 10 months gap readmission among pediatric asthma patients under 1 year old at CAH Setapak was frequent, with caregiver surveys showing 49% had difficulty recognizing early symptoms, 27% lacked awareness of triggers, and 24% reported low confidence in managing acute episodes. FMEA confirmed high risk for poor inhaler technique (RPN 288) and inadequate symptom monitoring (RPN 225).

Post implementation of the "**Asthma Diary**" in March 2025, readmission rates decreased to 13.7%, representing a 49% relative reduction. Analysis of causes showed missed doses (37%), incorrect inhaler use (32%), and delayed recognition of wheezing or tachypnea (31%) as the main contributors.

Compared with baseline, the frequency of inhaler-related errors declined, indicating better technique retention from nurse demonstration and diary reinforcement. Caregiver performance improved in three key areas: inhaler adherence, trigger awareness, and early symptom recognition.

CONCLUSIONS

The "**Asthma Diary**" reduced pediatric asthma readmissions from baseline levels to 13.7% and addressed key risks identified through FMEA, particularly inhaler technique and symptom monitoring. While some readmissions persisted due to missed doses, inhaler misuse, and delayed recognition, the intervention showed measurable improvements in caregiver knowledge and practice.

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