SEVERE CHRONIC RESPIRATORY FAILURE
DUE TO ASTHMA

July 2006
I - Guide

Introduction

The aim of this guide for doctors is to describe the best form of management and the care pathway for a patient admitted to the ALD [Long-term condition] scheme under ALD 14: severe chronic respiratory failure.

The guide deals only with the management of patients with asthma. There is a separate guide for patients with chronic obstructive pulmonary disease (COPD). No relevant guidelines could be used as a basis for a guide on patients with restrictive respiratory failure.

This guide concerns patients with severe persistent asthma according to the GINA\(^1\) criteria.

- GINA criteria in adults:
  - one of the following clinical signs: daily symptoms, frequent exacerbations, frequent night-time symptoms, physical activity restricted by symptoms;
  - peak expiratory flow (PEF) variability > 30%, and forced expiratory volume in 1 second (FEV\(_1\)) or PEF < 60% of expected values;
  - treatment with beta2-agonists combined with high doses of inhaled corticosteroids (ICS) (>1 000 µg/day beclomethasone equivalent) with additional therapy and oral corticosteroids (OC) during exacerbations, continuously if necessary, bronchodilator nebulisers at home in the most severe forms, and avoidance or control of trigger factors.

- GINA criteria in children:
  - persistence of symptoms and/or abnormal lung function test (LFT) values despite combination therapy with ICS (> 500 µg/day beclomethasone equivalent) and long-acting beta2-agonists (\(\beta\)2LA).

Severe asthma affects an estimated 1–3% of the general population in both children and adults.

- In 2000, the total number of patients with respiratory failure using oxygen therapy at home for COPD including asthma and bronchiectasis was 40 000 (SPLF\(^2\) 2003).
- In 2000, asthma accounted for 5.5% of patients using ventilation equipment.
- In 2002, 36 000 new patients were admitted to the ALD scheme because of chronic respiratory failure.

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1 GINA: Global Initiative for Asthma
2 SPLF: Société de Pneumologie de Langue Française
In 2004, 117,308 patients were covered by the ALD scheme for asthma.

This guide is intended as a practical reference tool for primary care doctors managing asthma. Its content has been discussed and validated by a multidisciplinary working group. It is a practical summary of available clinical practice and/or consensus conference guidelines and of expert opinion (when no relevant data were available to draw guidelines). Expert opinion is needed in fields such as patient follow-up when the pattern of surveillance is based on consensus among professionals rather than on comparative data obtained from clinical trials.

An ALD guide cannot be comprehensive, i.e. cover all comorbidities, treatment details, hospital care protocols, etc. It does not claim to cover all the ways of managing severe chronic respiratory failure caused by asthma, nor does it discharge doctors from their individual responsibility to their patient. It just describes the basic framework of care. It will be updated as new data are validated.

2. Initial assessment of a patient with asthma

2.1 Main aims

- Assess asthma severity and control.
- Look for complications and risk of severe acute asthma.

Control takes account of rapid changes in symptoms and bronchial obstruction during the previous 7–30 days. "Acceptable" control: daytime symptoms < 4 days a week, night time symptoms < 1 night a week, physical activity normal, exacerbations mild and infrequent and managed by the patient, requiring only a temporary increase (few days) in daily use of rapid- and short-acting beta2-agonists, no absence from work or studies, use of short-acting beta2-agonists < 4 doses week, FEV1 or PEF > 85% of best personal value, change in PEF over 24 hours < 15%. Control is graded in three levels: unacceptable = one or more of the criteria are not met; acceptable = all the criteria are met; optimal control = all the control criteria are either absent or normal, or (in a patient with acceptable control) the best compromise has been achieved between degree of control, acceptance of treatment and possible side effects.

Severity is based on the history of the disease over a 6–12 month period. Severity is based on the level of symptoms, degree of abnormality of functional parameters, and on the level and type of treatment required. Severity may be defined as the minimum level of treatment required for lasting disease control.

Risk factors for severe acute asthma: poor socioeconomic status, adolescent or elderly person, history of "near fatal" asthma or admission to intensive care, FEV1 < 40% of theoretical, reversibility under beta2-agonists > 50%, frequent visits to the emergency department or primary care doctor or repeated hospitalisations, high blood eosinophils, patients with poor perception of their degree of bronchial obstruction, smoking more than 20 pack-years, poor compliance or denial of disease, use of 3 or more asthma medicines, corticosteroid therapy discontinued within the last 3 months.
2.2 Professionals involved

Diagnosis and initial assessment are carried out by a primary care doctor jointly with a specialist. Referral to a chest physician or paediatrician is warranted when asthma is severe or hard to control.

► **Primary care doctor**

- Decides whether criteria for admission to the ALD scheme have been met: severity and frequency of symptoms, ongoing medication (see Introduction).
- Checks that inhalers are being used properly.
- Looks for risk factors for severe asthma and for environmental risk factors.
- Carries out a full clinical examination including measurement of peak expiratory flow (PEF), dyspnoea scale, looks for complications (signs of chronic *cor pulmonale*) and signs of severity. If appropriate equipment is available (pulse oximetry and/or electronic FEV$_1$ meter), measures arterial oxygen saturation (SaO$_2$), and/or FEV$_1$.
- Tests ordered: lab tests, lung function tests and imaging:
  - Lung function tests (LFT) should be ordered routinely.
  - Non-routine tests can:
    - assess the degree of chronic respiratory failure (blood gas analysis in adults if FEV$_1$ < 50% or if there is a discrepancy between symptoms and FEV$_1$ value, or if the patient has right ventricular dysfunction; SaO$_2$ in children);
    - provide a reference value for follow-up (complete blood count (haematocrit, eosinophils), chest X-rays).

► **Chest physician**

- The chest physician confirms the diagnosis and degree of severity, and adjusts treatment;
- Certain laboratory and other tests are not performed routinely, but should be ordered according to the history of the disease and the clinical picture: full LFT completed with a spirometric reversibility test and full set of lung volume tests, preferably using both plethysmography and gas dilution.
- In patients with chronic respiratory failure, an exercise test and/or 6-minute walking test should be ordered to assess the level of incapacity.
- Further investigations may be needed to eliminate other diagnoses (tracheal tumour, heart disease, chronic obstructive bronchitis) or to check for complications. These include an electrocardiogram (ECG), cardiac ultrasound, bronchial endoscopy, pH-metry in children.
Other health professionals involved, particularly in paediatrics

- Consultation with an allergy specialist for allergy tests (routine in paediatrics) including:
  - determination of total IgE in patients aged under 3 years;
  - single specific IgE tests, depending on clinical symptoms and skin test results.
- ENT consultation.

3. Management and treatment

3.1 Aims

- Adjust drug therapy according to asthma control, tolerability and compliance with current therapy.
- Treat any risk factors, aggravating and trigger factors.
- Prevent and treat complications.

3.2 Professionals involved

Severe asthma is managed by the primary care doctor or by a chest physician. Chronic respiratory failure at a stage requiring long-term oxygen therapy (LTO) or noninvasive ventilation (NIV) is managed by a chest physician in cooperation with the primary care doctor.

The professionals involved in structured patient education, who may or may not all work in the same healthcare facility, are primary care doctors, specialists, nurses, physiotherapists, psychologists, social workers, and environmental advisers and technicians.

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5 ALD guides refer to drug classes without listing all the drugs indicated in the disease in question. Each drug is to be used only within the framework of its Marketing Authorisation. If for a specific reason this is not the case, and more generally, whenever a drug is prescribed in circumstances other than those given in the Marketing Authorisation, this is the sole responsibility of the prescriber, who must specifically inform the patient of this.
3.3 Management of a patient with severe asthma who is not using long-term oxygen therapy or assisted ventilation

► Structured patient education for the patient and/or their family and carers

Structured patient education includes at least teaching the patient how to manage their own disease; this requires regular follow-up. Structured patient education should be given with particular care to adults and adolescents who have severe or poorly controlled asthma, and those at risk of severe acute asthma. It should be seen as an integral part of care and should include:

- assessing asthma control and severity;
- adjusting drug therapy according to symptoms (including measurement of PEF) according to a written treatment plan which is explained to the patient, and a copy of which is left with them;
- controlling their own environment, including avoiding trigger factors;
- physical exercise depending on exercise tolerance.

They are 4 stages in patient education:

1. adapting education for the patient by deciding what they need to learn;
2. determining with the patient the skills they need to acquire;
3. proposing structured activities for the patient (oral and written information, learning to manage their asthma themselves, practical application, help with psychological and social issues);
4. assessing successes and problems.

At the chronic respiratory failure stage, see "Structured patient education" in the Guide on "Severe chronic respiratory failure in adults due to chronic obstructive pulmonary disease."

Patient education for children should be adjusted to suit the child’s age, maturity and capacity for autonomous action. It should include the parents, but the way it does this will depend on the child's age. The goals should include understanding the disease, identifying trigger factors for exacerbations, learning how to prevent attacks, recognising signs of severe disease, mastering inhalation techniques and breathing in different situations, recognising symptoms and taking appropriate measures for self-management, being able to seek help from professionals depending on the degree of urgency, managing the disease to fit in with the child's activities and projects, developing preventive behaviours, etc.
► **Lifestyle changes**

This includes controlling the environment, including recognising and removing allergens, and physical exercise. In children, the goals to aim for include a normal school life and unrestricted physical, sports and everyday activities. The child may have to give up a sport or hobby which is not compatible with asthma because it takes place in an environment that exposes the child to trigger factors.

► **Drug therapy and treatment strategy in adults and adolescents**

The drug categories available are short-acting and long-acting bronchodilators, inhaled corticosteroids (ICS), leukotriene receptor antagonists, theophylline and its derivatives, and oral corticosteroids (for a short period of time).

Nebuliser aerosols should initially be prescribed by a specialist.

The therapeutic categories, doses and combinations depend on current long-term therapy and the degree of asthma control. Doses should be adjusted and combinations introduced in successive steps. Each of these steps should be between 1 and 3 months. The exact length depends on clinical and functional response:

- if control is unacceptable in a patient taking high-dose ICS and another drug as well\(^6\), add a second additional drug. If symptoms are frequent and FEV\(_1\) is significantly reduced, give oral corticosteroids;
- if control is unacceptable in a patient taking high-dose ICS and two additional drugs, give oral corticosteroids; alternatively a third additional drug may be added;
- if control is acceptable, the minimum effective therapy should be found. Generally, long-term therapy should be reduced in 3-month steps. For patients on long-term oral corticosteroid therapy, the dose should be reduced very gradually, and concomitant high-dose ICS and \(\beta2\LA\) should be given.

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\(^6\) The term "additional drug" includes long-acting beta-2 agonists (\(\beta2\LA\)), leukotriene receptor antagonists and theophylline and its derivatives
Drug therapy in children

Available drug categories are short-acting and long-acting bronchodilators, inhaled corticosteroids (ICS), leukotriene receptor antagonists, theophylline and its derivatives, and oral corticosteroids for a short period of time.

Doses and combinations should be adjusted according to current long-term therapy, degree of asthma control, and the child's age and weight. Persistent severe asthma should be treated with a combination of high dose ICS (≥400–500 µg a day beclomethasone equivalent), long-acting inhaled beta-2 agonists, and if necessary, leukotriene receptor agonists and/or sustained-release theophylline. Oral corticosteroids should never be prescribed for an extended period. When asthma control has been obtained and maintained for at least 3 months, an attempt should be made to gradually reduce long-term therapy to find the minimum treatment required to maintain control.

Concomitant therapy

This is necessary to prevent and reduce aggravating and trigger factors, or to treat comorbidities and complications:

- treatment for an ENT infection or disorder;
- oral antibiotics for bacterial superinfection;
- environmental control (search for and remove trigger factors such as allergens, smoking, domestic and industrial toxins, etc.);
- immunotherapy as prescribed, particularly in children;
- smoking cessation:
  - nicotine replacement or drug therapy as second-line therapy,
  - consultation with a specialist (if attempts to give up have failed);
- vaccination against flu and *Pneumococcus* in compliance with precautions for use;
- treatment of gastro-oesophageal reflux.

In children, in a few very rare cases, a stay in a different climate (short- or long-term) may be tried after discussion with all health professionals involved.

Respiratory physiotherapy

Respiratory physiotherapy consists of a combination of postural drainage (in asthma with profuse expectoration), control of ventilation, retraining of respiratory muscles and structured patient education.
3.4 Management and treatment of a patient receiving long-term oxygen therapy or with respiratory handicap

In irreversible obstruction leading to chronic respiratory failure requiring long-term oxygen therapy and/or pulmonary rehabilitation, see the section of the Guide for Doctors "Severe chronic respiratory failure in adults caused by chronic obstructive pulmonary disease".

4. Follow-up

4.1 Aims

- Check that treatment is effective and well-tolerated and that patient is complying with treatment; adjust medications according to asthma control.
- Check that inhalers are being used properly.
- Look for and treat aggravating factors and concomitant disease (COPD, heart failure).
- Continue structured patient education.

4.2 Professionals involved

- Coordination between the chest physician and/or paediatrician, and the primary care doctor

In the case of severe asthma in adults or children, follow-up should be carried out jointly by the chest physician and/or paediatrician, and the primary care doctor.

The chest physician and/or paediatrician:

- Optimise bronchodilator and inhaled corticosteroid therapy, and prescribe oral corticosteroids;
- Initiate and then adjust oxygen therapy: long-term oxygen therapy or indication for NIV;
- Decide whether rehabilitation is indicated, and if so, coordinate it.
### Other health professionals (see Table 1)

#### Table 1. Professionals who may be called upon

<table>
<thead>
<tr>
<th>Professional</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapist</td>
<td>Encourages bronchial drainage (asthma with profuse expectoration) and control of ventilation</td>
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<tr>
<td></td>
<td>Manages the retraining of respiratory muscles</td>
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<td></td>
<td>Involved in structured patient education</td>
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<tr>
<td>Professionals working in specialist structured patient education centres or services</td>
<td>Therapeutic education</td>
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<tr>
<td>Doctor specialising in physical medicine and rehabilitation</td>
<td>Coordinates treatment plan produced by the multidisciplinary respiratory rehabilitation team</td>
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<tr>
<td>Other specialists (e.g. allergy or ENT specialists)</td>
<td>Intervene depending on clinical history, comorbidities and treatment side-effects</td>
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<tr>
<td>Dietician</td>
<td>Involvement essential in paediatrics</td>
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<td></td>
<td>May be needed in patients with substantial nutritional imbalance.</td>
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<tr>
<td>Nurse</td>
<td>Provides care for patients receiving oxygen therapy or assisted ventilation; checks implementation of hygiene measures; involved in structured patient education.</td>
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<tr>
<td>Specialist in smoking cessation</td>
<td>Provides additional help with giving up smoking when required</td>
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<td>Service provider</td>
<td>For patients on LTO or mechanical ventilation:</td>
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<td></td>
<td>- supplies consumables and equipment needed depending on the type of contract;</td>
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<td></td>
<td>- provides technical services, administrative services and general services.</td>
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<tr>
<td>Shared care networks and patients’ associations</td>
<td>May be partners in the above interventions, particularly for patients on LTO or mechanical ventilation or for structured patient education.</td>
</tr>
<tr>
<td>Social services</td>
<td>May be needed for handicapped patients with respiratory failure</td>
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</tbody>
</table>

LTO: Long-term oxygen therapy
4.3 Follow-up schedule according to current therapy

► At each appointment

The following items should be recorded:
- Follow-up assessment (a follow-up diary is recommended)
- Peak expiratory flow (or LFT) value
- SaO₂
- Whether inhalers are being used properly
- Any side effects of current therapy
- Patient education measures
- If control is unacceptable, any aggravating factors or concomitant disorders.

► Follow-up schedule for a patient on neither long-term oxygen therapy nor assisted ventilation

- Adult or adolescent
  - If control is acceptable or optimal (see definitions in footnote 3): primary care doctor every 3–6 months;
  - If control is unacceptable (see definitions in footnote 3): frequency to be decided according to clinical situation, specialist's opinion;
  - Patient on short-term oral corticosteroid therapy: 1 week, then 1 month after discontinuation of oral corticosteroid therapy, specialist's opinion.
- Child: every 1–3 months.

► Follow-up schedule for a patient on either long-term oxygen therapy or assisted ventilation

- Primary care doctor: every 1–3 months.
- Chest physician: every 1–6 months.
- Doctor specialising in physical medicine and rehabilitation: once a year during follow-up for pulmonary rehabilitation.
- Technical check of ventilation equipment: every 2–4 months.

► Additional visits may be needed

- If an intercurrent event or asthma attack occurs.
- To carry out structured patient education.
- If the patient needs to give up smoking.
- As part of a rehabilitation programme.
- If an appointment has been scheduled after hospitalisation.
### 4.4 Further investigations

<table>
<thead>
<tr>
<th>Test</th>
<th>Indication</th>
<th>Timing/periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lung function tests</strong></td>
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<tr>
<td>LFT (including measurement of FEV₁, slow vital capacity and forced vital capacity) - used to assess functional effects of asthma</td>
<td>- Depending on level of asthma control</td>
<td>Every 3–6 months</td>
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<td></td>
<td>- If treatment has been changed</td>
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<td></td>
<td>- In patient on short-term oral corticosteroid therapy</td>
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<td></td>
<td>- On disease aggravation, during hospital stay, before / after rehabilitation programme</td>
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<tr>
<td>Blood gases in adults to monitor chronic respiratory failure and decide whether there is an indication for LTO</td>
<td>Depending on symptoms</td>
<td>On disease aggravation, during hospital stay, before / after rehabilitation programme</td>
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<tr>
<td>Night-time oximetry</td>
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<td>6-minute walk test or exercise test assessing incapacity and training</td>
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<tr>
<td><strong>Further tests</strong></td>
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<tr>
<td>Blood theophylline</td>
<td>If risk factors for side effects (young children, elderly, patients on drugs likely to increase blood theophylline levels) and depending on clinical progress If patient taking diuretics</td>
<td>At the start of treatment</td>
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<tr>
<td>Blood electrolytes and creatinine Bone density measurement</td>
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<tr>
<td><strong>Tests to monitor complications</strong></td>
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<tr>
<td>Complete blood count to measure haematocrit and blood eosinophils Chest radiographs</td>
<td>After an intercurrent respiratory event If looking for complications or to confirm diagnosis Pulmonary arterial hypertension Heart failure</td>
<td>Once a year</td>
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<tr>
<td>Bronchial endoscopy and chest CT-scan Cardiac ultrasound</td>
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</table>
References


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