Evaluation of the Severity of the Acute Asthmatic Attack*
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Asthma is an inflammatory process that is characterized by reversible obstruction in both the large and small airways. When the severity of the patient's airway obstruction is assessed accurately, the physician is able to provide appropriate therapy which at times may be life saving. Since the patient, physician and pulmonary function laboratory may all gauge the severity of the airways obstruction differently, the assessment process should not be dependent upon a single clinical or physiologic variable. The patient may complain of an irritating sensation in the chest or of persistent coughing, even when there is little or no demonstrable airway obstruction. Wheezing may be present when obstruction and even discomfort are minimal, and may be absent when obstruction is severe. Usually physical findings and clinical evidence of hypoxia do not appear until airway obstruction is life-threatening.

The objective of this presentation is to outline some of the more useful clinical and laboratory investigations that enable the characterization of the asthmatic patient whose condition justifies the level of care that can be provided only by hospitalization. These patients with severe asthma amount to approximately 10 percent of the asthmatic patients attending the emergency room.*

**Historical**
A history of previous, severe episodes of asthma, especially episodes requiring hospitalization, intensive therapy, or adrenal corticosteroid use, should alert the clinician to the possible need for aggressive therapy. If a patient is receiving corticosteroid therapy, any persistent episode of asthma should also be taken seriously. This is particularly true if there has been any recent reduction of steroid dose. The patient's opinion that the dyspnea is increasing in severity should always be respected even if alarming physical signs are absent. The patient is frequently the best judge of this aspect, and there is no clinical sign that will negate it. Perhaps the most important single feature is failure to respond to previously effective therapy. If a patient's asthma usually responds to an inhaled bronchodilator drug, properly administered, then failure of usual bronchodilator drugs to relieve the symptoms to the same extent or for the same duration should be taken as a warning that the patient requires further assessment.

**Physical Signs**
In a severe attack of asthma, the patient sits with arms thrust forward to grasp support, the chest is hyperinflated, wheezing is audible and the patient is too distressed to talk. The patient who presents with all these features is clearly very ill. The various other features listed below may underline the urgency of the situation.

**Rhonchi and the Silent Chest**
The finding of few or only scattered rhonchi, especially with soft breath sounds, in the chest of a patient who is very short of breath has become recognized as a sign that the airways are extensively obstructed with very little air passing through them and, hence, very little wheezing is being generated.

**Clinical Evidence of Hypoxia and Hypercapnia**
The clinical signs of arterial hypoxia and hypercapnia are late and unreliable.* Their absence does not detract from the diagnosis of severe asthma. However, their presence means that the asthma is very severe. Cyanosis, systemic hypertension, cardiac arrhythmias or any disturbance of consciousness are indications for urgent action. A tachycardia of greater than 110/min is indicative of a serious episode* and often subsides as the asthma is brought under control. This sinus tachycardia is commonly and often wrongly attributed to drug therapy.

**Hyperinflation of the Chest**
Hyperinflation of the chest accompanies most episodes of asthma of more than minimal severity.* It may vary quite rapidly with changes in the clinical state. Persistence of hyperinflation after dyspnea has subsided in the patient without a chronic chest deformity indicates that the relief is likely to be short lived.

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Advances in Assessment and Therapy of Asthma
**Pulsus Paradoxus**

The observation that the pulse decreases in amplitude or even momentarily disappears during inspiration is an easily measured clinical index of the severity of asthma. Inspiration normally produces a slight drop in arterial pressure of approximately 5 mm Hg. Clinically significant arterial paradox is judged to be present when brachial artery systolic pressure shows a difference of at least 10 mm Hg between expiration and inspiration in each respiratory cycle. Rebuck and Read\(^*\) found that a paradox greater than 10 mm Hg always indicated an FEV\(_1\) of 1.25 L or less, usually less than 0.9 L. Pulsus paradoxus may be present over a range of up to 50 mm Hg during severe episodes, and a reduction in this value parallels improvement in lung volumes, blood gas tensions and FEV\(_1\). This physical sign has been shown to reflect hyperinflation (expiratory resistance) combined with wide fluctuations in intrapulmonary pressure (inspiratory resistance).\(^7\)\(^8\) Pulsus paradoxus should be regarded as an indication of considerable disease severity.

**Electrocardiogram**

The electrocardiogram commonly becomes abnormal in a severe episode of asthma, reverting to normal with improvement of the asthma.\(^*\) P pulmonale may appear within minutes or hours as may supraventricular tachycardias and the electrocardiographic changes of right ventricular hypertrophy, right bundle branch block and right axis deviation. All of these features should be considered as added evidence of severe asthma.

**Chest Radiograph**

A chest x-ray film should be obtained in all patients whose attack is severe enough that they reach a hospital emergency service. The major danger signs are the presence of mediastinal emphysema or pneumothorax, both of which contraindicate positive pressure breathing without additional safeguards. Other radiologic features that may assist assessment include the degree of hyperinflation of the chest, as well as the presence of pneumonia or atelectasis.

**Ventilatory Function**

Vital capacity (VC), FEV\(_1\), and peak flow rate, obtained with portable spirometric devices, are now used routinely in the office and emergency room assessments of patients with asthma. If the patient is too sick to perform the test, he is too sick to remain out of hospital. If he is able to perform a ventilatory maneuver, it will reflect the degree of airway obstruction. If an adult has an FEV\(_1\) of less than 1 L, the asthma should be considered severe. In addition to providing an estimation of the severity of the airway obstruction, these ventilatory maneuvers also provide information regarding response to therapy and thus provide an objective measurement to follow the course of the disease.

**Arterial Blood Gases**

The arterial carbon dioxide tension is usually low, even in severe episodes of asthma. The heightened ventilatory drive is mediated by vagal irritant receptors in the lung and airways. The finding of an acute respiratory acidosis or a rising Pco\(_2\) in the setting of severe airway obstruction should be regarded as danger signals. Although the arterial oxygen tension is commonly reduced even in moderately severe asthma, the finding of arterial oxygen desaturation by its implication of severe hypoxemia or the development of hypercapnia is an additional danger signal.

These suggested guidelines for assessing the severity of asthma should always be considered in combination, as no single variable has thus far proved to be sufficiently specific or sensitive in all situations.

**References**

5. Woolcock AJ. Read J. Lung volumes in exacerbations of asthma. Am J Med 1986; 41:259