

# Clinical and Educational Implications of a Longitudinal Audit for Asthma

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In order to establish a primary care patient profile for curriculum development, 144 charts of asthmatic patients from the Medical College of Virginia-Riverside Family Practice population were examined. The results are presented in an educational format for residents along with suggestions for future audits and prospective studies to improve both patient care and knowledge of the disease process.

Traditionally the teaching and management of disease has been hospital-based and episodic in nature. Recently, however, the concepts of the model unit and ongoing care have been developed for family practice residency training. These concepts in turn indicate the need for sound curriculum development based on disease as it presents in the primary care setting.<sup>1,2</sup> By employing the problem-oriented record, the scientific method, and the longitudinal audit, individual problems or diseases can be examined as they present in the model unit. The results can then be presented to the residents in an educational format. Also, management plans can be made and results can be audited in terms of improved patient care and knowledge of the disease process.

The topic of asthma lends itself well to such a format. Asthmatic patients make up one percent of the entire patient population of the Med-

ical College of Virginia-Riverside Family Practice population. Asthma is also a significant problem in both the hospital and Emergency Room populations which make up the traditional teaching population. However, while educational supervision and curriculum is well-established for inpatient care in Riverside Hospital, a standard of care for the chronic asthmatic in the outpatient setting did not exist.

## Methods

The diagnostic index (E-book) was used to ascertain which patients had asthma listed as a medical problem.<sup>3</sup> These charts were then reviewed for a period of one year from 1974 to 1975. The only criterion used for the diagnosis of asthma was that it be listed on the problem list in the front of the chart. Special interest was paid to the number of health-care visits, therapeutic management, and other health problems.

## Results

From a total patient population of 14,000, 144 charts were reviewed. Of these patients, 86 were female and 58 were male. Figure 1 delineates their age distribution. Forty-six percent were between the ages of 0 and 20.

Figure 2 delineates the age distribution of the entire clinic population. The 144 asthmatic patients made a total of 1,174 office visits, or approximately eight visits per patient per year. An average of five visits per patient per year were for problems not related to asthma. The same group of patients also totaled 147 Emergency Room visits and eight hospitalizations between 1974 and 1975.

The remainder of the results are presented in bar graph form. Each graph illustrates the entire asthmatic population by age. Superimposed on each graph is the age distribution of the specific aspect of asthma being studied. The data shows classification of asthmatics within age groups according to mode of care; Class I — office visits only, Class II — office plus Emergency Room visits, and Class III — office plus Emergency Room visits plus hospitalizations (Figure 3); use of theophylline in asthmatics within age groups (Figure 4); use of "mixed" compounds in asthmatics within age groups (Figure 5); use of beta adrenergic compounds in asthmatics within age groups (Figure 6); pulmonary function studies in asthmatics within age groups (Figure 7); associated allergic problems within age groups (Figure 8); asthmatic referral patterns within age groups (Figure 9); and anxiety-depression problems in asthmatics by age group (Figure 10).

## Discussion

The results confirm the need both for a model unit in a training program and for a curriculum for the management of asthma in the outpatient setting. Figure 3 shows the classification of asthmatic patients and demonstrates that in the course of a year 71 percent of them are never seen in the Emergency Room or hospital. Of 1,321 health-care visits by asthmatic patients during the study, only 147, or 11 percent, were to the local Emergency Room. However, while the management of the acute asthmatic patient in the office and the Emergency Room was fairly standard, the long-term management was inconsistent. It was obvious that in the outpatient setting the residents were following this chronic problem without a standard approach to management.

For example, many authors and studies have concluded that pure

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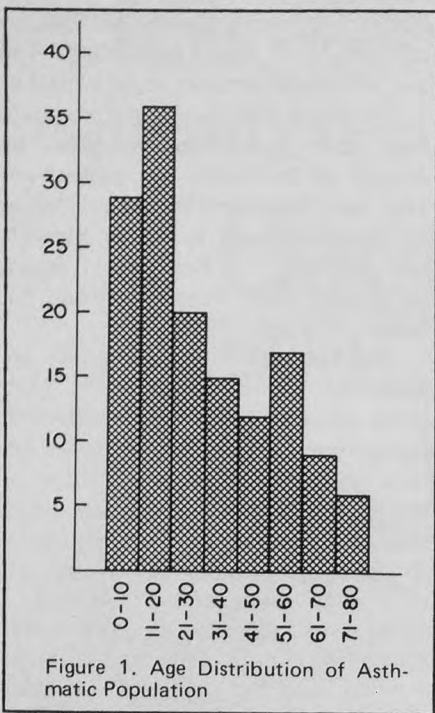


Figure 1. Age Distribution of Asthmatic Population

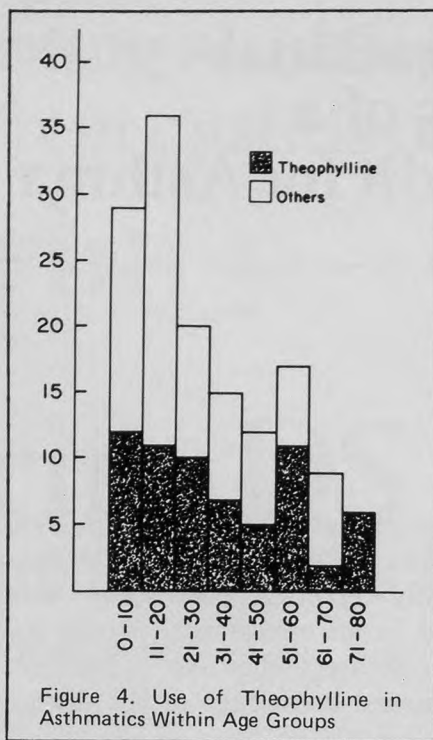


Figure 4. Use of Theophylline in Asthmatics Within Age Groups

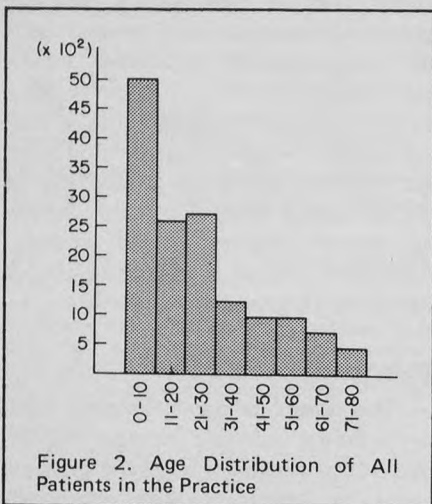


Figure 2. Age Distribution of All Patients in the Practice

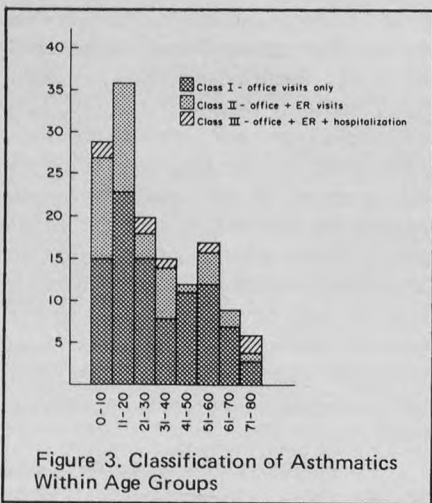


Figure 3. Classification of Asthmatics Within Age Groups

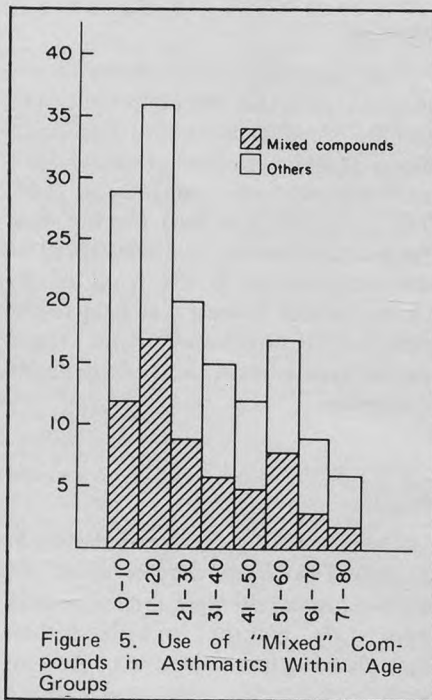


Figure 5. Use of "Mixed" Compounds in Asthmatics Within Age Groups

theophylline is the mainstay of bronchodilator therapy.<sup>4,5</sup> However, only 46 percent of the patients were being managed in this manner (Figure 4). Forty-four percent were being treated with fixed combination therapy without ever having been tried on aminophylline alone (Figure 5). Fourteen percent of the patients were taking beta adrenergic compounds (Figure 6). The only manner in which the efficacy of the drugs was monitored was by subjective data provided by the patient or by the absence of wheezing on chest examination.

In the area of pharmacology, the curriculum needs seem clear. The prospective family physician must be aware of the limitations of using fixed combination drugs early in the disease. Theophylline should be considered as the basis for management. The patient must first be carefully evaluated as to his need for bronchodilator therapy, and then monitored to determine if the chosen mode of therapy is indeed effective. This, of course, requires that the physician be familiar with the pharmacologic principles of the drugs he is using, their additive effects when used concomitantly, and their side effects.

While a subjective history of feeling better and a physical examination are useful in monitoring the success of drug therapy, Williams and McNicol's study in England has demonstrated that these data may be deceiving because some asthmatic patients and their families are actually unaware of what normal breathing is.<sup>6</sup> Williams and McNicol went on to demonstrate the crucial need for baseline pulmonary function studies to determine the need for around-the-clock bronchodilator therapy. These patients then need repeat testing to evaluate the efficacy of therapy. Figure 7 demonstrates that pulmonary function studies, despite their ready availability, were used infrequently in the model unit. In the 0 to 20-year age group only 3.1 percent had any pulmonary function tests performed. The incidence increases somewhat in the older age group with an overall total of 15 percent receiving pulmonary function testing. Again, the physician must be made aware of the importance of the pulmonary function test in evaluating and treating asthma. Furthermore, if the family physician is to do his own testing in his office, he must be aware both of the variety of instruments

available and of their limitations.

Another area of concern for the family physician is the role of the allergist in asthma (Figures 8 and 9). The data were studied to determine whether a pattern for referral existed among the residents. Again no standard approach could be found. A negative correlation existed between those patients with a history of allergy or allergic symptoms and those referred. A recurrent objective of this training program has been for the resident to learn his limitations and know when to refer a problem to the specialists. It is obvious that in the specific area of asthma, the guidelines need clarification.

Anxiety and its relationship to asthma was another area of interest in this study. Figure 10 shows the increasing incidence of anxiety with the increasing age of the patients. At this time, however, the distribution of anxiety for the entire clinic population is unavailable for comparison. Recent work by Marsland on the entire Medical College of Virginia patient population does reveal that anxiety neurosis composes only one percent of patient visits studied.<sup>2</sup> Even with these data, however, no statement can be made concerning a cause-and-effect relationship between asthma and anxiety. What is important is that regardless of cause or effect, the incidence of anxiety is high in the asthmatic population. The physician should be alert for this problem and make efforts to alleviate the anxiety after careful exploration of its relationship to asthma. Only after careful observation and recording can the cause-and-effect relationship be established.

No data were obtained in this study regarding patient education or its effectiveness since the extent of patient education could not be determined by examination of the charts. None of the charts indicated any medical progress as a result of further educating the patient. Again, this institution supports the concept of patient education as important therapy in the management of disease. However, the objectives determining what constitutes adequate education for the patient have not been fully developed nor has thought been given to monitoring the results to determine the efficacy of such instruction. However, a physician should have a firm idea of the knowledge his patients should acquire, as well as how to best

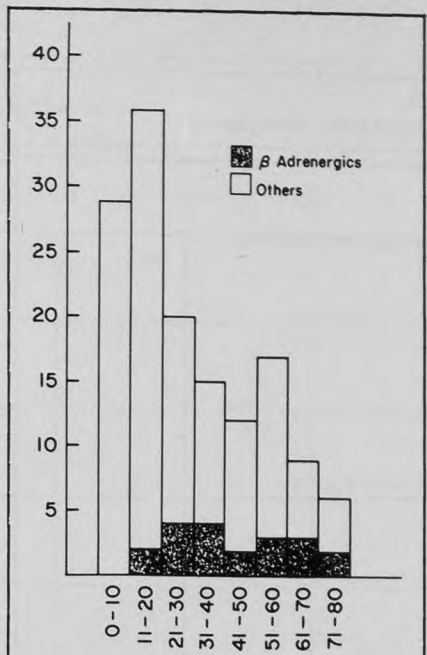


Figure 6. Use of beta Adrenergic Compounds in Asthmatics Within Age Groups

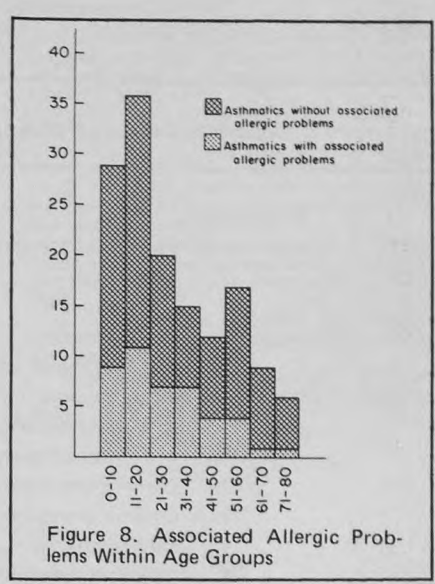


Figure 8. Associated Allergic Problems Within Age Groups

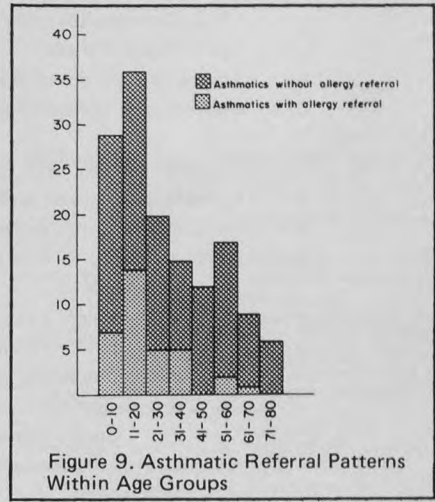


Figure 9. Asthmatic Referral Patterns Within Age Groups

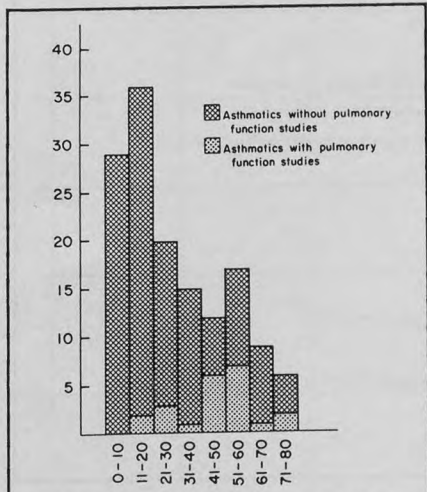


Figure 7. Pulmonary Function Studies in Asthmatics Within Age Groups

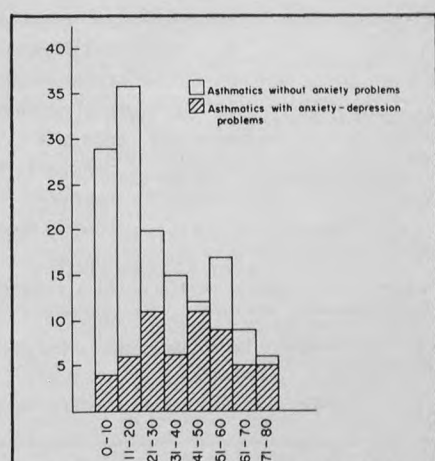


Figure 10. Anxiety-Depression Problems in Asthmatics by Age Groups

**Table 1. Curriculum Objectives for Asthma Management**

- I. Acute Attack
  - A. Knowledge of differential diagnoses of wheezing.
    - 1. Mechanical
      - a. tumors
      - b. aneurysm
      - c. laryngeal edema
      - d. enlarged thyroid
      - e. enlarged thymus
      - f. foreign body
    - 2. Chronic obstructive pulmonary disease
    - 3. Chronic bronchitis
    - 4. Cardiac asthma
    - 5. Carcinoid syndrome
    - 6. Pneumonia
    - 7. Tuberculosis
    - 8. Sarcoidosis
    - 9. Pulmonary fibrosis
    - 10. Pulmonary embolus
    - 11. Bronchiolitis
    - 12. Cystic fibrosis
  - B. Ability to treat status asthmaticus.
  - C. Awareness of complications of acute attacks.
- II. Chronic Disease Management
  - A. Awareness of role of pulmonary function studies.
  - B. Indications for around-the-clock bronchodilator therapy.
  - C. Pharmacologic principles and the problems of combination drugs.
    - 1. The drugs
      - a. theophylline
      - b. beta adrenergics
      - c. cromolyin sodium
      - d. steroids
      - e. desensitization
    - 2. Contraindications to drug usage.
    - 3. Side effects
    - 4. Seasonal use of antibiotics in adults.
  - D. Awareness of the role of continued health maintenance in children.
    - 1. Vaccinations
    - 2. Growth and development
    - 3. Tuberculosis skin testing
  - E. Patient education concepts
    - 1. Awareness of natural progression of disease.
    - 2. Relationship of adolescence and asthma.
    - 3. Etiology of acute attacks and avoidance or control.
      - a. allergens
      - b. chemicals
      - c. exercise
      - d. weather changes
      - e. smoke
      - f. ASA; isuprofen (Motrin)
      - g. anxiety
  - F. Be aware of associated psychosocial problems and importance of recording
  - G. Indications for allergy referral.

convey this knowledge and how to reevaluate its usefulness at a later time.

Table 1 presents in outline form an overall view of the proposed curriculum. The outline is general in order to include the basic concepts and yet allow for flexibility and expansion. This is important because, while the longitudinal audit is a useful instrument in establishing the basics for a sound curriculum based on the needs of the patients, it also presents many questions which will remain unanswered without further study. For example, an average patient visits the clinic 2.3 times per year. The asthmatic patient makes eight visits per year but only three of these are for asthma. There is no clear explanation of this discrepancy. However, in this patient population there appears to be a high incidence of associated anxiety, allergies, and cardiovascular disease. Also, no mention was made of the use of physiopulmonary therapy and its effectiveness. Little was learned about time lost at school or work or about the specific etiology of an acute attack. Furthermore, while theophylline levels are not yet available in this institution, their role in patient management requires further study.

The most important question, however, is whether or not changes in curriculum which result in changes in the approach to the asthmatic patient will improve his condition. Since the purpose of the curriculum is to improve patient care, the answer to this question is crucial. This study cannot answer that question specifically. However, since the longitudinal audit may be used as an instrument to determine what constitutes a practice, it may also be used as an instrument to monitor the results of any changes made as a result of the initial audit.

For this reason, an asthma flow sheet was developed and is presented here (Table 2). Indirectly it serves as a reminder to the resident of the management principles suggested in the curriculum. The instructors in the clinic can also use the flow sheet as a quick audit of the resident's performance and as a summary of the educational objectives for the asthma curriculum. Finally, the flow sheet will facilitate future audits to evaluate the results of changes made and indicate further curriculum revisions based on the needs of the patients.

**Table 2. Asthma Flow Sheet**

Dates				
Physical examination				
Growth and development				
Pulmonary function tests				
Eosinophilia count				
Sputum analysis				
Tuberculosis Skin Test				
Sweat chloride				
Chest x-ray				
Medicines:				
1) Theophylline				
2) Beta-adrenergics				
3) Cromolylin sodium				
4) Steroids				
5) Desensitization				
6) Combination drugs				
7) Antihistamines				
8) Antibiotics				
Medicine side effects				
Allergy consult				
Education — counseling				
Acute asthma attack, office				
Emergency Room visits — asthma				
Hospitalized — asthma				

**References**

1. Wood M, Mayo F, Marsland DW: A systems approach to patient care, curriculum and research in family medicine. *J Med Educ* 50:1106-1112, 1975
2. Marsland DW, Wood M, Mayo F: A data bank for patient care, curriculum and research in family practice: 526,196 patient problems. *J Fam Pract* 3:25-28, 1976
3. Wood M: Peer review potential: The way ahead in family practice records? *J Clin Computing* 2:20-28, 1973
4. Maselli R: Pharmacologic effects of intravenously administered aminophylline in asthmatic children. *J Pediatr* 76:777-882, 1970
5. Mitenko PA, Ogilvie RI: Rational intravenous doses of theophylline. *N Engl J Med* 289:600-603, 1973
6. Williams HE, McNicol KN: The spectrum of asthma in children. *Pediatr Clin North Am* 22:43-52, 1975

**Bibliography for Asthma Curriculum**

1. Bierman WC, Pierson WE: The pharmacologic management of status asthmaticus in children. *Pediatrics* 54:245-247, 1974
2. Buffum WP, Settupane GA: Prognosis of asthma in childhood. *Am J Dis Child* 112:214-217, 1966
3. Cropp GJA: Exercise induced asthma. *Pediatr Clin North Am* 22:63-76, 1975
4. Freeman GL, Johnson S: Allergic diseases in adolescents. II, Changes in allergic manifestations during adolescence. *Am J Dis Child* 107:560-566, 1964
5. Hyman C, Newcomb RW: Pharmacologic management of childhood asthma. *Am J Dis Child* 125:757-765, 1973
6. Johnstone DC, Dutton A: The value of hyposensitization therapy for bronchial asthma in children — a fourteen year study. *Pediatrics* 42:793-802, 1968
7. Karetzky MS: Asthma mortality: An analysis of one year's experience, review of the literature and assessment of current modes of therapy. *Medicine* 54:471-484, 1975
8. Kendig EL: Disorders of the Respiratory Tract in Children. Philadelphia, WB Saunders, 1972
9. Kopetzky MT: Pulmonary function tests in asthma — are they worth it? *Med Clin North Am* 58:93-110, 1974
10. Marks MB: Differential diagnoses of wheezing in children. *Clin Pediatr* 13:225-228, 1974
11. Mattsson A: Psychologic aspects of childhood asthma. *Pediatr Clin North Am* 22:77-88, 1975
12. Mitenko PA, Ogilvie RI: Rational intravenous doses of theophylline. *N Engl J Med* 289:600-603, 1973
13. Orange RP, Austen KF: Chemical mediators of immediate hypersensitivity. *Hospital Practice* 6(1):79-89, 1971
14. Richerson HB: Symptomatic treatment of adults with bronchial asthma. *Med Clin North Am* 58:135-145, 1974
15. Williams HE, McNicol KN: The spectrum of asthma in children. *Pediatr Clin North Am* 22:43-52, 1975
16. Wood DW: Pulmonary function testing in children. *Pediatr Clin North Am* 16:159-171, 1969