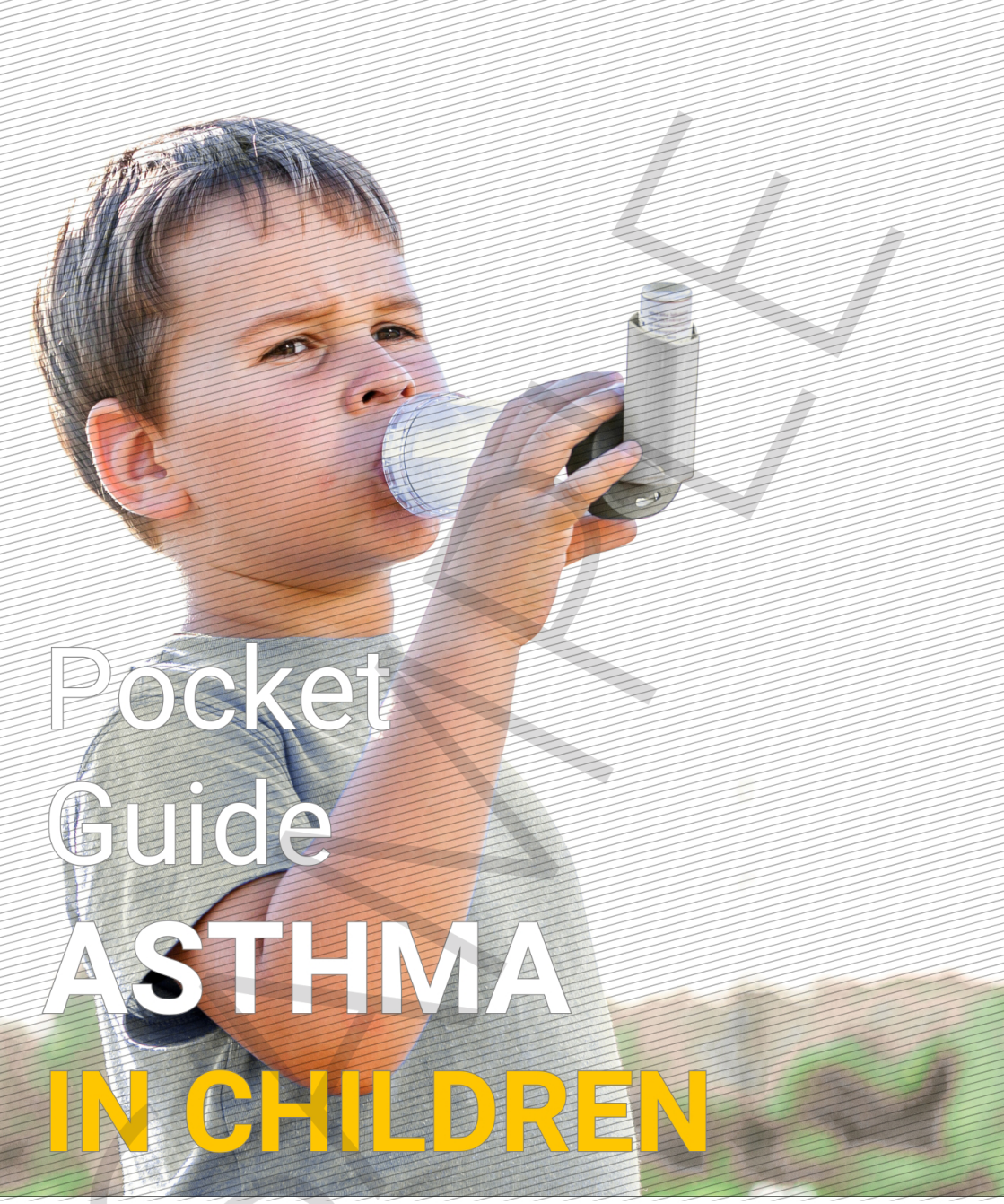

Pocket Guide ASTHMA IN CHILDREN

DEVELOPED BY EUFOREA EXPERT TEAMS
BASED ON INTERNATIONAL GUIDELINES

EUFOREA

Aim of the EUFOREA Paediatric Asthma Pocket Guide

This paediatric (children ≤ 11 years) asthma pocket guide is for non-respiratory clinicians.

Key goals and objectives:

- To note the most important characteristics of asthma in children
- To aid diagnosis of:
  - paediatric asthma and its most common comorbidities
  - other diseases resembling paediatric asthma
- To provide guidance on:
  - major triggers and precipitants
  - most common differential diagnoses
  - key diagnostic tests
  - most common comorbidities and other treatable traits
  - point-of-care biomarkers for phenotyping
  - specific aspects on asthma management in children
  - treatment modalities:
    - non-pharmacological
    - pharmacological (including side effects)
  - monitoring

What is Paediatric Asthma ?

Definition and characteristics

Asthma is a common **chronic inflammatory** condition of the lower airways which may present across all ages. Early-onset asthma (≤ 11 years) is usually allergic and often also T2 high having a certain profile of cytokines like IL4 and IL13 and potentially eosinophilia. Other phenotypes exist (viral-induced, exercise-induced).

Airway hyperresponsiveness to an array of (non-)specific stimuli is a ***hallmark*** of asthma, causing wheezing, coughing, shortness of breath, chest tightness. ***Asthma attacks (exacerbations)*** may occur in uncontrolled asthma; severe ones necessitate systemic corticosteroids and hospitalisation.

Frequent exacerbations lead to airway wall thickening ***('airway remodelling')*** and mucus hypersecretion that may result in **impaired lung function growth** and **air trapping**.

Given its **heterogeneity, variable time course, comorbid conditions (especially allergic rhinitis and atopic dermatitis) and varying presentations**, asthma is both under- or misdiagnosed and comorbidities are often overlooked, thus impacting individual patients' and their families' quality of life as well as imposing a major socio-economic burden.

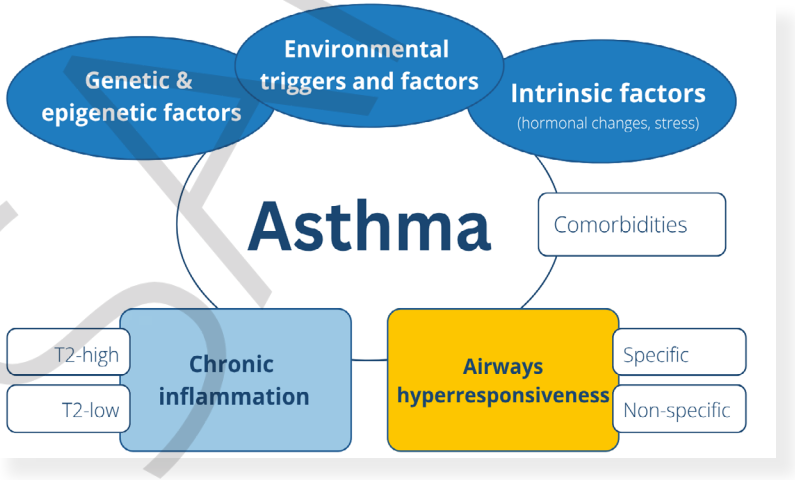

Figure 1. Asthma risk factors, triggers, characteristics and relationships.

PREVALENCE AND INCIDENCE

Asthma is **very common**, with approximately **120 million children** affected worldwide.

Prevalence and incidence of childhood asthma have increased in the past decades with considerable **regional variation**. In some regions, **decreased prevalence** is even seen in recent years. Childhood asthma is **more common in boys**, its prevalence at school age varies between 6 and 18% in different European countries.

There has been a significant reduction in asthma mortality rates due to improvement in early diagnosis and effective treatment. The **remission** rate of childhood asthma is not clear, probably around 30% until early adulthood.

TRIGGERS AND RISK FACTORS IN ASTHMA DEVELOPMENT

- **Genetic susceptibility** with multiple genes involved.
- **History of parental asthma** (especially maternal) increases asthma risk in the child.
- **Viral infections** trigger respiratory symptoms and induce airway hyperresponsiveness.
- **Type 2 (eosinophilic) inflammation**, clinically presenting as allergy, is a major risk factor for asthma.
- **Interaction with the environment** may have both protective (living on a farm) and harmful (allergens, tobacco smoke and fumes, traffic exposure, etc.) effects.
- **Disbalance in early gut and airway microbiome** may be relevant.
- **Low birth weight** and **prematurity** is a known risk factor for asthma-like symptoms.
- **Obesity** is a risk factor in asthma development and contributes to poor asthma control.

CLINICAL ASTHMA PHENOTYPES IN CHILDREN AND THEIR DEVELOPMENT ACROSS AGES

- **Asthma phenotypes** are defined from clinical parameters.
- **Allergic asthma** is associated with IgE sensitization, mainly to airborne allergens (pollen, house dust mites, pet allergens, moulds). It usually starts in the mid-preschool age and tends to persist. Eosinophilic inflammation can usually be observed, reflected by increased blood eosinophil count and fractional exhaled nitric oxide (FeNO).
- **Viral-induced asthma** usually starts early (in the first 2 years of life) and presents both with acute upper and lower respiratory tract infections and subsequent airway hyperresponsiveness with often long-lasting respiratory symptoms. If not associated with allergy, it may subside over time (by pre-school or early school age).
- **Exercise-induced bronchial obstruction** is frequent as children are physically active and reflects poor asthma control. It can occur with and without allergy.

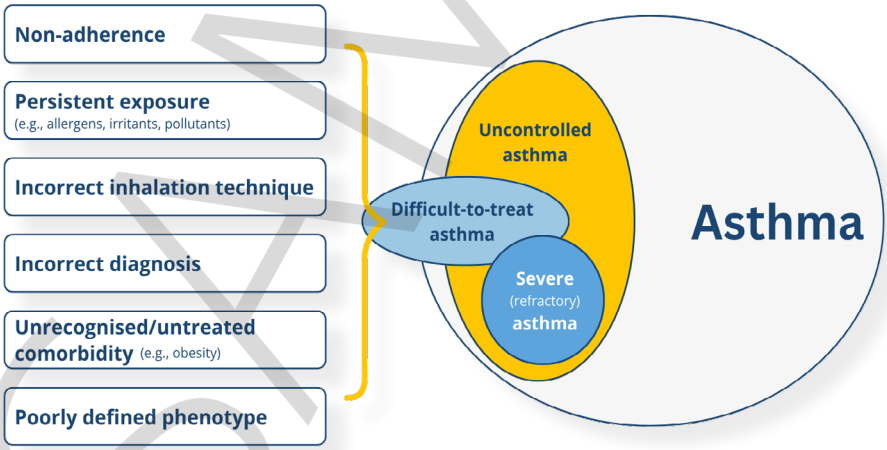

Figure 2. Modifiable factors causing respiratory symptoms and affecting asthma control.

SEVERE VS. DIFFICULT-TO-TREAT ASTHMA IN CHILDREN

- Asthma can be **well-controlled in most children**.

- **Asthma with persisting symptoms** despite adequate treatment and not improving even after intensification of the treatment is defined as *difficult-to-treat* asthma. In most cases, addressing the **possible modifiable factors (treatable traits)** can improve control. These factors include mainly poor adherence to treatment, inadequate inhalation technique, uncontrolled and persisting environmental triggers (allergens, tobacco smoke, fumes, other fine particles) and unrecognised/untreated comorbidities.

- Children with persisting symptoms (poor disease control, exacerbations) and/or compromised lung function with adequate control of modifiable factors have truly ***severe (refractory) asthma***. This phenotype is rare and characterised by uncontrolled inflammation (allergic or non-allergic) and may require high doses of conventional therapy and additional treatment, such as biologicals.

ASTHMA COMORBIDITIES IN CHILDREN

- Associated conditions may affect (aggravate) asthma and its response to treatment. These **comorbidities** represent treatable traits and should be proactively examined, identified and co-treated.

- **Atopic dermatitis** (atopic eczema) can precede asthma in a subgroup of asthmatic children (20%) and the barrier dysfunction may enhance multiple sensitizations to foods and also airborne allergens.

- **Allergic rhinitis** may impair asthma control and requires an active therapeutic approach.

- **Food allergy** may cause anaphylaxis, including asthma attacks.

- **Obesity** is associated with asthma development and poor control.

CORNERSTONES OF ASTHMA DIAGNOSIS IN CHILDHOOD

Clinical symptoms:

- Wheezing (especially outside viral infections)
- Coughing (e.g., during and beyond respiratory infections. after physical effort, in the night)
- Difficult or heavy breathing
- Chest tightness or pain
- Reduced activity and/or chronic fatigue
- Is there response to SABA?
  - When having symptoms
  - Taken before exercise

WHAT TO ASK ABOUT?

- Prematurity, small for gestational age
- Atopic dermatitis
- Known allergies (allergic rhinitis/food)
- Recurrent respiratory tract infections
- Parent or sibling with asthma or other atopic diseases
- Exposure to allergens (e.g., pets, house dust mites, moulds)
- Exposure to environmental pollutants (e.g., parental smoking, fumes, traffic, etc)
- Exercise-induced symptoms
- Perennial or seasonal symptoms
- Prescription of antibiotics for “chest infections” with wheezing

Treatment response as a predictor for asthma diagnosis

Recurrent wheezing in children >4 years of age probably indicates asthma, especially if it responds to inhaled ICS treatment (2–3-month).

Wheeze versus asthma

- Recurrent wheezing with viral respiratory tract infections (common colds) is common in children <4 years of age but only progresses to asthma in one third of those affected. **Respiratory syncytial virus** (RSV) is the primary cause of bronchiolitis and wheezing in children <1 year of age, while **rhinoviruses** (RV) are the dominant cause thereafter.
- Asthma is more likely if wheezing or coughing happens during exercise, laughing, eating or drinking cold food/liquids or crying, even in the absence of a respiratory tract infection.
- Atopic disease or asthma in first-degree relatives increases the likelihood of developing asthma.

Physical examination in children

◊ This may be normal when the child is asymptomatic
◊ Length, weight, BMI
◊ Oxygen saturation (during exacerbations)
◊ Targeted clinical examination should focus on:
  ◊ **Face:** (allergic) shiners around the eyes
  ◊ **Upper airways:** nasal congestion, post-nasal drip, presence of nasal polyps (rare in children <12 years of age), size of tonsils, tonsillitis
  ◊ **Thorax:** shape/movements, breathing rate, dry cough (e.g., after viral respiratory infections, exercise), prolonged wet cough
  ◊ **Heart:** sounds/murmurs, heart rate
  ◊ **Lower airways:** auscultation also upon forced expiration, distress or increased work of breathing
  ◊ **Skin:** atopic dermatitis,

Lung function testing in children

❒ Variable lung function is a hallmark of asthma, however most asthmatic children (with milder disease) have a normal lung function outside exacerbations.

❒ **In children <3 years of age**, diagnosis typically relies on a combination of (parents') history, physical examination, and response to treatment.

❒ **For children aged 3-6 years**, feasible lung function tests include impulse oscillometry (IOS) and spirometry (with animation, usually in children older than 5 years) and reversibility testing.

❒ **By the age 6-7 years**, spirometry or whole-body plethysmography, ideally combined with reversibility testing (using a bronchodilator – increase from baseline in FEV1 of ≥12% predicted or in PEF of ≥15%). Impulse oscillometry could also be used.

❒ Additionally, a challenge test such as standardised exercise challenge test, eucapnic hyperventilation or methacholine challenge may be performed.

BIOMARKERS FOR DIAGNOSING, PHENOTYPING/ENDOTYPING OF CHILDHOOD ASTHMA AND ITS MANAGEMENT:

- **Inflammometry (fractional exhaled nitric oxide – FeNO; blood eosinophils; allergy testing)** allows subtyping (pheno-/endotyping) individual patients into **Type 2** (T2-high) and **non-Type 2** (T2-low) asthma, predicting responsiveness to standard care (ICS) and/or T2-targeted treatment options (specialist care). Can be performed from age 5 years onwards.

- **Normal blood eosinophil counts** in children vary between 30 and 350 cells/µL. Hypereosinophilia is defined as > 500 cells/µ measured at least twice.

- **FeNO measurement** can also serve as a tool to confirm eosinophilic inflammation in the airways and to assess adherence to ICS and asthma control. **Interpretation of FeNO levels (best in children before start of ICS):**
  - < 20 ppb in children = T2 inflammation unlikely;
  - 20 – 35 ppb = T2 inflammation is probable;
  - > 35 ppb = indicates T2 airway inflammation;
  - > 50 ppb = T2 inflammation and good response to corticosteroids is present.
  - Raised FeNO can also be seen in atopic non-asthmatic children and therefore its value should be evaluated in the clinical context.

- Most childhood asthma is T2-high, presenting with allergy, blood eosinophilia, and/or elevated FeNO levels.

IMAGING

Imaging is not necessary in the standard diagnosis of asthma in children but may help in its differential diagnosis.

ALLERGY TESTING

- The identification of allergens which exacerbate symptoms is crucial for subsequent asthma management, which includes ***allergen avoidance*** and early ***administration of allergen immunotherapy (AIT)***.
- IgE-mediated sensitization can be assessed in vivo via standardized **skin prick tests (SPTs)** or in vitro through the measurement of **specific IgE levels in serum**. Both types of tests are without age limitations.
- SPTs are immediate, simple, reproducible with high sensitivity. These tests consist of intracutaneous application of allergens, leading to the development of a wheal of ≥3 mm (larger than negative control) in sensitized individuals.
- Systemic antihistamines and topical corticosteroids (at the site of skin tests application) need to be withdrawn at least 4 days before SPT.
- Patients with spontaneous hives (urticaria) may yield false positive results.
- The measurement of serum specific IgE is an equal alternative and provides option to test for multiple allergens (even those unavailable for skin prick testing), and can be used also in patients under antihistamine therapy.
- False positive and false negative results can occur, so tests should always be assessed in combination with patient's history of symptoms upon exposure.
- If necessary, allergy assessment can be supplemented by **component-resolved diagnostics** (CRD), which involve quantification of specific IgE against individual allergen molecules. CRD helps in discriminating between significant sensitizations and cross-sensitization, allowing a more precise selection of AIT treatment.
- The measurement of serum total IgE is not recommended for allergy diagnosis but may be needed for the indication of certain biologicals like Anti-IgE.

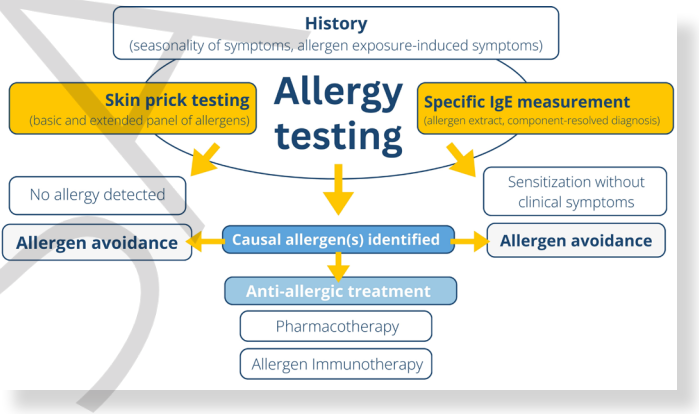

Figure 3. Diagnostics and treatment of airborne allergies

DIFFERENTIAL DIAGNOSES

INTRATHORACIC	Respiratory infections (acute, chronic, recurrent); bronchiectasis; cystic fibrosis; primary ciliary dyskinesia; immunodeficiency, congenital anomalies of lower airways and lungs; congenital anomalies of cardiovascular system (vascular rings); foreign body aspiration; allergic bronchopulmonary mycosis (e.g., aspergillosis; ABPA); eosinophilic granulomatosis with polyangiitis (EGPA); postinfectious bronchiolitis obliterans (PIBO); tumours (extremely rare in children).
EXTRATHORACIC	Upper airway inflammation (AR/CRS) and /or infections (e.g., laryngitis); focal infections, subglottic stenosis (e.g. haemangioma, stenosis after intubation), OSAS, gastroesophagal reflux (rare in children)
DYSFUNCTIONAL BREATHING	Upper airways obstruction (vocal cord dysfunction, exercise-induced laryngeal obstruction: usually no nocturnal symptoms); hyperventilation; obesity; sleep-disordered breathing.

Treatable traits

Definition:
Treatable traits (TTs) are clinically relevant characteristics that are either phenotypic or endotypic.

TTs facilitate a personalised treatment plan that emphasizes patient (and/or parents) involvement and partnered decision-making. Certain TTs may necessitate specialist referral.

PULMONARY DOMAIN		
Pulmonary domain	**Marker/Parameter**	**Treatment/Action**
Reversible airflow limitation/Wheezing/ Airway hyperresponsiveness	Response to SABA treatment	Salbutamol, Ipratropium, Tiotropium **together** with ICS
Recurrent respiratory infections leading to AE/ Recurrent rhinosinusitis	Number of infections leading to AE	Assess immune parameters (IgG, IgA, IgM) Exclude muco-obstructive disorders (CF, PCD) Short course of azithromycin Vaccination (influenza)
AIRWAY INFLAMMATION		
	Marker/Parameter	**Treatment/Action**
Eosinophilic inflammation	Blood eosinophils Total/specific IgE FeNO	ICS Biologics (specialist referral) - see guidelines
EXTRAPULMONARY DOMAIN		
	Marker/Parameter	**Treatment/Action**
Allergic Rhinitis *See EUFOREA Pocket Guide here or scan QR code*	History and nasal examination Allergy tests (skin/serum) Exposure-symptom relationship	Allergen avoidance Non-sedating antihistamines INCS, INAH or a combination Allergen immunotherapy
Chronic Rhinosinusitis *See EPOS guidelines here or scan QR code*	History and nasal examination Imaging (sinus CT) rarely helpful as abnormal in 45% of children	Sinus saline lavage, INCS, LTRA, ENT referral if persistent
Food Allergy	History Allergy tests (skin/serum) Exposure-symptom relationship	Food allergen avoidance AIT to specific food e.g. peanut Epinephrine (+ autoinjector) SABA
Obesity	BMI, Cole index	Dietitian, physical activity
LIFESTYLE/TECHNICAL ISSUES		
	Marker/Parameter	**Treatment/Action**
Inadequate inhaler/dose/ inhalation technique	Overuse of nebulizers	Use of spacers Replacement of nebulizer with MDIs Check inhalation technique
Environmental tobacco smoke exposure/Exposure to airborne noxious molecules, moist houses with poor ventilation (moulds)	Cotinine test, Environmental reports, Patient's history	Encourage (parental) smoking cessation/avoid wood burning stoves/ gas cookers Indoor air purifiers Ensure good ventilation
Exposure to allergens to which child is sensitized	Allergy tests, possibly nasal provocation	Allergen avoidance (pet removal) Laminar airflow

Asthma Management in Children

Children with asthma should be assessed by a specialist at least once to confirm the diagnosis and ideally once or twice a year while on treatment.

Key Goals of Asthma Management

- Adequate control of asthma symptoms (no rescue medication, no exacerbation, remission under therapy), comorbidities and TTs
- Identification and removal of trigger factors
- Consideration of AIT (pollens, house dust mites)
- Normal lung function and development
- Improved physical and psychological functioning; decreased number of school absences and improvement in other (sport) activities and in quality of life
- Patient and parents' engagement through education and self-management support (reassurance)

Specific aspects of asthma management in children

- √ Therapeutic measures should be extensively explained and discussed with parents in order to increase **awareness, acceptance and adherence**.
- √ **The asthma inhaler device** should be chosen individually, inhalation technique demonstrated and (re)checked at follow up visits. Limitations should be frankly discussed. Videos and mobile applications can support optimization of the inhalation technique.
- √ **Choice of anti-asthmatic treatment** should follow **guidelines** (national, ERS, GINA).
- √ **Dose of ICS should be monitored** and re-evaluated regularly as ICS may have systemic effects. Selection of the molecules with the lowest systemic availability is preferred.
- √ **Growth velocity** should be monitored at least twice a year.

Non-pharmacological Interventions

Education

- All children (and their parents) should receive education on how to self-manage their asthma including a written personalized asthma action plan.

Inhalation technique and its specificities in children

- An MDI using a spacer is the preferred method of delivery of β2 agonists and/or ICS. A facemask is required until the child can breathe through the spacer mouthpiece (mostly first 3 years).
- While a DPI requires an initial forceful inhalation to disperse the powder, a slow and deep inhalation with an MDI facilitates optimal lung deposition.

Lifestyle measures

- Allergen avoidance
- Active and passive smoking/vaping should be avoided.
- Weight loss in overweight/obese individuals should be encouraged.
- Encourage regular physical activity and provide advice on how to manage exercise-induced bronchospasm.
- Stay indoors when the temperature dips very low (< -10°C) or there is a thunderstorm.
- If psychological factors worsen asthma encourage patients to identify helpful strategies.

Pharmacological Treatment

Controller therapy in childhood asthma

GINA terminology has changed from controller to ***ICS-containing or maintenance therapy***. Relievers **(beta$_2$-agonists: SABA/LABA)** should only be taken in combination with ICS, i.e., as ***anti-inflammatory reliever*** (AIR) ***therapy***. Combining ICS and a reliever both as ***maintenance and (as needed) reliever treatment*** is referred to as MART.

Maintenance treatment recommendations

- Treatment strategy is different in children ≤ 5 years and in children 6 – 11 years.
- **An appropriate inhalation device and adequate inhalation technique is essential**
- **The majority of children with frequent asthma symptoms respond well to low-to-medium doses of ICS.** In case of insufficient control and persisting symptoms, additional controller therapy should be added **(LABA, LAMA, LTRA)**.
- GINA guidelines suggest anti-inflammatory reliever therapy (AIR) from age 6 years. However, in Europe, **ICS-formoterol** therapy as a fixed combination is not licensed for anti-inflammatory reliever use.
- Monotherapy of LABA as controller therapy is contra-indicated.
- LAMA is not recommended as controller therapy but can be used in a minority of children unresponsive to ICS/SABA/LABA.
- **Leukotriene receptor antagonists** (LTRA) can be used as anti-inflammatory monotherapy in mild asthma, or as add on from step 3 of the GINA guidelines. Compared to ICS, both the effect and evidence is relatively weak. Oral administration is an advantage when inhaled medication is difficult.
- In children <5 years with frequent wheezing episodes requiring SABA, a diagnostic asthma therapy can be tried for 2 to 3 months (daily low-dose ICS or LTRA), followed by specialist referral.

Side effects of asthma pharmacotherapy

Corticosteroids:

- Cumulative high maintenance doses of (topical) CS and especially intermittent 'rescue' courses of **systemic CS** may induce growth retardation, weight gain, behavioural changes, sleep disturbance, and adrenal insufficiency
- Local side effects of inhaled CS: hoarseness, oropharyngeal candidiasis, pharyngitis
- Sensitivity to side-effects of CS varies greatly individually
- Modern molecules with low systemic bioavailability are preferred
- **Systemic CS should be avoided wherever possible**

Bronchodilators

- Tremor, palpitations, anxiety, and behavioural changes especially at high doses (during exacerbations), just as in adults
- Bronchodilators can mask underlying airway inflammation and should not be used without concomitant ICS
- Tachyphylaxis to bronchodilators, meaning higher doses required for the same effect, is relatively common and can be mitigated by ICS.

Leukotriene receptor antagonists

- Changes in behaviour or mood, e.g., agitation, anxiety, depression, hallucinations, suicidal ideation and nightmares.
- Caregivers should be aware of this, as these side effects usually occur quickly after the start of medication.

Biologics

- In case of insufficient asthma control at combined treatment (medium dose of ICS-LABA or low-dose ICS-formoterol in MART regimen ± tiotropium or LTRA), high dose ICS/LABA or biologics should be considered.
- For biologics, precise phenotypic assessment using available biomarkers is crucial.
- Children with severe asthma should be referred to a specialist with expertise in the management of severe asthma.

Other (add-on) treatment options

Allergen Immunotherapy (AIT)

- AIT is the only treatment which can alter the course of disease, reducing its progression and further sensitizations. It should be considered in children (≥5 years) with confirmed allergen sensitization driving disease.

Click here to access the Paediatric Allergic Rhinitis Pocket Guide or scan the QR code

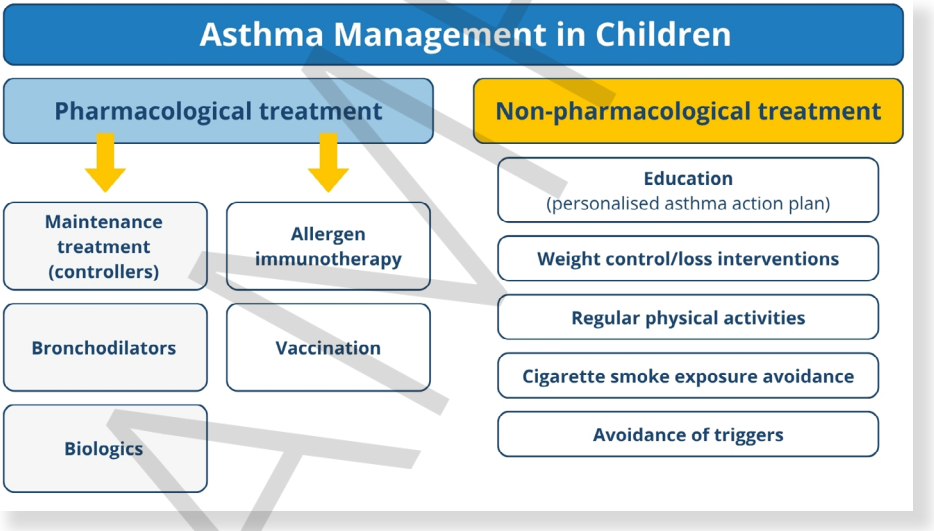

Figure 4. Pharmacological and non-pharmacological treatment of Childhood Asthma

IMPORTANT RECOMMENDATIONS

Swimming:
All children need to learn to swim. Swimming is a good sport for asthmatics as it requires a constant cardiovascular strain. Sea water is preferable as some children are intolerant of chemicals, such as chlorine. Swimming pool water can also be disinfected with ozone or lower concentrations of chloramine which are preferable for children with sensitive airways.

Vaccination:
Asthmatic children have a slightly impaired IFN-gamma and -alpha response to viruses, especially rhinovirus, influenza, and RSV. Therefore, children and adolescents with asthma and T2-driven inflammation should be vaccinated according to national guidelines.

✔ Vaccination is safe in children with asthma and does not cause asthma exacerbations.

✔ Vaccination should not be done during an acute asthma exacerbation, and the procedure should be postponed at least 2 weeks after one.

✔ Children with asthma (especially severe asthmatics) have increased risk for selected infections and their complicated course: influenza, RSV, pneumococcal infections, whooping cough.

✔ Asthmatic children should be vaccinated against influenza annually. In children <9 years vaccinated for the first time; two subsequent doses should be administered 4 weeks apart. Allergy against egg protein is not a contraindication.

✔ Polyvalent conjugated pneumococcal vaccines is recommended already for infants and normally part of the national immunization programmes and should be preferred to polysaccharide pneumococcal vaccine. The schema and number of the doses is dependent on the age of the vaccinated child.

Asthma monitoring in children

General aspects

- **Regular monitoring** is crucial for:
  - (re)confirming the diagnosis and identification of any emerging comorbidities
  - assessing the level of control and fine-tuning treatment
  - addressing side effects of medication.
- In most children ***visits every 6 – 12 months*** are adequate and should include lung function testing, inflammometry and control questionnaires.

Questionnaires and their children-adapted versions

- Several patient reported outcome measures (PROMs) have been proposed and validated for both adults and children, and it is advisable to use these validated tools, rather than non-standardised approaches.
- The most widely used questionnaires are the **Asthma Control Test** (ACT) and the **Asthma Control Questionnaire** (ACQ). Both are accurate in assessing well- and partially controlled asthma, but not as accurate when asthma is uncontrolled. **Childhood ACT** (c-ACT) is designed for children 4-11 years. **CARAT** (Child Asthma Risk Assessment Tool) assesses control of both asthma and allergic rhinitis.

eHealth/mHealth for monitoring

- Technology offers new opportunities for improving asthma monitoring.
- A major step is the ability to monitor **asthma in-between visits, even in real time**.
- Recently, several studies have shown that **'smart inhaler' devices**, i.e., devices that can sense medication intake and adherence, may improve clinical outcomes. Such devices are gaining approval for clinical use.

Asthma remission in children

- More recently, the concept of **asthma remission** has been introduced as a **new achievable treatment goal** in asthma management.
- Asthma remission is characterised by a **high level of sustained disease control**: i.e., absence of symptoms and exacerbations, normalisation/ optimisation of lung function, achieved asthma control (assessed by relevant questionnaires) and no use of systemic corticosteroids within the last 12 months.
- Up to now, there is **no universally accepted consensus on the definition of asthma remission in children**.

Multidisciplinary approach to paediatric asthma

- The optimal management of asthma may require the **collaboration of several different specialists**.
- Wherever possible parents should be able to bring their children to an asthma clinic where all their needs are met at a single visit, not trail round different specialties on different days.

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List of abbreviations

AE	Asthma Exacerbations
ACT	Asthma Control Test
ACQ	Asthma Control Questionnaire
AIR	Anti-Inflammatory Reliever
AIT	Allergen Immunotherapy
BDT	Bronchodilation Test
BMI	Body Mass Index
CARAT	Child Asthma Risk Assessment Tool
COMISS	Cow's Milk-related Symptom Score
CRD	Component-Resolved Diagnostic
CS	Corticosteroids
DPI	Dry Powder Inhaler.
EGPA	eosinophilic granulomatosis with polyangiitis
ERS	European Respiratory Society
FeNO	Fractional exhaled Nitric Oxide
FEV1	Forced Expiratory Volume in the first second
FVC	Forced Vital Capacity
GINA	Global Initiative for Asthma
HDM	House Dust Mite
ICS	Inhaled Corticosteroids
INCS	Intranasal Corticosteroids
IOS	impulse oscillometry
LABA	Long-Acting Beta-Agonist
LAMA	Long-Acting Muscarinic Antagonist
LMA	Laryngeal Mask Airway
LTRA	Leukotriene Receptor Antagonist
mAPI	modified Asthma Predictive Index
MART	Maintenance and Reliever Treatment
MDI	Metered Dose Inhaler
OCS	Oral Corticosteroids
PAPG	Paediatric Asthma Pocket Guide
PeARL	Pediatric Asthma in Real Life
PEF	Peak Expiratory Flow
PIBO	postinfectious bronchiolitis obliterans
PPI	Proton Pump Inhibitors

List of abbreviations (continued)

PROM	Patient reported outcome measures
RSV	Respiratory Syncytial Virus
RTI	Respiratory Tract Infection
RV	rhinovirus
SABA	Short-Acting Beta-Agonist
SCIT	Subcutaneous Immunotherapy
SCS	Systemic Corticosteroids
SGA	Small for Gestational Age
SLIT	Sublingual Immunotherapy
SPT	Skin Prick Test
TLA	Temperature controlled Laminar Airflow
TT	Treatable Trait

Vision

EUFOREA is an international non-profit organization forming an alliance of all stakeholders dedicated to reducing the prevalence and burden of chronic respiratory diseases through the implementation of optimal patient care via education, research and advocacy.

Mission

Based on its medical and scientific core competency, EUFOREA offers a platform to introduce innovation and education in healthcare leading to optimal patient care.

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