

## Evidence-based focused approach for fulfillment of aims: Experiences of an asthma clinic

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### ABSTRACT

**Background:** A new health system for the 21<sup>st</sup> century should be based on the best scientific knowledge, according to the Institute of Medicine, US. **Objective:** We have evaluated the effectiveness of asthma clinic providing comprehensive care based on the best available scientific evidence. **Materials and Methods:** This intervention study was conducted in a tertiary care hospital having a devoted asthma clinic for the comprehensive management. All children diagnosed as having asthma were included, and data of cases managed from July 2014 to June 2016 were analyzed. Intervention - comprehensive management of asthma including assessment, monitoring, health education, avoidance of triggers, management of comorbid conditions, appropriate medications, written asthma action plan, and counseling for follow-up. Outcome measures were treatment direction, asthma control, emergency visits, and hospitalizations. **Results:** 260 children were treated over a 2-year period. The effects of focused approach with progressive expertise lead to statistically significant benefits over the two successive years from July 2014 to June 2015 and July 2015 to June 2016. These were in: (i) Treatment direction: Cases requiring stepping up of treatment decreased from 36.49% to 17.24% (relative risk [RR]: 0.473 [95% confidence interval {CI}: 0.249-0.895]); p=0.01229, (ii) asthma control: Cases with not well-controlled asthma decreased from 16.44% to 7.02% (RR 0.427: [95% CI: 0.199-0.914]); p=0.045, (iii) emergency department visits decreased from 35.62% to 21.05% (RR 0.591: [95% CI: 0.39-0.897]), p=0.00766, (iv) hospitalizations decreased from 16.44% to 5.26% (RR 0.32: [95% CI: 0.135-0.757]), p=0.00462. **Conclusion:** Establishing an asthma clinic and progressive expertise leads to significant beneficial results.

**Key words:** Asthma, Control, Education, Organization, Preventive measures

“The health-care delivery system should provide consistent, high-quality medical care to all people based on the best scientific knowledge” states the Institute of Medicine, US, report for a new health system for the 21<sup>st</sup> Century [1]. It is a source of worldwide inspiration. Efforts have been initiated at some medical centers to establish evidence-based clinical pathways for disorders (such as asthma) where sound evidence exists to advise these guidelines [2]. Specific initiatives are definitely needed for the health of children so that they achieve their full growth potential. Asthma is a serious global health problem affecting all age groups. Its prevalence is increasing in many countries, especially among children [3,4]. Strategies are constantly being researched and facilities for all activities of all domains of care at one place should be rewarding. Testing and implementing new ideas and approaches demonstrates innovation in improvement and development of quality in health service delivery [5].

Popular wisdom is that a specialist is a person who knows more and more about less and less. Super/sub-specialists characteristics logically follow. However, common conditions demand wise treatment by anyone and everyone. Hence for common ailments,

we should aspire that all doctors should be able to provide the best possible treatment. With this philosophy, we established a devoted asthma clinic for focused approach by all and for comprehensive care, control, and cure. The service delivery reform suggested in the World Health Organization (WHO) report 2008 – “Primary health care: Now more than ever” is important and aims to make health systems people-centered [6]. Caring for all people with the same ailment at one place, e.g., asthma clinic can be a promising advancement for this pertinent aim.

Because of the variable nature of asthma and the wide spectrum of severity, it is a prime example of a disease where all health-care professionals should work to a common strategy, providing consistent care [7]. A dedicated clinic provides an excellent opportunity for engagement and clinical status assessment for guiding therapy - both for emergency and for preventing emergencies.

The discoveries in basic sciences leading to the development of new tools for prevention, diagnosis, and therapies have been fascinating and now we should also focus on modes of delivery of these advances, to all those who need them. A comprehensive clinic with devoted doctors can play an important role in this regard.

For common ailment, asthma we need to define the fruitfulness for future directions. Hence, we studied the effectiveness of our devoted asthma clinic.

## MATERIALS AND METHODS

This intervention study was conducted in a tertiary care hospital having a devoted asthma clinic for the comprehensive management. An Asthma clinic was established from July 2014, and this study was carried out to quantify its effectiveness. All children diagnosed as having asthma were included, and data of cases managed from July 2014 to June 2016 were analyzed. The following definitions were used for inclusion/exclusion, classification, and outcomes.

### Asthma

The diagnosis of asthma was based on modification of the working definition of asthma as per expert panel report 3 (EPR3). Asthma is a chronic inflammatory disorder of the airways, clinically manifesting as recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment [8]. Cases not fulfilling this definition were not included in the study. The classification of severity was clinical and determined by both impairment and risk, assigning to the most severe category in which any feature was present (Table 1) [8].

### Age Groups

The National Institutes of Health guidelines have distinct criteria for three childhood age groups for the evaluation of both severity and control. These are 0-4; 5-11; and  $\geq 12$  years. Hence, data were compiled and analyzed for these age groups. For socioeconomic

status, rank structure was used (Class of government employee: Officers - Class I, Junior Commissioned Officers - Class II, other ranks - Class III and IV) so as to guide future environmental factors and living conditions interventions.

### Comorbid Conditions

- Rhinitis - diagnosis was on the basis of allergic rhinitis and its impact on asthma definition “an inflammation of the lining of the nose and is characterized by nasal symptoms including anterior or posterior rhinorrhea, sneezing, nasal blockage, and/or itching of the nose.” These symptoms persist for more than 1 h for two or more consecutive days on most of the days [9].
- Sinusitis - diagnosis was based on the history of persistent symptoms of upper respiratory tract infection, including nasal discharge, congestion and cough, and confirmed by radiographic evidence.
- Gastroesophageal reflux disease (GERD) - diagnosis was based on a thorough history and physical examination, with identification of the pertinent positives in support of GERD and its complications and the negatives that make other diagnoses unlikely.

### Asthma Control

The classification of the level of control was clinical and based on both impairment and risk, assigning to the most severe category in which any feature was present (Table 2) [8].

### Step Up and Step Down Approach

Depending on severity treatment was initiated with higher-level controller therapy at the outset to establish prompt control, with

**Table 1: Classification of asthma severity**

Components of severity	Intermittent	Persistent		
		Mild	Moderate	Severe
Impairment				
Daytime symptoms	$\leq 2$ days/week	$> 2$ days/week but not daily	Daily	Throughout the day
Nighttime awakenings				
Age 0-4 year	0	1-2 $\times$ /month	3-4 $\times$ /month	$> 1$ $\times$ /week
Age $\geq 5$ year	$\leq 2$ $\times$ /month	3-4 $\times$ /month	$> 1$ $\times$ /week but not nightly	Often 7 $\times$ /week
Short-acting $\beta_2$ -agonist use for symptoms (not for prevention of exercise induced bronchospasm)	$\leq 2$ days/week	$> 2$ days/week but not daily, and not more than 1 $\times$ on any day	Daily	Several times per day
Interference with normal activity	None	Minor limitation	Some limitation	Extreme limitation
Risk				
Exacerbations requiring systemic corticosteroids				
Age 0-4 year	0-1/year	$\geq 2$ exacerbations in 6 months requiring systemic corticosteroids or $\geq 4$ wheezing episodes/year lasting $> 1$ day and risk factors for persistent asthma		
Age $\geq 5$ year	0-1/year	$\geq 2$ /year		

**Table 2: Classification of asthma control**

Components of control	Well-controlled	Not well-controlled	Very poorly controlled
Impairment			
Daytime symptoms	≤2 days/week but not more than once on each day	>2 days/week or multiple times on ≤2 days/week	Throughout the day
Nighttime awakenings			
Age 0-4 year	≤1×/month	>1×/month	>1×/week
Age 5-11 year	≤1×/month	≥2×/month	≥2×/week
Age ≥12 year	≤2×/month	1-3×/week	≥4×/week
Short-acting β <sub>2</sub> -agonist use for symptoms (not for exercise induced bronchospasm pretreatment)	≤2 days/week	>2 days/week	Several times per day
Interference with normal Activity	Minor limitation	Some limitation	Extreme limitation
PEFR (% predicted)	>80% predicted or personal best	60-80% predicted or personal best	<60% predicted or personal best
Risk			
Exacerbations requiring systemic corticosteroids			
Age 0-4 year	0-1/year	2-3/year	>3/year
Age ≥5 year	0-1/year	≥2/year	

PEFR: Peak expiratory flow rate

measures to “step down” therapy once good asthma control is achieved. If well-controlled for at least 3 months, dose/number of controller medication(s) decreased to establish the minimum required medications to maintain well-controlled asthma. Regular follow-up was emphasized. In cases with less than good control, the following was checked for adherence – correct inhaler technique, treatment compliance, environmental control, and re-evaluation for comorbid conditions. If clear benefit was not observed within 4-6 weeks, stepping up of treatment was done [8]. All cases were followed for a minimum period of 3 months, and maximum follow-up period for the study was 6 months.

### Activities of the Clinic

The aim of the asthma clinic was optimal asthma control based on best available scientific evidence. Activities included explanation of basic facts about asthma; assessment and monitoring of disease activity; education for correct self-management, including demonstration of proper technique for inhaled medication use (spacer use with metered-dose inhaler), and addressing concerns about potential adverse effects of asthma pharmacotherapeutic agents; health education for identification and management of precipitating factors and comorbid conditions; appropriate selection of medications as per EPR3 guidelines [8]. Education was done for eliminating and reducing problematic environmental exposures - tobacco smoke, allergens (Animal danders: Pets [cats, dogs, rodents, birds], pests [mice, rats], dust mites, cockroaches, molds), other airway irritants (wood- or coal-burning smoke, strong chemical odors and perfumes [e.g., household cleaners], dusts).

All patients were asked to maintain individual management booklets. In these, a written asthma action plan was documented. This included: (1) Daily management, (2) how to recognize

and handle worsening asthma. Records of all were also maintained in the clinic. All management including counseling and documentation comprising maintenance of records and emergency visits was done by the doctors of the clinic.

For all cases with intermittent and persistent asthma of all severity, consultation was available at all times. Regular weekly follow-up was ensured through counseling. Once well-controlled regular monthly follow-up was done. For cases with not well-controlled and very poorly controlled emergency consultation was ensured at all times. Regular supply of all medications/MDIs/spacers/nebulizers was ensured. Peak flow meters were made available and also issued to patients requiring them – for monitoring at home, for poor perceivers of asthma, for diurnal variation, and especially those with poor control.

The data of cases of asthma managed were analyzed. All the cases registered completed the follow-up and were included in analysis of results. Relative risk along with 95% confidence interval and p-value (Chi-square test) for the difference between results over two consecutive time periods was calculated using conventional methods.

### RESULTS

A total of 260 cases were managed over 2 years. The patient characteristics were similar (Table 3). The effects of focused approach with the progressive expertise of doctors manning the clinic were analyzed over two successive time periods – July 2014 to June 2015 and July 2015 to June 2016 (Tables 4-6).

### DISCUSSION

Worldwide, there is a felt need to improve professional practice and the delivery of effective health services. The importance of

this can be realized by the fact that a new Cochrane Review Group titled – “The Effective Practice and Organization of Care Group” have been formed [10]. Our asthma clinic aimed to meet both

these. Asthma is a common chronic disease, causing considerable morbidity [4]. There is encouraging evidence that chronic disease management programs for adults with asthma result in improvements as compared to usual care. However, the optimal composition of these needs further investigation [11]. Studies for similar analysis for children are also needed. Our study provides results of a well-functioning asthma clinic for optimal control in children, as per the EPR3 guidelines.

When asthma care is consistent with evidence-based recommendations, outcomes improve [12-14]. The findings of a systematic review of the effectiveness of patient-centered care for children with asthma suggest that positive outcomes specific to emergency room (ER) visits, hospitalizations, unscheduled primary care provider visits, and missed school days are engendered in children with asthma when care is patient-centered; asthma care plans are individualized and when an educational component is incorporated [15]. Our asthma clinic results have been statistically significant for reductions in stepping up of treatment requirements, not well-controlled patients, emergency department visits, and hospitalization rates.

In a systematic review, out of the nine studies which looked at the outcome of hospitalizations, only two showed statistically significant decline in hospitalizations ( $p < 0.05$  and  $< 0.001$ , respectively) when a patient-centered care model was used [15]. In our study, total admissions due to asthma dropped significantly ( $p = 0.00462$ ), (Table 6). Similarly, in another systematic review, eight studies looked at the outcome of ER visits. Three of these reported a statistically significant decline in ER visits after the intervention ( $p < 0.001$ ,  $< 0.05$  and  $< 0.05$ ) [15]. In our study, emergency department visits dropped significantly ( $p = 0.00766$ ), (Table 6). Dedication and devotion of doctors with a comprehensive action plan is definitely beneficial and demonstrated results of our asthma clinic are a definitive boost in this direction.

Health education is an important component of asthma management. Education by our team for environmental control,

**Table 3: Asthma clinic: Patient numbers and characteristics**

Patient characteristics	Number of patients (%)	
	July 2014-June 2015	July 2015-June 2016
Total asthma clinic registered patients	146 (56.15)	114 (43.85)
Age profile (years)		
0-4	59 (40.41)	49 (42.98)
5-11	77 (52.74)	58 (50.88)
>12	10 (6.85)	07 (6.14)
Rank/socioeconomic status		
Officers	09 (6.16)	05 (4.39)
JCOs	7 (4.79)	04 (3.51)
ORs	130 (89.04)	105 (92.11)
Asthma severity		
Intermittent	72 (49.32)	56 (49.12)
Persistent		
Mild	48 (32.88)	39 (34.21)
Moderate	21 (14.38)	16 (14.04)
Severe	05 (3.42)	03 (2.63)
Treatment of comorbid conditions		
Rhinitis	126 (86.30)	102 (89.47)
Sinusitis	6 (4.11)	3 (2.63)
GE reflux	8 (5.48)	6 (5.26)
Chest radiographs (for complications during asthma exacerbations)		
Atelectasis	4 (2.74)	3 (2.63)
Pneumomediastinum	0	0
Pneumothorax	1 (0.69)	0

JCOs: Junior Commissioned Officers, OR: Other ranks, GE: Gastro-esophageal

**Table 4: Asthma clinic results: Treatment requirement direction**

Treatment and outcomes	Number of patients		RR (95% CI)	p-value
	July 2014-June 2015 n=74 (%)	July 2015-June 2016 n=58 (%)		
Treatment direction				
Step down	47 (63.51)	48 (82.76)	1.303 (1.057-1.606)	0.01229
Step up	27 (36.49)	10 (17.24)	0.473 (0.249-0.895)	

n - Total number of asthma clinic patients with persistent asthma. RR: Relative risk, CI: Confidence interval

**Table 5: Asthma clinic results: Categorization of control**

Asthma control class	Number of patients		RR (95% CI)	p-value
	July 2014-June 2015 n=146 (%)	July 2015-June 2016 n=114 (%)		
Well-controlled	117 (80.14)	104 (91.23)	1.138 (1.031-1.257)	0.045
Not well-controlled	24 (16.44)	08 (7.02)	0.427 (0.199-0.914)	
Very poorly controlled	05 (3.42)	02 (1.75)	0.512 (0.101-2.592)	

n - Total asthma clinic registered patients. RR: Relative risk, CI: Confidence interval

**Table 6: Asthma clinic results: Hospital need**

Treatment and outcomes	Number of incidences		RR (95% CI)	p-value
	July 2014-June 2015 n=146 (%)	July 2015-June 2016 n=114 (%)		
Emergency department visits for asthma	52 (35.62)	24 (21.05)	0.591 (0.39-0.897)	0.00766
Total admissions due to asthma	24 (16.44)	6 (5.26)	0.32 (0.135-0.757)	0.00462
Total admissions pediatric ward	2796	2826		
Total mortality due to asthma	0	0		
Mortality due to ARI	2	2		
Total mortality pediatrics department (excluding neonatal mortality)	14	15		

n - total asthma clinic registered patients. RR: Relative risk, CI: Confidence interval, ARI: Acute respiratory illnesses

identification and avoidance of triggers, daily management, action plan for asthma exacerbations, adherence to correct inhaler technique, treatment compliance, resulted in reductions in stepping up of treatment requirements. Holistic treatment was effective in better home management for optimum control and less hospital need.

Spirometry in children is often difficult and not available or accessible most of the times. Communities with limited resources are found not only in low and middle-income countries [3]. Our clinic relied on clinical monitoring and peak expiratory flow (PEF) monitoring. Peak flow meters have been proposed by the WHO as essential tools in the package of essential non-communicable disease interventions for primary health care [16]. The results of our study reiterate the fact that basic clinical skills and PEF measurements can produce desired results.

Intermittent asthma can be managed in emergency settings by anyone. Persistent asthma requires persistent efforts and a place for this will definitely improve compliance and consistency. For stepping up/down of treatment monitoring and follow-up is required. An asthma clinic is the definite place for these activities, and our clinic developed expertise and demonstrated significant results over a period in requirements of stepping up treatment and number of cases with not well-controlled asthma. However, in our study, there was no significant decline in the number of cases with very poorly controlled asthma. For these cases, we carried out thorough investigations to exclude another differential diagnosis, managed the comorbidities, checked compliance and correct inhaler technique, and educated about avoidance of environmental exposure to tobacco smoke, allergens or toxic substances. In spite of all this, there was no improvement. Although these cases are less in number, our real test lies in optimizing control for these cases, and our findings necessitate further research for these.

It is important to build the capacity of primary care physicians for asthma diagnosis and management [3]. The EPR3 guidelines recommend initiatives to stimulate adoption of the recommendations at all levels, but particularly with primary care clinicians at the community level [8]. Establishing asthma clinics in tertiary care hospitals followed by secondary care hospitals is feasible and can be fruitful. Learning stints of primary care physicians in these clinics can have multiplied effects. As such maintaining competence and expertise require continuous

professional development [17]. The precision of the diagnosis of asthma among doctors working in the primary care health services has been reported to be far from ideal, varying from 54% under-diagnosis to 34% over-diagnosis [18]. Hence, the importance of strategy we are suggesting. Experience and evidence can be complementary, and our study demonstrates benefits with experience with evidence.

Our study has strengths and limitations. Comprehensive clinical management based on the evidence-based guidelines produced results, this is the strength. Limitations of our study were the absence of spirometry and allergy testing. These can further lead to improvements.

Impact of asthma clinics can have far-reaching implications. Out of the total 260 cases managed over a 2-year period, 146 were managed during July 2014-June 2015 and 114 during July 2015-June 2016. The implied implications of this decline could have been due to multiplied effects of health education which we did, spread of the message of preventive actions for asthma among the families in the cantonment, which included avoidance of allergen exposure and modification of home environment suitably. The “Clean India Campaign” can be complementary and specifically for asthma sophisticated strategies should be in sync with this, for success and for broad health and holistic benefits.

## CONCLUSION

Asthma management can be optimized through regular clinic visits. A devoted asthma clinic can be a lot beneficial in improving compliant and correct treatment with correct technique, for improved control resulting in a decline in emergency hospital visits and hospitalizations. With involvement of all doctors as suggested, we can march forwards for fulfillment of the dream of “Health for all”, and for this common ailment achieve the aim “Breathe fresh, free and full”.

### Key Messages

- A devoted Asthma clinic for comprehensive care leads to significant beneficial results.
- Extrapolating the effectiveness with the strategies suggested can lead to healthy lives for all with this ailment.

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