Asthma or bronchial asthma (BA) is one of the most common chronic diseases in children. In young children, asthma is largely caused by a number of respiratory viruses, such as RSV, flu-virus, and others, while in older children, allergy is one of the major risk factors for persistent asthma. During the last 3 decades an important increase in the prevalence of asthma has been noted, and nowadays 15% to 20% of all children worldwide suffer from asthma. Asthma in children is a non-curable disease (or syndrome) with a variable, even unpredictable evolution: some children will spontaneously grow out of it, while others will suffer from persistent asthma for the rest of their lives. Usually, persistence of BA is associated with an impaired lung function and/or with severe allergy. The good news, however, is that symptoms of asthma are controllable in most children, because of the availability of effective and safe anti-asthmatic medications. However, once the treatment is stopped, re-occurrence of BA is the rule, as most treatments have no carry-over effect (except for some types of immunotherapy).

Allergy testing (i.e. skin prick testing) is very useful in children with asthma, as it will identify allergens that are involved in asthma. In Singapore, the most common allergy in asthma is house dust mite allergy. Lung function testing is very useful to assess lung growth, the severity of asthma, and effectiveness of medication. Treating asthma is more than just prescribing medication. It is offering the child and the family a whole package of treatment measures, including appropriate education on asthma, now referred to as a holistic approach. Although viral infections are recognised as important precipitants of acute wheezing, the most common answers to "what makes your child's asthma worse?" are cold fruits, cold drinks, ice cream, and chocolate from the fridge. It is difficult to understand the basis for this reported effect (culture? tradition?), but it is consistently reported by all Asian races. Moreover, beliefs about what foods should or should not be taken by asthmatic children are often held with great conviction by parents and are considered just as important for recovery as the doctor's prescription. Although some families' concern with food can become an obsession, it would be counterproductive to dismiss such ideas on the grounds that medical evidence is lacking or because they are difficult to explain. Therefore, extensive (and repeated) education of parents on mechanisms and causes of asthma is crucial. This will make them understand their child's disease, which will result in a better compliance to treatment.

Goals of asthma treatment have been well described in guidelines on asthma management. They include: control of all asthma symptoms, prevent new asthma attacks and allow the child to lead a healthy normal life. Recent guidelines on the management of asthma now focus more extensively on achieving control of asthma, using individualised management plans in the context of a team effort that includes the patient, relevant family members or care takers, doctor, nurse/clinic assistant and pharmacist. Control of BA is defined as the control of several outcomes. These are:

1. No (twice or less/week) daytime symptoms
2. No limitation of daily activities, including exercise
3. No nocturnal symptoms or awakening because of BA
4. No (twice or less/week) need for reliever treatment
5. No exacerbations
6. Normal or near-normal lung function results

Extensive education on asthma by trained asthma nurses is pivotal in a holistic treatment approach to asthma.

Management of the asthmatic child
The table shows the different aspects of the treatment of childhood asthma. However, it is important to mention that all treatments should be individually tailored and adapted
in time, depending on type, severity and prognosis of the child’s asthma.

**TABLE: The different aspects of the treatment of bronchial asthma**

1. Education (child + family) and self assessment and management
2. Avoidance of all triggers (allergens, irritants)
3. Medication (preventers - relievers)
4. Immunotherapy (specific cases)
5. Other
   - treatment of upper airways abnormalities (rhinitis, sinusitis, etc.)
   - treatment of gastro-esophageal reflux (especially in infants)

Education of parents and child should cover the following pillars in asthma management:

1. **Education on asthma medications**
   There are two groups of asthma medications:

   **Relievers:** to treat symptoms. Usually these medications open the airways, and are also called bronchodilators. They are only used when the child has symptoms, and they have no effect upon long-term outcome of BA. Relievers include short-acting beta-agonists (salbutamol, terbutaline) and anti-cholinergic drugs (ipratropium bromide). A high dose of a systemic corticosteroid (prednisolone, hydrocortisone) can also be considered as a reliever, mainly in case of a severe asthma attack.

   **Preventers:** to prevent new symptoms by reducing the degree of inflammation (e.g. anti-inflammatory agents). These medications will control asthma, allowing the child to have a higher change to grow out of BA. These medications should be taken on a daily basis, and long-term administration is necessary to control the underlying inflammation (some children need to take their preventers for many years). The most common preventer is an inhaled corticosteroid, which is now the treatment of 1st choice for most asthmatic children. Inhaled corticosteroids in a normal dose of 1st choice for most asthmatic children. Inhaled corticosteroids in a normal dose are very effective and safe: virtually no side-effects have been described, and these medications have now been used in millions of asthmatic children, during the last 40 years. Other forms of preventers, such as leukotriene-receptor antagonists (LTRA) can be taken orally, but are usually less effective than inhaled corticosteroids. Long-acting beta-agonists (LABA) can also be used, but only in combination with an inhaled corticosteroid, as an add-on treatment, which can be useful in a minority of older asthmatic children with severe underlying asthma. LABA should not be used in young children (< 5 years), because of the lack of sufficient safety data.

2. **How to approach severe asthma attacks?**
   Usually, acute symptoms of asthma are treated with relievers, especially with short-acting beta-agonists, such as salbutamol (Ventolin). However, sometimes symptoms can be severe, needing more treatment than beta-agonists, and some children need to be admitted to a hospital. Severe attacks usually occur in children who were not diagnosed as suffering from asthma (first attack), in young children with certain viral infections of the lower airways (RSV infections) or in asthmatic children who are not compliant to their maintenance treatment. Symptoms of acute asthma include shortness of breath, cough, wheezing or chest tightness, or a combination of these symptoms. The speed of progression of acute symptoms is variable and can be anything from a few minutes to a few hours to days. Often, perception of severity of acute symptoms by patients, relatives, or even by health care workers is poor and this may result in under-estimation of the severity of an acute attack. Therefore, assessment of the severity of the acute symptoms is important, and parents should be instructed on how to recognise severe symptoms. The child and family must be familiar with the acute action plan and act on the earliest sign of deterioration before the attack requires emergency care or hospitalisation. Treatment in the hospital includes administration of oxygen, high doses of corticosteroids, and intra-venous administration of beta-agonists. In severe attacks, leading to respiratory insufficiency, intubation and mechanical ventilation might be necessary.

3. **Instructions on how to administer inhaler medications**
   In most children, anti-asthmatic medications are administered directly into the lower airways, using different inhaler devices. Success of treatment is very much dependent on the correct choice of inhaler device and the prescription of an appropriate holding chamber device (also called “spacer”) when necessary, mainly according to the age of the asthmatic child. It is also very important to educate the child and the caregivers on the use of the inhaler device and ask them to demonstrate the procedure to affirm that learning has occurred, and to optimise intra-bronchial administration of the medications.

Correct instructions on how to use the different intra-bronchial devices is crucial in asthma education and management.

4. **Monitoring of asthma management**
   Monitoring of BA treatment is very important for a number of reasons, such as, assessment of asthma evolution and asthma severity (childhood BA can be very dynamic: spontaneous improvement or deterioration), quality of life (sleep, sports), lung growth (through lung function testing), general development of the child (growth) and to adapt the treatment, to check regularly inhaling technique and compliance to treatment. Treatment of BA should be kept as simple as possible, preferably once or twice a day dosing. For older children, new inhaler devices, e.g. turbuhalers and other breath-activated devices may enhance drug delivery and encourage compliance. Furthermore, regular assessment of lung function, especially of lung growth, is useful in adapting the treatment.

In conclusion, treating asthma is more than just prescribing medication. It is mainly educating child and family, monitoring treatment and adapting treatment. Treatment constitutes medication, but other measures are as important. Therefore, it is only a holistic and dynamic approach towards asthmatic children that can guarantee optimal treatment, and improvement of the long-term outcome of the child’s asthma.

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