Emergency
Paediatric
Asthma
Guideline

Tús Áite do Shábháíteacht
Patient Safety
First

National Clinical Programme for Asthma
April 2013
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1 INTRODUCTION AND BACKGROUND

1.1 Policy Statement

It is the objective of the National Asthma Programme that assessment and management of acute asthma exacerbations should be undertaken according to the best available clinical evidence which is outlined in this document.

Confidential enquiries into asthma deaths or near fatal asthma exacerbations from the UK and also Ireland have identified a number of factors which contribute to an asthma death. Most deaths from asthma occur before admission to hospital, and are usually in patients who have chronic asthma, who are on inadequate inhaled corticosteroid therapy with increased reliance on inhaled β₂-agonists. There is generally poor perception by the patient or physician caring for the patient of the overall severity of the asthma exacerbation. In addition, inadequate management in the acute event including using sedation in some cases are also factors linked to asthma deaths.

Typically most exacerbations have a progressive onset although a few can occur rapidly. Most attacks of asthma severe enough to require hospital admission have developed relatively slowly over a period of six hours or more and even up to 48 hours so there is often time for effective action to reduce the number of hospitalisations for acute asthma. There are many similarities between those patients who are admitted to hospital with a severe asthma exacerbation and patients who die from asthma or who have had a near-fatal asthma episode.

Respiratory distress is common during exacerbations along with decreases in lung function (FEV1 or PEF). In adults measurement of lung function is a more reliable indicator than symptoms of an attack severity, however in children it is rarely possible to accurately measure lung function during an acute attack, therefore the assessment of severity is based predominantly on the history and physical examination. Severe exacerbations are potentially life-threatening and their treatment requires close supervision. Patients or caregivers should be taught to recognise a severe attack and to see their doctor promptly when this occurs or ring 112 / 999 and request an ambulance to proceed to the nearest ED that provides emergency access for patients with acute asthma. Strategies for treating different levels of asthma exacerbations are outlined in this Emergency Asthma Care document to be adapted and implemented at a local level.

In terms of follow up after discharge, patients should be seen promptly by their GP and a respiratory specialist should follow up patients admitted with severe asthma for at least one year after the admission.

1.2 Purpose

The purpose of this guideline is to outline the standard treatment protocols for emergency and acute management of the paediatric asthma patient in an Irish healthcare setting.
1.3 Scope

The scope of the National Asthma Clinical programme is to ensure the management of asthma is based on current international evidence-based care. These guidelines are for the management of acute paediatric asthma exacerbations.

1.4 Glossary of terms and Definitions

- **RCPI**: Royal College of Physicians Ireland
- **ICGP**: Irish College of General Practitioners
- **ED**: Emergency Department
- **AMU**: Acute Medical Unit
- **MAU**: Medical Assessment Unit
- **OOH**: GP Out of Hours Service
- **GP**: General Practitioner
- **PN**: Practice Nurse
- **CNS**: Clinical Nurse Specialist in Respiratory care
- **PEF**: Peak Flow Measurement
- **pMDI**: Metered dose inhaler
- **FEV1**: Forced Expired Volume per second
- **SPO2**: Level of Oxygen Saturation as determined by pulse oximetry
- **PHECC**: Pre-Hospital Emergency Care Council
1.5 Stakeholders Roles and Responsibility

The roles and responsibilities of all stakeholders involved in the lifecycle of the guideline are detailed below. This is not an exhaustive list.

<table>
<thead>
<tr>
<th>Process Responsible</th>
<th>Applying the protocol</th>
<th>Auditing Use of protocol</th>
<th>Developing/Updating protocol</th>
<th>Reviewing the protocols</th>
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<tr>
<td>Out of Hours Staff</td>
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<tr>
<td>Community Pharmacist</td>
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<td>Pre-hospital emergency care practitioners</td>
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<tr>
<td>ED/AMU Physicians</td>
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<td>ED/AMU Nursing Staff</td>
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2 ACUTE ASTHMA IN CHILDREN

2.1 Introduction

Asthma is the most common chronic disease of childhood, and is traditionally defined as intermittent, reversible obstructive airway disease. It is now known to be a chronic inflammatory disorder of the airways. Clinically it manifests as recurrent episodes of wheezing, dyspnoea, chest tightness, and cough. These episodes are associated with variable airflow obstruction that is usually reversible.

2.2 History

A family history of asthma, atopy, or allergic disease is common.

Enquire specifically about the following:

- duration and nature of symptoms;
- treatments used (relievers, preventers);
- mode of delivery of treatments – pMDI, pMDI and spacer, or nebuliser
- trigger factors (including upper respiratory tract infection, allergy, passive smoking);
- pattern and course of previous acute episodes e.g. admission or ICU admissions;
- parental understanding of the treatment of acute episodes; and
- the presence of interval symptoms.

Consider other causes of wheeze e.g. bronchiolitis, aspiration, foreign body, anaphylaxis.

2.3 Assessment

In children the levels of severity are assessed by the following:

<table>
<thead>
<tr>
<th>Level of Severity</th>
<th>Life Threatening Asthma Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen Saturation $\text{SpO}_2$</td>
<td>$\text{SpO}_2 &lt; 90%$</td>
</tr>
<tr>
<td>Speech</td>
<td>Unable to talk, Altered Consciousness, Agitation</td>
</tr>
<tr>
<td>Respiratory Examination</td>
<td>Poor respiratory effort, Silent chest, Cyanosis</td>
</tr>
<tr>
<td>Pulse</td>
<td>Bradycardia</td>
</tr>
<tr>
<td>BP</td>
<td>Hypotensive</td>
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## Severe Asthma Features

<table>
<thead>
<tr>
<th>Life Threatening Features</th>
<th>Oxygen Saturation SpO₂</th>
<th>Speech</th>
<th>Respiratory Examination</th>
<th>Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>No life threatening features</td>
<td>SpO₂ &lt; 92% in air</td>
<td>Too breathless to talk, Use of accessory muscles</td>
<td>In children &lt; 5yrs:</td>
<td>Heart Rate &gt; 120</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Respiration Rate &gt; 30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Heart Rate &gt; 130</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Life Threatening Features</th>
<th>Oxygen Saturation SpO₂</th>
<th>Speech</th>
<th>Respiratory Examination</th>
<th>Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>No life threatening features</td>
<td>SpO₂ ≥ 92% in air</td>
<td>Able to talk, Normal Mental State</td>
<td>Some accessory muscle use</td>
<td>Heart rate within normal range</td>
</tr>
</tbody>
</table>

**NB:** If a patient has signs and symptoms across categories, always treat according to their most severe features.

## 2.4 Examination

The most important parameters in the assessment of the severity of acute childhood asthma are general appearance/mental state and work of breathing (accessory muscle use, recession), as indicated in the table below.

- Initial SpO₂ in air, heart rate and ability to talk are helpful but less reliable additional features.
- Wheeze intensity is not reliable.
- Asymmetry on auscultation is often found due to mucous plugging, but warrants consideration of foreign body or pneumothorax.
- A prolonged expiratory phase is often a very sensitive sign of diffuse small airway obstruction and will almost always be present, as will expiratory muscle use.
2.5 Investigations

Chest x-ray is not generally required (discuss with registrar/consultant if considering).

In the case of patients with diffuse bilateral wheeze, bacterial infection is rarely implicated. Antibiotics are only rarely needed in acute asthma as pneumonia is uncommon. Always ask about a temperature. Without a fever, serious bacterial infection is unlikely.

Blood gases are rarely required in the assessment of acute asthma in children.

In the severe or critical episode, a venous blood gas measurement may be useful. However, a normal venous pCO\textsubscript{2} value does not rule out a critical problem and should be interpreted with caution.

2.6 Objective assessment of the paediatric asthma patient

In the assessment of children please note the following:

2.6.1 Pulse Oximetry

Accurate measurements of oxygen saturation are essential in the assessment of all children with acute wheezing. Oxygen saturation monitors should be available for use by all health professionals assessing acute asthma in both primary and secondary care settings. Low oxygen saturations after initial bronchodilator treatment indicate a more severe group of patients. Consider admission for intensive inpatient treatment for children with SpO\textsubscript{2} <92% in air after initial bronchodilator treatment.

2.6.2 PEF or FEV\textsubscript{1}

There are significant limitations in the use of PEF in children with acute asthma, however PEF measurements may be of benefit in assessing some children who are familiar with the use of such devices. In general peak flow is rarely relied upon in the acute management of children's asthma in the ED setting. However, when used, the best of three PEF measurements, ideally expressed as a percentage of personal best, can be useful in assessing the response to treatment. A measurement of <50% predicted PEF or FEV\textsubscript{1} with poor improvement after initial bronchodilator treatment is predictive of a more prolonged asthma attack.

2.6.3 Chest X-Ray

Chest X-rays rarely provide additional useful information and are not routinely indicated. A chest X-ray should be performed if there is subcutaneous emphysema, persisting unilateral signs suggesting pneumothorax, lobar collapse or consolidation and/or life threatening asthma not responding to treatment.

2.6.4 Blood Gases

Blood gas measurements should be considered if there are life threatening features not responding to treatment. Arterialised ear lobe blood gases can be used to obtain an accurate measure of pH and pCO\textsubscript{2}. If ear lobe sampling is not practicable a finger prick sample can
be an alternative. Normal or raised pCO\textsubscript{2} levels are indicative of worsening asthma. A more easily obtained free flowing venous blood pCO\textsubscript{2} measurement of less than 6kPa (45 mm Hg) excludes hypercapnia.

2.7 Acute Treatment of the Paediatric Asthma Patient during an Exacerbation

The primary therapies for the management of an exacerbation to relieve airflow obstruction and hypoxemia include:

- Repetitive administration of rapid-acting inhaled β\textsubscript{2}-agonist bronchodilator;
- Early introduction of systemic glucocorticosteroids;
- Oxygen supplementation.

2.7.1 Oxygen

Many patients with acute severe asthma are hypoxemic (low blood oxygen). Supplementary oxygen should be given urgently to hypoxemic patients, using a face mask, Venturi mask or nasal cannula with flow rates adjusted as necessary to maintain SpO\textsubscript{2} of ≥92%. Hypercapnoea (raised blood CO\textsubscript{2} levels) indicates the development of near-fatal asthma and the need for emergency specialist/anaesthetic intervention. It is imperative to give supplementary oxygen to all hypoxemic patients with acute severe asthma to maintain a SpO\textsubscript{2} level of ≥92%. A lack of pulse oximetry should not prevent the use of oxygen.

2.7.2 Bronchodilators – repeated administration of rapid-acting inhaled β\textsubscript{2}-agonist

In most cases inhaled β\textsubscript{2}-agonists given in high doses act quickly to relieve bronchospasm with few side effects. There is no evidence for any difference in efficacy between salbutamol and terbutaline. Nebulised adrenaline (epinephrine), a non-selective β\textsubscript{2}-agonist, does not have significant benefit over salbutamol or terbutaline.

In acute asthma without life-threatening features, β\textsubscript{2}-agonists should be administered by repeated activations of a pMDI via an appropriate spacer or, if a spacer/MDI is unavailable, by wet nebulisation driven by oxygen. Inhaled β\textsubscript{2}-agonists are as efficacious and preferable to intravenous β\textsubscript{2}-agonists (meta-analysis has excluded subcutaneous trials) in adult acute asthma in the majority of cases. Metered dose inhalers with spacers can be used for patients with exacerbations of asthma other than life-threatening. The bronchodilator therapy delivered via a metered-dose inhaler (pMDI), ideally with a spacer, produces at least an equivalent improvement in lung function as the same dose delivered via nebuliser. This route of delivery is the most cost effective, provided patients are able to use a pMDI.

Mild exacerbations: In children under 6 years of age up to 6 puffs every 20 minutes, over 6 years of age up to 12 puffs every 20 minutes for the first hour. Continue with 6 or 12 puffs as appropriate every one-to-four hours. No additional medication is necessary if the rapid-acting inhaled β2-agonist produces a complete response (FEV\textsubscript{1} or PEF returns to greater than 80% of predicted or personal best) and the response lasts for 3 to 4 hours.
Oxygen-driven nebulisers are preferred for nebulising \( \beta_2 \)-agonist bronchodilators because of the risk of oxygen desaturation while using air-driven compressors. Emergency oxygen should be available in hospitals, ambulances and primary care. A flow rate of 6 litres/min is required to drive most nebulisers. Where oxygen cylinders are used, a high flow regulator must be fitted. The absence of supplemental oxygen should not prevent nebulised therapy from being administered when appropriate. Therefore in hospital, ambulance and primary care, nebulised \( \beta_2 \)-agonist bronchodilators should preferably be driven by oxygen. Repeat doses of \( \beta_2 \)-agonists at 15-30 minute intervals or give continuous nebulisation of salbutamol at 5-10 mg/hour (requires appropriate nebuliser) if there is an inadequate response to initial treatment.

2.7.3 Intravenous \( \beta_2 \)-agonists,

In those patients requiring high dependency or intensive care for asthma, intravenous salbutamol has a role. However, most cases of acute asthma will respond adequately to bolus administration of \( \beta_2 \)-agonists. Continuous nebulisation of \( \beta_2 \)-agonists with an appropriate nebuliser may be more effective than bolus nebulisation in relieving acute asthma for patients with severe or life-threatening asthma.

2.7.4 Glucocorticosteroids (Steroids)

Steroids reduce mortality, relapses, subsequent hospital admission and requirement for \( \beta_2 \) agonist therapy. The earlier they are given in the acute attack the better the outcome. Oral glucocorticosteroids (1 mg of prednisolone/kg or equivalent during a 24-hour period) should be used to treat exacerbation, especially if they develop after instituting other short-term treatment options recommended for loss of control.

Steroid tablets are as effective as injected steroids, provided they can be swallowed and retained. Prednisolone 1 mg/kg/day (up to a maximum of 40 mg daily) for 3 days or parenteral hydrocortisone 4 mg/kg up to a maximum of 160 mg is as effective as higher doses. Where necessary soluble prednisolone (sodium phosphate) 5 mg tablets can be used. In cases where oral treatment may be a problem, consider intramuscular methylprednisolone 160 mg as an alternative to a course of oral prednisolone (this is likely to be a large 4 mL injection).

Following recovery from the acute exacerbation steroids when given for less than 7 days can be stopped abruptly. Doses do not need tapering provided the patient receives inhaled steroids (apart from patients on maintenance steroid treatment or rare instances where steroids are required for three or more weeks). It is not known if inhaled steroids provide further benefit in addition to systemic steroids. Inhaled steroids should however be started, or continued as soon as possible to commence the chronic asthma management plan.

2.7.5 Ipratropium bromide

Combining nebulised ipratropium bromide with a nebulised \( \beta_2 \)-agonist produces significantly greater bronchodilation than a \( \beta_2 \)-agonist alone in moderate-to-severe asthma exacerbations, leading to a faster recovery and shorter duration of admission. Anticholinergic treatment is not necessary and may not be beneficial in milder exacerbations of asthma or after stabilisation.
2.7.6 Magnesium Sulphate

There is some evidence that, in adults, magnesium sulphate has bronchodilator effects.

A recent systematic review and meta-analysis reported that this agent reduces the need for admission to hospital and improves lung function in children with severe acute asthma. (Mohammed and Goodacre, 2007). Experience suggests that magnesium is safe when given by the intravenous (IV) or nebulised route however trials comparing these routes of administration are awaited. Intravenous magnesium sulphate is safe and beneficial as adjuvant therapy for children with moderate to severe asthma.

The safety and efficacy of repeated IV doses have not been assessed. Repeated doses could cause hypermagnesaemia with muscle weakness and respiratory failure. More studies are needed to determine the optimal route, frequency and dose of magnesium sulphate therapy.

IV magnesium sulphate (50 mg/kg up to max of 3 g IV infusion over 20 minutes) should only be used following consultation with senior medical staff.

2.7.7 Intravenous Aminophylline

This drug is generally not for routine use as it may potentially increase morbidity and delay anaesthetic review. It should only be given on the advice of a senior physician. However, in acute asthma, IV aminophylline may result in additional bronchodilation. Side effects such as arrhythmias and vomiting are increased if IV aminophylline is used. Some patients with near-fatal asthma or life threatening asthma with a poor response to initial therapy may gain additional benefit from IV aminophylline (5 mg/kg loading dose over 20 minutes unless on maintenance oral therapy, then infusion of 0.5-0.7 mg/kg/hr.). Such patients are probably rare and could not be identified in a meta-analysis of trials. If IV aminophylline is given to patients on oral aminophylline or theophylline, blood levels should be checked on admission. Levels should be checked daily for all patients on aminophylline infusions.

2.7.8 Leukotriene receptor agonist

There is some emerging evidence to suggest a possible role of montelukast (singulair) in acute asthma but is insufficient currently to make a recommendation of its use in the management of acute asthma.

2.7.9 Antibiotics

When an infection precipitates an exacerbation of asthma it is likely to be viral. The role of bacterial infection has been overestimated.

2.7.10 Intravenous fluids

There are no controlled trials, observational or cohort studies of differing fluid regimes in acute asthma. Some patients with acute asthma require rehydration and correction of electrolyte imbalance. Hypokalaemia can be caused or exacerbated by β₂-agonist and/or steroid treatment and must be corrected.
2.7.11 ICU/HDU

Indications for admission to intensive care or high-dependency units include patients requiring ventilator support and those with severe acute or life threatening asthma who are failing to respond to therapy, as evidenced by:

- deteriorating PEF;
- persisting or worsening hypoxia;
- hypercapnoea;
- arterial blood gas analysis showing fall in pH or rising H+ concentration;
- exhaustion, feeble respiration;
- drowsiness, confusion, altered conscious state;
- respiratory arrest.

Not all patients admitted to the Intensive Care Unit (ICU) need ventilation, but those with worsening hypoxia or hypercapnoea, drowsiness or unconsciousness and those who have had a respiratory arrest require intermittent positive pressure ventilation. Intubation in such patients is very difficult and should ideally be performed by an anaesthetist or ICU consultant. Treatment has to be adjusted periodically in response to worsening control, which may be recognised by the minor recurrence or worsening of symptoms. Following treatment for an exacerbation, maintenance treatment can be resumed at previous levels unless the exacerbation was associated with a gradual loss of control suggesting chronic under treatment.

2.8 Discharge and follow-up planning

Children with a life-threatening/ severe asthma exacerbation should be admitted for at least 24 hours and should be reviewed by a senior physician/respiratory consultant before discharge.

Children with mild to moderate asthma may be discharged from ED one hour after initial treatment unless they meet any of the following criteria when admission may be appropriate:

- Still have significant symptoms;
- Previous near-fatal or brittle asthma;
- Had an exacerbation despite adequate dose steroid tablets pre-presentation;
- Presentation at night.
- Children who are capable of using a peak flow meter and whose flow rate is less than 75% best or predicted

All patients being discharged following an asthma exacerbation should be educated in the management of their condition.

This should include:

- Awareness of triggers and symptoms related to onset of attack;
• Medications compliance;
• Inhaler technique;
• Peak flow technique and diary recording;
• Asthma management plan.

People requiring further supports prior to discharge should be referred to appropriate services. Such patients include:

- The appropriate primary care practice should be informed by fax / email within 24 hours of the patient’s discharge;
- Before discharge the patient should be instructed to arrange an appointment with their GP or asthma nurse within 2 working days;
- A follow-up appointment with a hospital asthma / respiratory service should be made within 4 weeks of the episode;
- A copy of the discharge letter should be sent to each of the following:
  - the person with asthma or their carer;
  - the patient’s named GP /practice nurse;
  - care home/community nurses, where appropriate.
- A sample discharge bundle and a sample discharge letter/fax/email template can be found in the appendices.

2.9 Appendices

i. Emergency Treatment Protocols

   Emergency treatment protocols are standardized flow of treatment to be applied to the acute asthmatic
   - Management of Acute Asthma in Children in General Practice
   - Management of Acute Children’s Asthma in ED, AMU & In hospital

ii. Emergency Pre-Hospital Protocols

iii. Salbutamol IV Protocol

iv. Emergency Treatment Care Bundles
   - Paediatric Acute Management in General practice care bundle
   - Paediatric Asthma Patient Discharge Care Bundle

v. Discharge Letters/ Fax/Email templates
vi. Audit of treatment Protocols and Treatment Pathways  
vii. Asthma Management Plans  
viii. Peak flow Measurement Graph  
ix. Medications in use for Asthma  
x. Instructions for multiple dosing in acute asthma exacerbation  
xi. Wheezing In Infants Under 2 Years Of Age  
xi. Acknowledgements

2.10 Implementation Plan

All hospitals admitting asthma exacerbations should adopt this standard treatment protocol for the management of the asthma patient. The treatment care bundles should be held in the patients chart. The bundles will be key to the evaluation and audit of care process.

These protocols should be adopted by all hospitals who may deal with an asthma exacerbation in the course of other procedures, interventions, day surgery, admission, in-patient and out-patient visits.

General Practitioners managing Acute Asthma Exacerbations in primary care should adopt these standard treatment protocols and bundles for the management of the patient with asthma.

The implementation of the guidelines will take multiple routes. This will be a phased approach over a two to three year period. Medical training, undergraduate, post graduate and continuous professional development courses will need to be updated regularly in line with guidelines. For immediate application in our acute setting scheduled clinical workshops across all healthcare sites nationally will be rolled out.

Evaluation and audit of care according to the guidelines is key to ensuring successful implementation and sustaining standards of asthma care for patients.

2.11 Evaluation and Audit

Audit of the use of the treatment protocols will be carried out by the local Respiratory service in conjunction with the Emergency and Acute Medicine teams. The ED, Medical Assessment Unit, Medical ward will retain a copy the treatment bundle administered on file and make available a copy to the local Respiratory service to assist them with audit. This will serve a dual function:

1) Notification of the patient to the Respiratory service for follow-up; 
2) Audit of the treatment and education supplied to the patient prior to discharge.

The National Asthma Programme will perform an annual audit of compliance with and adherence to standard protocols as outlined in the National Asthma Guidelines.
2.12 Guideline Development

A systematic evidence review of literature was undertaken by the National Asthma Programme in the formulation of this guideline. This included review of international evidence based guidelines, investigations of existing materials in use in Emergency Departments within Ireland and internationally to establish best practice in the assessment, management, and treatment of acute exacerbations of asthma in primary care, pre-hospital and hospital settings.

Consultation, review and input to the guideline was achieved via the Royal College of Physicians of Ireland Clinical Advisory Group nominated by the Irish Thoracic Society and other national clinical programmes, councils and patient organisations.

Please see full list of participants in Acknowledgements in appendix xii

2.13 Evidence Base

The evidence base for this guideline is built on the following existing international guidelines which have been adapted to reflect care in an Irish healthcare setting.


APPENDIX I - EMERGENCY TREATMENT PROTOCOLS

Management of acute asthma in children in general practice

AGED 2–5 years

ASSESS ASTHMA SEVERITY

**Life threatening asthma**
- SpO₂ <92%
- Silent chest
- Poor respiratory effort
- Agitation
- Altered consciousness
- Cyanosis

- Oxygen via facemask
- Nebuliser
- Salbutamol 2.5 mg
- Or terbutaline 5 mg
- Ipratropium 0.25 mg
- Soluble prednisolone 20 mg or IV hydrocortisone 50 mg

**Severe exacerbation**
- SpO₂ <92%
- Too breathless to talk
- Heart rate >130/min
- Respiratory rate >60/min
- Use of accessory neck muscles

- Oxygen via facemask
- Up to 6 puffs of β₂ agonist via spacer (given one at a time and inhaled separately). Review and repeat if necessary after 20 mins (3 doses in total) or nebulised salbutamol 2.5 mg or nebulised terbutaline 5 mg.
- Soluble prednisolone 20 mg

Assess response to treatment: 10-20 mins after β₂ agonist

**Mild/Moderate exacerbation**
- SpO₂ >92%
- Able to talk
- Heart rate ≤130/min
- Respiratory rate ≤60/min

- β₂ agonist up to 6 puffs via spacer + facemask. Review and repeat if necessary after 20 mins (3 doses in total)
- Consider soluble prednisolone 20 mg

Assess response to treatment: 10-20 mins after β₂ agonist

**POOR RESPONSE**
- Reassess at 10-20 min intervals.
- Administer β₂ agonist according to response to treatment while awaiting transfer to hospital.
- Stay with patient until ambulance arrives.
- Send written assessment and referral details.
- Repeat β₂ agonist via oxygen-driven nebuliser in ambulance.

**GOOD RESPONSE**
- Continue β₂ agonist via spacer or nebuliser as needed but not exceeding 4-hourly.
- If symptoms are not controlled repeat β₂ agonist and refer to hospital.
- Continue prednisolone for up to 3 days.
- Arrange follow-up within 2 working days.

**LOWER THRESHOLD FOR ADMISSION IF:**
- Attack in late afternoon or at night
- Recent hospital admission or previous severe attack
- Concern over social circumstances or ability to cope at home

**NB:** If a patient has signs and symptoms across categories, always treat according to their most severe features

Based on GINA and BTS Guidelines for Management of Asthma 2008
### Management of acute asthma in children in general practice

**AGED 6 -15 years**

#### ASSESS ASTHMA SEVERITY

<table>
<thead>
<tr>
<th>Life threatening asthma</th>
<th>Severe exacerbation</th>
<th>Mild/ Moderate exacerbation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- SpO₂ &lt;92%</td>
<td>- SpO₂ &lt;92%</td>
<td>- SpO₂ &gt; 92%</td>
</tr>
<tr>
<td>- PEF &lt;33% best or predicted</td>
<td>- PEF &lt;50% best or predicted</td>
<td>- PEF ≥ 50%best or predicted</td>
</tr>
<tr>
<td>- Silent chest</td>
<td>- Too breathless to talk</td>
<td>- Able to talk</td>
</tr>
<tr>
<td>- Poor respiratory effort</td>
<td>- Heart rate &gt;120/min</td>
<td>- Heart rate &lt;120/min</td>
</tr>
<tr>
<td>- Agitation</td>
<td>- Respiratory rate &gt; 30/min</td>
<td>- Respiratory rate &lt;30/min</td>
</tr>
<tr>
<td>- Altered consciousness</td>
<td>- Use of accessory neck muscles</td>
<td></td>
</tr>
<tr>
<td>- Cyanosis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Oxygen via facemask**
  - Nebulise:
    - Salbutamol 5 mg
    - Or terbutaline 10 mg
    - +
    - Ipratropium 0.25 mg
  - Soluble prednisolone 30-40 mg or IV hydrocortisone 100 mg

- **2 agonist up to 12 puffs via spacer +_ facemask. Review and repeat if necessary after 20 mins (3 doses in total)**
  - or nebulised salbutamol 2.5-5 mg or nebulised terbutaline 5-10 mg
  - Soluble prednisolone 30-40 mg

**Assess response to treatment 10-20 mins after 2 agonist**

- **IF POOR RESPONSE – REPEAT 2 AGONIST VIA OXYGEN-DRIVEN NEBULISER Whilst ARRANGING IMMEDIATE HOSPITAL ADMISSION**
- **IF POOR RESPONSE REPEAT 2 AGONIST AND ARRANGE ADMISSION**
- **GOOD RESPONSE**
  - Continue 2 agonist via spacer or nebuliser, as needed but not exceeding 4-hourly
  - If symptoms are not controlled repeat 2 agonist and refer to hospital
  - Continue prednisolone for up to 3 days
  - Arrange follow-up within 2 working days

- **LOWER THRESHOLD FOR ADMISSION IF:**
  - Attack in late afternoon or at night
  - Recent hospital admission or previous severe attack
  - Concern over social circumstances or ability to cope at home

- **NB:** If a patient has signs and symptoms across categories, always treat according to their most severe features

Based on GINA and BTS Guidelines for Management of Asthma 2008
### Management of acute children’s asthma in ED, AMU and hospital

**AGED 2 to 5 Years**

**ASSESS ASTHMA SEVERITY**

<table>
<thead>
<tr>
<th>Life threatening asthma</th>
<th>Severe exacerbation</th>
<th>Mild - Moderate exacerbation</th>
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</thead>
<tbody>
<tr>
<td>- SaO₂ &lt;90% in air</td>
<td>- SaO₂ &lt;92% in air</td>
<td>- SaO₂ ≥ 92% in air</td>
</tr>
<tr>
<td>- Silent chest</td>
<td>- Too breathless to talk</td>
<td>Normal Mental State</td>
</tr>
<tr>
<td>- Poor respiratory effort</td>
<td>- Use of accessory neck</td>
<td>Able to talk</td>
</tr>
<tr>
<td>- Agitation</td>
<td>- In children &lt; 5yrs:</td>
<td>- Some accessory muscle use</td>
</tr>
<tr>
<td>- Altered consciousness</td>
<td>- HR &gt; 130</td>
<td></td>
</tr>
<tr>
<td>- Cyanosis</td>
<td>- RR &gt; 40</td>
<td></td>
</tr>
<tr>
<td>- Bradycardia</td>
<td></td>
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</tr>
</tbody>
</table>

**NB:** If a patient has signs and symptoms across categories, always treat according to their most severe features.

**Salbutamol:**
- 3 doses over 1 hour
  - via spacer*: 6 puffs (<5 yrs)
  - or nebulise: 2.5 mg (<5 yrs)

**Prednisolone:**
- 1 mg/kg (up to max 40mg)
- Reassess

**IF LIFE THREATENING FEATURES PRESENT**

- **Call Senior Staff/Anaesthetics Now**
- O₂ via mask 6-8ltrs per min or as required to maintain SaO₂ > 92%
- Nebulise:
  - **Salbutamol**: continuously or 3 doses over 1 hour
    - 2.5 mg (<5 yrs)
  - **Ipratropium**: 3 doses over 1 hour
    - 250 mcg (<5 yrs)
  - **Prednisolone oral**: 1 mg/kg (up to max 40mg)
    - or
  - **Hydrocortisone iv**: 4 mg/kg (up to 160mg)
  - Repeat Salbutamol as required

**LIFE THREATENING**

Consider:
- Chest Xray & blood gases
- I.V. **Salbutamol**: 5 mcg/kg/min for 1st hour then 1-2 mcg/kg/min
- I.V. **Aminophylline**: 5 mg/kg over 20 mins
- I.V. **Magnesium**: 50 mg/kg (max 3g) over 20 mins
- **These must be given via separate intravenous lines.**
- Arrange transfer to PICU/HDU

**NOT RESPONDING**

- Repeat inhaled β₂ agonist

**ARRANGE ADMISSION**

(lower threshold if concern over social circumstances)

**RESPONDING**

- Continue inhaled β₂ agonist 1-4 hourly
- Give soluble oral prednisolone 20 mg
- SpO₂ >92% (on room air)

**DISCHARGE PLAN**

- Complete asthma discharge plan and provide with Asthma Management Plan
- Continue Salbutamol as needed
- Prednisolone 1 mg/kg (up to 40mg) for 3-5 days
- Review regular treatment
- Check inhaler technique
- Arrange follow-up:
  - GP
  - Asthma nurse
  - Paediatrician

---

Based on GINA, BTS and AMINCH Management of Paediatric Asthma
ASSESS ASTHMA SEVERITY

**Life threatening asthma**
- SaO$_2$ <90% in air
- Silent chest
- Poor respiratory effort
- Agitation
- Altered consciousness
- Cyanosis
- Bradycardia

**Severe exacerbation**
- SaO$_2$ <92% in air
- Too breathless to talk
- Use of accessory neck
- In children > 5 yrs:
  - HR > 120
  - RR >30

**Mild - Moderate exacerbation**
- SaO$_2$ ≥ 92% in air
- Normal Mental State
- Able to talk
- Some accessory muscle use

**NB:** If a patient has signs and symptoms across categories, always treat according to their most severe features.

**Salbutamol:** 3 doses over 1 hour
- **via spacer:** 12 puffs > 5 yrs
- **or nebulate:** 5 mg > 5 yrs
- Prednisolone 1 mg/kg (up to max 40mg)
- Reassess

**IF LIFE THREATENING FEATURES PRESENT**
- **Call Senior Staff/Anaesthetics Now**
- O2 via mask 6-8lttrs per min or as required to maintain SaO$_2$ > 92%
- Nebulise:
  - **Salbutamol:** continuously or 3 doses over 1 hour
    - 5 mg (>5yrs)
  - **Ipratropium:** 3 doses over 1 hour
    - 500mcg (>5yrs)
  - **Prednisolone oral:** 1 mg/kg (up to max 40mg)
  - **Hydrocortisone iv:** 4 mg/kg (up to 160mg)
  - Repeat Salbutamol as required

**LIFE THREATENING**
Consider:
- Chest Xray & blood gases
- I.V. Salbutamol: 5 mcg/kg/min for 1st hour then 1-2 mcg/kg/min
- I.V. Aminophylline: 5 mg/kg over 20 mins
- I.V. Magnesium: 50 mg/kg (max 3g) over 20 mins
These must be given via separate intravenous lines
- Arrange transfer to PICU/HDU

**NOT RESPONDING**
- Repeat inhaled $\beta_2$ agonist

**ARRANGE ADMISSION**
(lower threshold if concern over social circumstances)
- Continue inhaled $\beta_2$ agonist 1-4 hourly
- Give soluble oral prednisolone 20 mg
- SpO$_2$ >92% (on room air)

**DISCHARGE PLAN**
- Complete asthma discharge plan and provide with Asthma Management Plan
- Continue Salbutamol as needed
- Prednisolone 1 mg/kg (up to 40mg) for 3-5 days
- Review regular treatment
- Check inhaler technique
- Arrange follow-up:
  - GP
  - Asthma nurse
  - Paediatrician

Based on GINA, BTS and AMNCH Management of Paediatric Asthma
The Pre-Hospital Emergency Care Council is a statutory agency responsible for education, training and standards in pre-hospital emergency care in Ireland. Their functions include registering Emergency Medical Technicians, Paramedics and Advanced Paramedics, as well as publishing Clinical Practice Guidelines (CPGs) which are the legal authority by which they administer medications.

The Pre-Hospital Emergency Care Council have published many CPGs which also encompass Emergency First Responders and others. These CPGs as well as other information are available on their website www.phecc.ie.
Inadequate Respirations – Paediatric (≤ 13 years)

Respiratory distress

Assess and maintain airway

Oxygen therapy

Chest Auscultation

Inadequate rate or depth

Asymmetrical movements

Possible Hx of Narcotic overdose

No

Yes

Naloxone 0.01 mg/kg, IM
Repeat x 1 pm

Naloxone 0.01 mg/kg, IV/IOIM
Repeat x 1 pm to max 0.1 mg/kg

Tension Pneumothorax suspected

No

Yes

Needle decompression

Positive pressure ventilation – 12 to 20 per minute

Consider supporting ventilations if patient becomes exhausted

Silent chest, < 2 words per breath; cannot feed or SpO2 < 50%

Silent chest, x 1 at 5 minutes pm

Consider supporting ventilations if patient becomes exhausted

Silabutamol = 5 years 2.5 mg NEB ≥ 5 years 5 mg NEB
Repeat x 1 at 5 minutes pm

Silabutamol = 5 years 2.5 mg NEB ≥ 5 years 5 mg NEB
Repeat x 1 at 5 minutes pm

SALbutamol, 2 puffs, metered aerosol
Repeat x 1 at 5 minutes pm

Silabutamol 0.250 mg nebulise (specific dose) nebulise mixed

Silabutamol 0.250 mg nebulise (specific dose) nebulise mixed

Special Authorisation:
Advanced Paramedics are authorised to repeat Salbutamol x 3 pm

ECG & SpO2 monitoring

Moderate asthma exacerbation (2)

Increasing symptoms:
PFR > 50-75% best or predicted
No features of acute severe asthma

Life threatening asthma

Any one of the following in a patient with severe asthma;
Silent chest
Cyanosis
Poor respiratory effort
Hypotension
Exhaustion
Confusion
Unresponsive


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Inadequate Respirations – Paediatric (≤ 13 years)

Inadequate respirations

- Assess and maintain airway
- Do not distress
- Permit child to adopt position of comfort
- Consider FBAO
- Oxygen therapy

Unresponsive patient with a failing respiratory rate

- Reassess
- Reassess

Positive pressure ventilations 12 to 20 per minute

Audible wheeze

- Yes
  - Reassess
  - Respiratory arrest

- No
  - Go to FBAO/CPG

Echocardiogram & SpO2 monitoring

Moderate asthma exacerbation (2)
- Increasing symptoms
- No features of acute severe asthma

Life-threatening asthma
Any one of the following in a patient with severe asthma:
- Inability to complete sentences in one breath or too breathless to talk or feed
- Respiratory rate > 30/min for > 5 years old
  - < 50/min for 2 to 5 years old
- Heart rate > 120/min for > 5 years old
  - > 130/min for 2 to 5 years old

Inadequate Respirations – Paediatric (≤ 13 years)

Respiratory difficulties
- Assess and maintain airway
- Do not distress
- Permit child to adopt position of comfort
- Consider FBAO
- Oxygen therapy

Life threatening asthma
- Any one of the following in a patient with severe asthma:
  - Silent chest
  - Cyanosis
  - Poor respiratory effort
  - Hypotension
  - Exhaustion
  - Confusion
  - Unresponsive

Unresponsive patient with a falling respiratory rate
- Positive pressure ventilations 12 to 20 per minute

Audible wheezes
- Yes
- History of asthma
  - Yes
  - Patient prescribed salbutamol
    - No
    - Yes
      - Assist patient to administer Salbutamol, 2 puffs (0.2 mg) metered aerosol

Acute severe asthma
- Inability to complete sentences in one breath or too breathless to talk or feed
- Respiratory rate
  - > 30/min for > 5 years old
  - > 50/min for 2 to 5 years old
- Heart rate
  - > 120/min for > 5 years old
  - > 130/min for 2 to 5 years old

Moderate asthma exacerbation (2)
- Increasing symptoms
- No features of acute severe asthma

APPENDIX III INTRAVENOUS SALBUTAMOL FOR PAEDIATRIC PATIENTS

Salbutamol is a β₂-agonist and intravenous administration is indicated for patients with severe or life-threatening acute asthma who are unresponsive to maximal inhaled therapy.

5.1 Compatible fluids
Sodium Chloride 0.9%
Glucose 5%

5.2 Side effects
- Tremor
- Headache
- Tachycardia
- Palpitation
- Muscle Cramps
- Hypokalaemia (potentially serious, see monitoring)
- Lactic Acidosis had been reported rarely in treatment for acute asthma exacerbation.

5.3 Monitoring
- Potentially serious hypokalaemia may occur. Particular caution is required in severe asthma as this effect may be potentiated by concomitant treatment with theophylline and its derivatives, corticosteroids, diuretics and by hypoxia.
  Recommendation: Plasma potassium concentration should therefore be monitored in severe asthma.
- Use with caution in patients with diabetes mellitus as blood glucose may rise and there is a risk of ketoacidosis.
  Recommendation: Monitor blood glucose levels during salbutamol administration.
- Tachycardias and arrhythmias may occur and therefore caution is required in patients with hyperthyroidism, cardiovascular disease, arrhythmias, susceptibility to QT-interval prolongation and hypertension.
  Recommendation: Continuous ECG monitoring

During infusion, the child requires very close monitoring including pulse oximetry, ECG, Heart rate and blood pressure, preferably in a paediatric HDU.

5.4 Dilution
Injection must be diluted prior to administration.

Dilute to a stock solution:
- Remove 10 mL from a 50 mL bag of compatible infusion fluid.
- Add 2 vials of Ventolin Concentrate for IV Infusion® 5 mg/5 mL to the bag.
• This gives a total of 10 mg salbutamol in 50 mL of compatible infusion fluid. Concentration of 200 micrograms/ mL.

Caution

• Ventolin® (salbutamol) IV parenteral preparations should not be administered in the same syringe or infusion as any other medication

5.5 Loading Dose

Age 1 month - 2 Years: 5 micrograms/kg over 5 minutes
Age 2 Years - 18 Years: 15 micrograms/kg over 15 minutes

(to a maximum of 250 micrograms)

5.6 Maintenance dose:

1-2 micrograms/kg/min
For a child aged 2 years who weighs 10kg

**Loading dose:** 15 micrograms/kg over 15 minutes

**Step 1. Multiply by weight.**

15 micrograms/kg x 10 kg = 150 micrograms over 15 minutes

**Step 2. Calculate the number of mls of stock solution required.**

Concentration of stock solution: 200 micrograms in 1 mL

Dose required: 150 micrograms in x mL

150/200 = 0.75 mL required over 15 minutes.

**Maintenance dose:** 1-2 micrograms/kg/min

To calculate the number of mL of stock solution required per hour the following validated formula may be used as a quicker alternative to working out the calculation step-by-step:

**Formula:**

\[
\text{Weight (kg) } \times 0.3 = X \text{ number of mL per hour} \\
\text{Weight (kg) } \times 0.6 = Y \text{ number of mL per hour} \\
\text{Dose range} = X-Y \text{ mL per hour.}
\]

**Example:**

10 kg child

10 kg x 0.3 = 3 mL per hour

10 kg x 0.6 = 6 mL per hour

Dose range = 3-6 mL per hour.

**Maximum weight of 70kgs:** 21-42 mL /hr

---

**Example Calculation:***

**References**

## Paediatric Asthma Acute Management in Primary Care

2-5 years

Assess asthma severity based on features presented. Regard each emergency asthma consultation as for acute life threatening/severe asthma until it is shown otherwise.

<table>
<thead>
<tr>
<th>Date (of review):</th>
<th>Time:</th>
<th>Initials</th>
<th>Comments</th>
</tr>
</thead>
</table>

- Give Oxygen to maintain SpO2 > 92% (where available)
- Give β2 agonist 6 puffs via spacer device (given one at a time and inhaled separately) at intervals of 20 mins
  - OR
  - Give salbutamol 2.5mg or terbutaline 5 mg via air/oxygen driven compressor
- Consider additional use of ipratropium bromide in infants at a dose of 0.25 mg via nebuliser
- Administer soluble prednisolone 20mg po
- Assess response to treatment in 20 minutes
- If good response continue β2 agonist as needed but no greater than Every 4 hours
  - Continue prednisolone for 3 days
  - Arrange follow up within 2 working days
- If poor response to treatment arrange admission to hospital
  - Repeat β2 agonist
- Demonstrate inhaler technique to new patients and check parents understanding of same. Review inhaler technique in all other patients
- Ensure written asthma self management plan given to parents

Affix Patient Label Here
Paediatric Asthma Acute Management in ED / Amu Aged 2-5 years

Assess asthma severity based on features presented. Regard each emergency asthma consultation as for acute life threatening / severe asthma until it is shown otherwise.

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<th>Time processed Nurse/physician Initials / comments</th>
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</thead>
</table>

Give oxygen to maintain Sp02 > 92%

Give β2 agonist up to 6 puffs via spacer device (give one at a time and inhaled separately) at intervals of 20 mins
Or
Give salbutamol 2.5 mg or terbutaline 5mg nebulised with oxygen

Give prednisolone 1mg/kg to max of 40mg

Reassess response to treatment every 20 minutes

If responding:
Continue inhaled β2 agonist 1-4 hourly
Give soluble prednisolone 20 mg PO

If not responding:
Repeat inhaled β2 agonist
Arrange admission (lower the admission threshold if concerns over social circumstances)

Life threatening:
O2 via mask
Nebulise salbutamol 2.5 mg continuously or 3 doses in 1 hour
Ipratropium bromide 250 mcg 3 doses over 1 hour
Oral prednisolone 1 mg/kg (max 40 mg) or Hydrocortisone iv: 4 mg/kg(max 160 mg)

Consider:
Chest x ray and blood gases
IV salbutamol: 5 mcg/kg/min for 1st hour then 1-2 mcg/kg/min
IV Magnesium: 50 mg/kg (max 3g) over 20 mins
IV Aminophylline: 5 mg/kg over 20 mins
These must be given via separate intravenous lines
Arrange transfer to PICU/HDU

Discharge planning:
Complete asthma management plan and going home plan for children
Continue salbutamol / β2 agonist as needed
Continue prednisolone for 3-4 days
Review regular treatments and adjust as necessary
Check inhaler technique and device
Arrange follow up with GP / Asthma Nurse / Paediatrician

Affix Patient Label Here
## Paediatric Asthma Acute Management in Primary Care

### Age 6 to 15 years

Assess asthma severity based on features presented.

Regard each emergency asthma consultation as for acute life threatening / severe asthma until it is shown otherwise.

PEF measurement can be of benefit when assessing children who are used to the devices. Best of three measurements expressed as a % of personal best can be used in assessing response to treatment.

<table>
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<tr>
<th>Date (of review): ________________</th>
<th>Time: ________________</th>
<th>Time processed Nurse/physician Initials / comments</th>
</tr>
</thead>
</table>

Give Oxygen to maintain SpO2 > 92% (where available)

Give β2 agonist up to 12 puffs via spacer device (give one at a time and inhaled separately) at intervals of 20 mins

Or

Give salbutamol 2.5 mg or terbutaline 5 mg via air/oxygen driven compressor

Administer soluble prednisolone 30-40mg po

Assess response to treatment in 20 mins

If good response continue β2 agonist as needed but no greater than every 4 hours

Continue prednisolone for 3 days

Arrange follow up within 2 working days

If poor response to treatment arrange admission to hospital

Repeat β2 agonist

Demonstrate inhaler technique to new patients and check parents/patients understanding of same. Review inhaler technique with all other patients/parents

Ensure written asthma self management plan given to parents

Affix Patient Label Here
Paediatric Asthma Acute Management in ED / AMU
Aged 6-15 years

Assess asthma severity based on features presented.

Regard each emergency asthma consultation as for acute life threatening / severe asthma until it is shown otherwise.

PEF measurement can be of benefit when assessing children who are used to the devices. Best of three measurements expressed as a % of personal best can be used in assessing response to treatment.

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<td>Give β2 agonist up to 12 puffs via spacer device (give one at a time and inhaled separately) at intervals of 20 mins</td>
<td>Or</td>
<td>Initials / comments</td>
</tr>
<tr>
<td>Give salbutamol 5 mg or terbutaline 5 mg nebulised with oxygen</td>
<td>Give prednisolone 1 mg/kg to max of 40mg</td>
<td></td>
</tr>
<tr>
<td>Reassess response to treatment every 20 minutes</td>
<td></td>
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<td>If responding:</td>
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<td>Continue inhaled β2 agonist 1-4 hourly</td>
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<td>Hydrocortisone iv: 4 mg/kg (max 160 mg)</td>
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</tr>
<tr>
<td>Arrange transfer to PICU/HDU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge planning:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete asthma management plan and going home plan for children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue salbutamol / β2 agonist as needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue prednisolone for 3-4 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review regular treatments and adjust as necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check inhaler technique and device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrange follow up with GP / Asthma Nurse / Paediatrician</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Version 1.0
### Paediatric Asthma Discharge Checklist from ED and AMU

**>2 years**

Review each of the steps and incorporate into your discharge planning process for an Asthma Patient

<table>
<thead>
<tr>
<th>Date (of discharge): _______________</th>
<th>Time: _______________</th>
<th>Initials</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider psycho-social factors in discharge and refer to MDT or agency if required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider delay in discharge to 8am if after midnight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If patient received nebulised β2 agonists prior to ED consider an extended observation period (more than 4 hours) prior to discharge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider additional use of ipratropium bromide in infants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In all patients ensure prescription for oral (if required) and inhaled steroid and β2 agonist is supplied to patient on discharge (GMS patient to go to GP for medical card prescription)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate inhaler technique to new patients and check parents understanding of same. Review inhaler technique in all other patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure written asthma self management plan given to parents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advise GP follow up within 2 working days post presentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fax Or email discharge letter to GP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy To Asthma nurse / Respiratory service (where available)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Affix Patient Label Here
Discharge Letter following acute asthma Exacerbation to Emergency Department / Hospital

Hospital Name

Patient Name: DOB: ___________

Address ______________________________________________________________________

Date /time __________________________________ :

Dear GP’s Name _______________________________________________________________

Age: Height Predicted Peak Flow:

<table>
<thead>
<tr>
<th></th>
<th>Initial assessment</th>
<th>On discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp O₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We have discussed
- Inhaler use / technique with (type) ..............................................................
- Medicines including side effects ...............................................................
- Trigger avoidance ..........................................................................................
- Smoking cessation .........................................................................................
- How to recognise worsening asthma and what to do in asthma attack: ...
  Was given a leaflet detailing a simple management plan (copy enclosed)...........
  .......................................................................................................................  

Other important issues discussed:
1. ..........................................................................................................................
2. ..........................................................................................................................
3. ..........................................................................................................................
 ....................................................................................................................................

They have been given written information about asthma management

They have been referred to:
- Asthma Nurse Specialist .................................................................
- Respiratory Consultant .................................................................
- Other ............................................................................................................

For follow-up appointments.

They have been discharged on the following medications:

Contact Details: Emergency Department
Signature: Hospital
Name: 
Title: 
Bleep:
Asthma Going Home Plan for Children

Once your Doctor/Nurse is happy that your child’s symptoms are under control, you can continue treatment at home. If your child is currently on a controller, this should be continued at the usual dose.

1st 24 hours after discharge

Blue inhaler
Give 4-6 puffs every 4-6 hours
(1st 24 hours) via spacer
Times:
Steroid tablets:
What if my child needs their reliever more often?
Give the reliever
AND get urgent medical help
What do I do if my child is sleeping?
Do not wake them. If your child does wake during the night, give the inhaler then

Days 2-3

If improving:
Reliever: (Blue inhaler)
Give 2-4 puffs at breakfast, lunch, late afternoon and bedtime
Steroid tablets:
Breathing will be quieter, slower & easier
Less cough and wheeze better
Can I cut down the number of puffs of the reliever?
Yes, as your child improves cut down the number of puffs & increase the time between

If not getting better:
Reliever: Give up to 6 puffs (up to 12 puffs if your child is over 6 years of age) on one occasion. If this does not help or if your child requires another multidose in 4 hours, seek medical advice
Steroid tablets:
How will I know if my child is getting worse?
Faster breathing or too breathless to walk or play
Cannot talk or feed easily
Skin colour may become pale or grey
What should I do if my child does not seem to be getting better?
Get medical advice
Continue giving the 6 puffs (12 puffs if your child is over 6 years of age) of the reliever inhaler every 4 hours until your child is reviewed

Day 4

If fully recovered:
Reliever: Give 2 puffs as required
Steroid tablets:
How do I know if my child is fully recovered?
Your child will be symptom free

If not getting better:
Reliever: Give up to 6 puffs (up to 12 puffs if your child is over 6 years of age) on one occasion. If this does not help or if your child requires another multidose in 4 hours, seek medical advice
Steroid tablets:
What do I do if my child is not better by day 4?
Get medical advice
Continue giving the 6 puffs (12 puffs if your child is over 6 years of age) of the reliever inhaler every 4 hours until your child is reviewed

It is advisable to contact your GP/practice nurse for review within 2 working days of your ED visit

Clinical Signature: ___________________________ Date: ___________________
Audit Form for Emergency Asthma Care

Patient Name:………………………………………………………………………………

DOB: …………………………………… Date/Time:……………………………………

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PEF on admission and after treatment (in anyone over 5 years)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2.</td>
<td>Pulse rate, respiratory rate and SpO₂. Where SpO₂ &lt; 92% check arterial blood gases and give oxygen as appropriate</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3.</td>
<td>Inhaler technique checked and recorded</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4.</td>
<td>Relevant past medical history recorded (asthma and atopy in particular)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5.</td>
<td>Triggers identified and avoidance discussed</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6.</td>
<td>Current medicines recorded, including dose, frequency (or their absence) recorded</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7.</td>
<td>Concordance issues addressed</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8.</td>
<td>Psycho-social or other risk factors</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9.</td>
<td>Stable on four hourly treatment or when PEF &gt;75% of personal best or predicted value</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10.</td>
<td>Steroid tablets given as appropriate, as per GINA guidelines</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11.</td>
<td>Provided written information and action plan</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12.</td>
<td>Follow-up with GP within 2 working days of discharge arranged and discharge letter sent</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Where you have ticked N/A (not applicable) please explain here e.g. No Peak flow as under 5
## 9APPENDIX VII – SUMMARY MANAGEMENT

<table>
<thead>
<tr>
<th>Severity</th>
<th>Signs of Severity</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild</strong></td>
<td>Normal mental state</td>
<td><strong>Salbutamol</strong> by Metered Dose Inhaler (pMDI)/spacer 1 dose every 20 minutes for 1 hour and review 20 minutes after 3rd dose (1 dose (100 microgram/puff) = 6 puffs if &lt; 5 years old, 12 puffs if 6-15 years old).</td>
</tr>
<tr>
<td></td>
<td>Subtle or no accessory muscle use/recession</td>
<td>- Ensure device/technique appropriate</td>
</tr>
<tr>
<td></td>
<td>O₂ saturation &gt; 94% (may be normal even in severe asthma)</td>
<td>- Good response - discharge on oral steroid and β₂-agonist as needed.</td>
</tr>
<tr>
<td></td>
<td>Able to talk normally</td>
<td>- Poor response - treat as moderate.</td>
</tr>
<tr>
<td></td>
<td>PEFR &gt; 70%</td>
<td>Oral <strong>prednisolone</strong> (1 mg/kg daily (max. 40 mg/day) for 3 days – if patients presents to ED within days of recent discharge, then discuss with consultant before prescribing second course of oral steroids.</td>
</tr>
<tr>
<td></td>
<td>Normal mental state</td>
<td>Provide written advice on what to do if symptoms worsen. Consider overall control and family’s knowledge.</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>Some accessory muscle use/recession</td>
<td>Need for O₂ should be assessed.</td>
</tr>
<tr>
<td></td>
<td>O₂ saturation 92-94% in air</td>
<td><strong>Salbutamol</strong> by pMDI/spacer - 1 dose every 20 minutes for 1 hour; review 10-20 min after 3rd dose to decide on admission or discharge.</td>
</tr>
<tr>
<td></td>
<td>Tachycardia</td>
<td><strong>Ipratropium</strong> by pMDI/spacer 1 dose every 20 minutes for 3 doses (1 dose = ipratropium (Atrovent 20 microgram/puff) 4 puffs if &lt; 5 years old, 8 puffs if 6-15 years old).</td>
</tr>
<tr>
<td></td>
<td>Some limitation of ability to talk</td>
<td>Oral <strong>prednisolone</strong> (1 mg/kg daily for 3 days)</td>
</tr>
<tr>
<td></td>
<td>PEFR 40-70%</td>
<td>The few children of moderate severity who can go home must be discussed with the registrar and should not leave ED until at least one hour after their last pMDI/spacer.</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td>Agitated/distressed</td>
<td>Oxygen</td>
</tr>
<tr>
<td></td>
<td>Moderate-marked accessory</td>
<td>Arrange home treatment and follow-up as above.</td>
</tr>
<tr>
<td>Critical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confused/drowsy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximal accessory muscle use/recession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor respiratory effort (including bradypnoea)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaustion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silent chest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyanosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₂ saturation &lt; 90% in air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marked tachycardia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to talk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumothorax</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Nebulised salbutamol** 0.15 mg/kg/dose (5 mg/mL solution – 0.03 mL/kg/dose to max 1 mL (5 mg) diluted with 3 mL saline) every 20 minutes for 1 hour

- Review on-going requirements 10-20 min after 3rd dose
- if improving reduce frequency and consider change to spacer/pMDI, if no change continue nebulisers 20 minutely;
- if deteriorating at any stage treat as critical.

**Nebulised ipratropium** (every 20 minutes, added to salbutamol)

- 1-5 years old: 125 microgram 3 times in 1st hr only;
- 6-15 years old: 250 microgram 3 times in 1st hr only

**Nebulised ipratropium** 20 minutely, added to salbutamol

- 1-5 years old: 125 microgram 3 times in 1st hr only;
- > 5 years old: 250 microgram 3 times in 1st hr only

**Oral prednisolone** (1 mg/kg daily for 3 days); if vomiting give IV hydrocortisone (4 mg/kg) every 4 hours.

**Hydrocortisone** 4 mg/kg IV 4-hourly.

**Clinical Strategy and Programmes**
**Version 1.0**
If deteriorating give bolus **magnesium sulphate IV** 50 mg/kg (Magnesium sulphate 50% solution 0.1 mL/kg, diluted 1 in 5 with 5% Dextrose or 0.9% Sodium Chloride and administered over 20 min).

Also consider **aminophylline** 6 mg/kg IV (maximum dose 500 mg) over 30 min. Following loading dose consider giving continuous infusion (0.7 mg/kg/hr up to 1 mg/kg/hr). If currently taking oral theophylline, **do not** give IV aminophylline - take serum level. Also, consider checking levels if infusion is continued.

If poor response to IV aminophylline, or child is very sick, also give **IV salbutamol** 5 microgram/kg/min for one hour as a load, followed by 1-2 microgram/kg/min (Aminophylline and salbutamol must be given via separate IV lines).
### APPENDIX VIII – PEAK FLOW MEASUREMENTS

#### PAEDIATRIC NORMAL VALUES

Peak Expiratory Flow Rate

For use with EU/EN13826 scale PEF only

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Height (ft)</th>
<th>PEFR (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.85</td>
<td>2' 9&quot;</td>
<td>87</td>
</tr>
<tr>
<td>0.9</td>
<td>2' 11&quot;</td>
<td>95</td>
</tr>
<tr>
<td>0.95</td>
<td>3' 1&quot;</td>
<td>104</td>
</tr>
<tr>
<td>1.0</td>
<td>3' 3&quot;</td>
<td>115</td>
</tr>
<tr>
<td>1.05</td>
<td>3' 5&quot;</td>
<td>127</td>
</tr>
<tr>
<td>1.1</td>
<td>3' 7&quot;</td>
<td>141</td>
</tr>
<tr>
<td>1.15</td>
<td>3' 9&quot;</td>
<td>157</td>
</tr>
<tr>
<td>1.2</td>
<td>3' 11&quot;</td>
<td>174</td>
</tr>
<tr>
<td>1.25</td>
<td>4' 1&quot;</td>
<td>192</td>
</tr>
<tr>
<td>1.3</td>
<td>4' 3&quot;</td>
<td>212</td>
</tr>
<tr>
<td>1.35</td>
<td>4' 5&quot;</td>
<td>233</td>
</tr>
<tr>
<td>1.4</td>
<td>4' 7&quot;</td>
<td>254</td>
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<tr>
<td>1.45</td>
<td>4' 9&quot;</td>
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<tr>
<td>1.5</td>
<td>4' 11&quot;</td>
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<tr>
<td>1.55</td>
<td>5' 1&quot;</td>
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<tr>
<td>1.6</td>
<td>5' 3&quot;</td>
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</tr>
<tr>
<td>1.65</td>
<td>5' 5&quot;</td>
<td>370</td>
</tr>
<tr>
<td>1.7</td>
<td>5' 7&quot;</td>
<td>393</td>
</tr>
</tbody>
</table>
### APPENDIX IX – MEDICATIONS IN ACUTE ASTHMA

| Medicine/ Generic name | Paediatric dose age 2 – 5 years | Paediatric dose age 6 – 15 years |  
|-------------------------|---------------------------------|---------------------------------|---|
| **Oxygen**              | High flow                       | High flow                       | Children with severe asthma are hypoxaemic and should be given high flow oxygen to maintain oxygen saturation at 92% or above. |
| **β2 agonist bronchodilators / salbutamol, terbutaline** | Up to 6 puffs repeated every 20-30 minutes according to clinical response for mild attacks (3 doses in total) via a pMDI + spacer +/- facemask.  
Children who have not improved after receiving 3 doses should be referred to hospital and further doses given while awaiting transfer.  
During transfer to hospital 2.5 mg salbutamol or 5 mg terbutaline via nebuliser. | Up to 12 puffs repeated every 20-30 minutes according to clinical response for mild attacks (3 doses in total) via a pMDI + spacer +/- facemask.  
Children who have not improved after receiving 3 doses should be referred to hospital and further doses given while awaiting transfer.  
During transfer to hospital 2.5 - 5 mg salbutamol or 5 - 10 mg terbutaline via nebuliser. | These act quickly to relieve bronchospasm and have few side effects and should be administered as early as possible in an asthma attack. Used as first line treatment in children. pMDI + spacer is preferable method of delivery.  
6 PUFFS (12 if AGE > 6 YEARS) VIA SPACER IS JUST AS EFFECTIVE AS NEBULISER UNLESS FEATURES OF LIFE-THREATENING ASTHMA ATTACK.
<table>
<thead>
<tr>
<th>Clinical Strategy and Programmes</th>
<th>In hospital, where close monitoring is available - In severe/ life threatening asthma a bolus dose of IV salbutamol (15 mcg/kg to a max of 250 micrograms) in addition to nebulised salbutamol may be considered in children over 2 years</th>
<th>In hospital, where close monitoring is available - In severe/ life threatening asthma a bolus dose of IV salbutamol (15 mcg/kg to a max of 250 micrograms) in addition to nebulised salbutamol may be considered in children over 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bronchodilators/ Ipratropium</strong></td>
<td>0.25 mg used in first two hours of severe asthma attack mixed with nebulised β2 agonist every 20-30 minutes</td>
<td>0.25 mg – 0.5 mg used in first two hours of severe asthma attack mixed with nebulised β2 agonist every 20-30 minutes</td>
</tr>
<tr>
<td><strong>Steroids/ Prednisolone</strong></td>
<td>Soluble prednisolone 20 mg daily for 3-5 days for children 2-5 years</td>
<td>Soluble prednisolone 30-40 mg daily for 3-5 days for children 6-15 years</td>
</tr>
<tr>
<td>Drug</td>
<td>Initial Dosing</td>
<td>Max Dosage</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Steroids/hydrocortisone</td>
<td>4 mg/kg body weight, 4 hourly</td>
<td>Max 160 mg</td>
</tr>
<tr>
<td>IV Magnesium sulphate</td>
<td>Use only after consultation with senior staff</td>
<td></td>
</tr>
<tr>
<td>IV aminophylline</td>
<td>Use only after consultation with senior staff</td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. APPENDIX X INSTRUCTIONS FOR MULTIPLE DOSING IN ACUTE ASTHMA EXACERBATION

Use spacer device: Volumatic / Aerochamber

- Shake pMDI
- Place spacer device in mouth
- Actuate pMDI once
- Wait while patient inhales five breaths through the device
- Remove pMDI from spacer
- Repeat steps for each actuation required
13. APPENDIX XI – WHEEZING IN INFANTS UNDER 2 YEARS OF AGE

The National Asthma Clinical Care programme has been set up to develop guidelines and protocols for the management of asthma. The terms of reference does not include infantile wheeze.

The members of the working group recognize that infantile wheeze presents a particular set of issues both in primary and secondary care. While the scope of this programme does not allow for specific guidelines in this area we recommend that health care providers refer to the following consensus statement from the European Respiratory Society.

### APPENDIX XII – ACKNOWLEDGEMENTS

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Asthma Programme Working Group</strong></td>
<td></td>
</tr>
<tr>
<td>National Clinical Programme Lead</td>
<td>Dr Pat Manning, Respiratory Consultant, HSE Regional Hospital Mullingar</td>
</tr>
<tr>
<td>ICGP Lead</td>
<td>Dr Dermot Nolan, General Practitioner, Tramore Medical Clinic, Waterford</td>
</tr>
<tr>
<td>Specialist In Public Health</td>
<td>Dr Ina Kelly, HSE Dublin Mid Leinster</td>
</tr>
<tr>
<td>Patient Organisation</td>
<td>Dr Jean Holohan, CEO Asthma Society of Ireland</td>
</tr>
<tr>
<td>Clinical Nurse Specialist (Adult)</td>
<td>Ann Tooher, Mullingar Regional Hospital</td>
</tr>
<tr>
<td>Clinical Nurse Specialist (Children)</td>
<td>Niamh O’Regan, Mullingar Regional Hospital</td>
</tr>
<tr>
<td>Practice Nurse Development Coordinator</td>
<td>Rhonda Forsythe, PNDC</td>
</tr>
<tr>
<td>Nursing Service Planner</td>
<td>Marian Wyer, Tullamore General Hospital</td>
</tr>
<tr>
<td>Respiratory Scientist</td>
<td>Maria McNeill, Respiratory Scientist, Chair of IARS</td>
</tr>
<tr>
<td>Irish Pharmacy Union</td>
<td>Pamela Logan, Director Pharmacy Service, IPU</td>
</tr>
<tr>
<td>AHP Representative</td>
<td>Joanne Dowds, Physiotherapist, St James Hospital</td>
</tr>
<tr>
<td>Programme Manager</td>
<td>Noreen Curtin, Clinical Strategy and Programmes Directorate</td>
</tr>
<tr>
<td>Regional Lead DNE</td>
<td>Dr John Faul, Respiratory Consultant, Connolly Hospital</td>
</tr>
<tr>
<td>Regional Lead DML</td>
<td>Prof Stephen Lane, Respiratory Consultant AMNCH</td>
</tr>
<tr>
<td>Regional Lead South</td>
<td>Dr Terry O’Connor, Respiratory Consultant, Mercy University Hospital, (President of the Irish Thoracic Society to Nov 2011)</td>
</tr>
<tr>
<td>Regional Lead West (to March 2012)</td>
<td>Dr Robert Rutherford, Respiratory Consultant, Merlin Park Hospital</td>
</tr>
<tr>
<td>(March 2012 to date)</td>
<td>Dr Anthony O’Regan, Respiratory Consultant, University College Hospital Galway</td>
</tr>
<tr>
<td><strong>RCPI Clinical Advisory Group</strong></td>
<td>Regional Leads</td>
</tr>
<tr>
<td></td>
<td>Dr Aidan O’Brien, Respiratory Consultant, Mid Western Regional Hospital Limerick</td>
</tr>
</tbody>
</table>
Dr Barry Linnane, Paediatric Respiratory Consultant, Mid Western Regional Hospital Limerick

Dr Basil Elnazir, Paediatric Respiratory Consultant, Adelaide Meath and National Children’s Hospital, Tallaght

Dr Des Murphy, Respiratory Consultant, Cork University Hospital

Dr Una Geary, ED Programme Lead, Consultant in Emergency Medicine, St. James Hospital

Prof. Ronan O’Sullivan, Head of Paediatrics, School of Medicine & Medical Science, UCD, Consultant in Paediatric Emergency Medicine, Our Lady’s Children’s Hospital Crumlin

Dr Garry Courtney, Acute Medicine Programme Lead, Clinical Director, St Luke’s Hospital Kilkenny

Prof Shane O’Neill, Acute Medicine Programme Lead, Respiratory Consultant, Beaumont Hospital

Prof Alf Nicholson, Consultant Paediatrician, Children’s University Hospital, Temple Street

Dr Geoff King, Director, Pre-Hospital Emergency Care Council

Dr Philip Crowley Chair.

Margaret O’Riordan Chair