

Chapter 1 : First10EM Classic: Management of Severe Asthma - CanadiEM

Severe asthma with fungal sensitisation is defined as severe asthma with evidence of sensitisation to one or more of seven fungi (as specified earlier). 26 Allergic bronchopulmonary aspergillosis is rare in paediatric asthma, but fungal sensitisation is common.

Signs that your asthma is under control are: You can participate fully in any activity you choose. You do not need to miss school or work because of asthma symptoms. You rarely need to visit urgent care or the emergency department for asthma. You have the best lung function possible. Your medications control your asthma with as few side effects as possible. You are satisfied with your asthma care. Four fundamental steps for achieving these goals are: Treating co-existing medical conditions. Monitoring changes in your symptoms or lung function. When symptoms flare up, a written Asthma Action Plan can help you begin treatment at home and figure out when to get additional medical help. What asthma medications are used for long-term asthma control? For people with persistent asthma, using asthma control medications daily is key to achieving the treatment goals. Long-term control medications include inhaled corticosteroids, inhaled long-acting beta agonists, leukotriene modifiers, theophylline, omalizumab, and cromolyn. This reduces your risk of having an asthma attack. Knowing what triggers your asthma is a necessary first step. You and your provider can work together to identify your triggers. Common triggers include pet dander, dust-mites, cockroaches, pollen, mold, and viruses. Exercise, cold air, and pollution can also trigger symptoms. It can be helpful to think about which triggers you are regularly exposed to and when your symptoms are worst. Allergy testing can confirm specific allergies. This can help you to focus on the most important things to avoid. Certain triggers are unavoidable, but you can be prepared for times when additional treatments may be needed. You can monitor your asthma based on symptoms or using a peak flow meter. Both methods can work well. Symptom-based monitoring may be better for children. Peak flow monitoring may be better for people with severe asthma, a history of sudden attacks, or difficulty noticing worsening symptoms. Monitoring your asthma helps you to notice the start of an asthma attack early. By starting treatment right away, you may be able to avoid having a severe asthma attack. How are asthma attacks treated? Follow your written Asthma Action Plan in the event of an asthma flare-up. Your plan should describe who and when to call based on your peak expiratory flow measurements and the type of symptoms you are having. In general, treatment begins at home. The next steps depend on how your symptoms respond to your rescue medication. What alternative therapies are used to treat asthma? In general, there have been very few studies of complementary and alternative therapies for asthma. Herbal remedies and homeopathy have not been studied well enough to know whether they work. Sign up for emails from Asthma. Subscribe By providing your email address, you are agreeing to our privacy policy. We never sell or share your email address. Let us know at contact Asthma. Try again or let us know at contact Asthma. Expert panel report 3 EPR Guidelines for the diagnosis and management of asthma - Full Report Ann Allergy Asthma Immunol.

discussion of severe asthma phenotypes in relation to genetics, natural history, pathobiology and physiology, as well as sections on evaluation and treatment of severe asthma where specific recommendations for practice were made.

Mild symptoms up to two days a week and up to two nights a month
Mild persistent Symptoms more than twice a week, but no more than once in a single day
Moderate persistent Symptoms once a day and more than one night a week
Severe persistent Symptoms throughout the day on most days and frequently at night

Treatment Prevention and long-term control are key in stopping asthma attacks before they start. Treatment usually involves learning to recognize your triggers, taking steps to avoid them and tracking your breathing to make sure your daily asthma medications are keeping symptoms under control. In case of an asthma flare-up, you may need to use a quick-relief inhaler, such as albuterol. Medications The right medications for you depend on a number of things – your age, symptoms, asthma triggers and what works best to keep your asthma under control. Preventive, long-term control medications reduce the inflammation in your airways that leads to symptoms. Quick-relief inhalers bronchodilators quickly open swollen airways that are limiting breathing. In some cases, allergy medications are necessary. Long-term asthma control medications, generally taken daily, are the cornerstone of asthma treatment. Types of long-term control medications include: You may need to use these medications for several days to weeks before they reach their maximum benefit. Unlike oral corticosteroids, these corticosteroid medications have a relatively low risk of side effects and are generally safe for long-term use. These oral medications – including montelukast Singulair , zafirlukast Accolate and zileuton Zyflo – help relieve asthma symptoms for up to 24 hours. In rare cases, these medications have been linked to psychological reactions, such as agitation, aggression, hallucinations, depression and suicidal thinking. Seek medical advice right away for any unusual reaction. These inhaled medications, which include salmeterol Serevent and formoterol Foradil, Perforomist , open the airways. Some research shows that they may increase the risk of a severe asthma attack, so take them only in combination with an inhaled corticosteroid. These medications – such as fluticasone-salmeterol Advair Diskus , budesonide-formoterol Symbicort and formoterol-mometasone Dulera – contain a long-acting beta agonist along with a corticosteroid. Because these combination inhalers contain long-acting beta agonists, they may increase your risk of having a severe asthma attack. Theophylline Theo, Elixophyllin, others is a daily pill that helps keep the airways open bronchodilator by relaxing the muscles around the airways. Quick-relief rescue medications are used as needed for rapid, short-term symptom relief during an asthma attack – or before exercise if your doctor recommends it. Types of quick-relief medications include: These inhaled, quick-relief bronchodilators act within minutes to rapidly ease symptoms during an asthma attack. Short-acting beta agonists can be taken using a portable, hand-held inhaler or a nebulizer – a machine that converts asthma medications to a fine mist – so that they can be inhaled through a face mask or a mouthpiece. Like other bronchodilators, ipratropium acts quickly to immediately relax your airways, making it easier to breathe. Oral and intravenous corticosteroids. These medications – which include prednisone and methylprednisolone – relieve airway inflammation caused by severe asthma. If you have an asthma flare-up, a quick-relief inhaler can ease your symptoms right away. Keep a record of how many puffs you use each week. If you need to use your quick-relief inhaler more often than your doctor recommends, see your doctor. You probably need to adjust your long-term control medication. Allergy medications may help if your asthma is triggered or worsened by allergies. Over time, allergy shots gradually reduce your immune system reaction to specific allergens. You generally receive shots once a week for a few months, then once a month for a period of three to five years. This medication, given as an injection every two to four weeks, is specifically for people who have allergies and severe asthma. It acts by altering the immune system. Generally, over the span of three outpatient visits, bronchial thermoplasty heats the insides of the airways in the lungs with an electrode, reducing the smooth muscle inside the airways. This limits the ability of the airways to tighten, making breathing easier and possibly reducing asthma attacks. Treat by severity for better control: A stepwise approach Your treatment should be flexible and based on changes in your symptoms, which should be

assessed thoroughly each time you see your doctor. Then your doctor can adjust your treatment accordingly. For example, if your asthma is well-controlled, your doctor may prescribe less medicine. Asthma action plan Work with your doctor to create an asthma action plan that outlines in writing when to take certain medications or when to increase or decrease the dose of your medications based on your symptoms. Also include a list of your triggers and the steps you need to take to avoid them. Your doctor may also recommend tracking your asthma symptoms or using a peak flow meter on a regular basis to monitor how well your treatment is controlling your asthma. Request an Appointment at Mayo Clinic Clinical trials Explore Mayo Clinic studies testing new treatments, interventions and tests as a means to prevent, detect, treat or manage this disease. Lifestyle and home remedies Although many people with asthma rely on medications to prevent and relieve symptoms, you can do several things on your own to maintain your health and lessen the possibility of asthma attacks. Avoid your triggers Taking steps to reduce your exposure asthma triggers is a key part of asthma control, including: Use your air conditioner. Air conditioning reduces the amount of airborne pollen from trees, grasses and weeds that finds its way indoors. Air conditioning also lowers indoor humidity and can reduce your exposure to dust mites. Minimize dust that may worsen nighttime symptoms by replacing certain items in your bedroom. For example, encase pillows, mattresses and box springs in dustproof covers. Remove carpeting and install hardwood or linoleum flooring. Use washable curtains and blinds. If you live in a damp climate, talk to your doctor about using a dehumidifier. Clean damp areas in the bath, kitchen and around the house to keep mold spores from developing. Get rid of moldy leaves or damp firewood in the yard. Having pets regularly bathed or groomed also may reduce the amount of dander in your surroundings. Clean your home at least once a week. If your asthma is worsened by cold or dry air, wearing a face mask can help. Stay healthy Taking care of yourself can help keep your symptoms under control, including: Treatment can prevent asthma attacks and control symptoms during activity. Regular exercise can strengthen your heart and lungs, which helps relieve asthma symptoms. If you exercise in cold temperatures, wear a face mask to warm the air you breathe. Maintain a healthy weight. Being overweight can worsen asthma symptoms, and it puts you at higher risk of other health problems. Control heartburn and gastroesophageal reflux disease GERD. If you have frequent or constant heartburn, talk to your doctor about treatment options. You may need treatment for GERD before your asthma symptoms improve. Alternative medicine Certain alternative treatments may help with asthma symptoms. However, keep in mind that these treatments are not a replacement for medical treatment especially if you have severe asthma. Talk to your doctor before taking any herbs or supplements, as some may interact with medications you take. While some alternative remedies are used for asthma, in most cases more research is needed to see how well they work and to measure the extent of possible side effects. Alternative asthma treatments include: These exercises may reduce the amount of medication you need to keep your asthma symptoms under control. Herbal and natural remedies. A few herbal and natural remedies that may help improve asthma symptoms include black seed, caffeine, choline and pycnogenol. Coping and support Asthma can be challenging and stressful. You may sometimes become frustrated, angry or depressed because you need to cut back on your usual activities to avoid environmental triggers. You may also feel limited or embarrassed by the symptoms of the disease and by complicated management routines. The best way to overcome anxiety and a feeling of helplessness is to understand your condition and take control of your treatment. Here are some suggestions that may help: Take breaks between tasks and avoid activities that make your symptoms worse. Make a daily to-do list. This may help you avoid feeling overwhelmed. Reward yourself for accomplishing simple goals. Talk to others with your condition. If your child has asthma, be encouraging. Involve teachers, school nurses, coaches, friends and relatives in helping your child manage asthma. However, when you call to set up an appointment, you may be referred to an allergist or a pulmonologist. What you can do These steps can help you make the most of your appointment: Write down key personal information, including any major stresses or recent life changes. Take a family member or friend along, if possible. Sometimes it can be difficult to recall all the information provided to you during an appointment. Someone who accompanies you may remember something that you missed or forgot. Write down questions to ask your doctor. Your time with your doctor is limited, so preparing a list of questions will help you make the most of your time together. List your questions from most important to least important in

case time runs out. For asthma, some basic questions to ask your doctor include:

inadequate asthma management from severe asthma despite optimal asthma management. Moreover, based on emerging scientific evidence, we sought to provide guidance for characterizing individuals with severe asthma and considering a phenotype-specific management. We also aimed to review other novel new potential therapeutic approaches.

Print Diagnosis For adults and children over 5 years old, lung pulmonary function tests are used to check how well the lungs are working. In some cases, lung function tests are also used in asthma emergencies to help check the severity of an asthma attack or how well treatment is working. Lung function tests include: Your doctor may take a peak flow reading when you come in for a scheduled visit or for emergency treatment during an asthma attack. This test measures how quickly you can breathe out. You also may use a peak flow meter at home to monitor your lung function. The results of this test are known as peak expiratory flow PEF. A peak flow test is done by blowing into a mouthpiece as hard and as fast as you can with a single breath expiration. During spirometry, you take deep breaths and forcefully exhale into a hose connected to a machine called a spirometer. A common spirometry measurement is forced expiratory volume, which measures how much air you can breathe out in one second. The results of this test are known as forced expiratory volume FEV. Spirometry can also measure how much air your lungs can hold and the rate at which you can inhale and exhale. A newer diagnostic test, this exam measures the amount of nitric oxide gas you have in your breath when you exhale. High nitric oxide readings indicate inflammation of the bronchial tubes. Exhaled nitric oxide can be measured by having a patient exhale directly into an analyzer. Exhaled air may be captured in a nitric-oxide-impermeable container for measurement later. This test is used during a severe asthma attack. It measures the amount of oxygen in your blood.

Treatment If you and your doctor have worked out an asthma plan, follow its directions at the first sign of an asthma attack. Small children and those who have trouble with inhalers can use a nebulizer. After 20 minutes, you can repeat the treatment one time if necessary. Same-day medical care is also warranted if you continue to wheeze and feel at all breathless after initial treatment. Your doctor may recommend that you continue to use quick-acting medication every three to four hours for a day or two after the attack. You might also need to take oral corticosteroid medication for a short time. These are the same medications as those in your quick-acting rescue inhaler. You may need to use a machine called a nebulizer, which turns the medication into a mist that can be inhaled deep into your lungs. Taken in pill form, these medications help reduce lung inflammation and get your asthma symptoms under control. Corticosteroids can also be given intravenously, typically to patients who are vomiting or under respiratory failure. Ipratropium is sometimes used as a bronchodilator to treat a severe asthma attack, especially if albuterol is not fully effective. Intubation, mechanical ventilation and oxygen. If your asthma attack is life-threatening, your doctor may put a breathing tube down your throat into your upper airway. Using a machine that pumps oxygen into your lungs will help you breathe while your doctor gives you medications to bring your asthma under control. Your doctor will give you instructions on what to do if you have another asthma attack. In some cases, a severe, persistent asthma attack requires a stay in the intensive care unit ICU.

Request an Appointment at Mayo Clinic Clinical trials Explore Mayo Clinic studies testing new treatments, interventions and tests as a means to prevent, detect, treat or manage this disease. Lifestyle and home remedies All asthma attacks require treatment with a quick-acting rescue inhaler such as albuterol. One of the key steps in preventing an asthma attack is to avoid your triggers. If your asthma attacks seem to be set off by outside triggers, your doctor can help you learn how to minimize your exposure to them. Allergy tests can help identify any allergic triggers. Washing your hands frequently can help reduce your risk of catching a cold virus. If your asthma flares up when you exercise in the cold, it may help to cover your face with a mask or scarf until you get warmed up. Preparing for your appointment Be prepared for your visit to your doctor so that you can get the most out of your appointment. Take your asthma action plan with you when you see your doctor. This plan should discuss how to treat an asthma attack. Also bring your peak flow meter results and all of your medications. Be prepared to discuss your symptoms, and how much your asthma has been bothering

you. Often, periodic changes in treatment are needed to keep asthma under control and to prevent asthma attacks. Be prepared to demonstrate using your metered-dose inhaler. Your time with your doctor is limited, so preparing a list of questions will help you make the most of your time together. Some good questions to ask your doctor include: Do my medications or treatment plan need to be changed? What are the signs that I may be about to have an asthma attack? What steps do I need to take to stop an asthma attack in progress? When do I need to go to the emergency room or seek other emergency treatment? What can I do to prevent this? Is it time for my flu shot? Am I due for a pneumonia shot? What else can I do to protect my health during cold and flu season? What to expect from your doctor Your doctor is likely to ask you a number of questions. Being ready to answer them may reserve time to go over any points you want to spend more time on. Your doctor may ask: Have you noticed anything that makes your asthma worse? What medications are you taking? How and when are you taking them? Can you show me how you use your inhaled medication? Are you having any problems with your medications? Do you know when to call me or go to the hospital? Do you have any questions about your asthma action plan? Are you having any problems with your asthma action plan?

Chapter 4 : Management of Severe Asthma: A Transition from Inhalations to Biologics – DRG Blog – D

Epinephrine in the management of severe asthma Epinephrine has a theoretical advantage for asthmatics who have not quickly responded to beta-2 agonists: it will act as an alpha agonist which may help decrease airway edema as well as providing additional beta-2 agonism.

Bradycardia, dysrhythmia, or hypotension. If patient has any life-threatening feature: Measure arterial blood gases. No other investigations are needed for immediate management. Blood gas markers of a life-threatening attack: Patients with severe or life-threatening attacks may not be distressed and may not have all these abnormalities. The presence of any should alert the doctor. Requiring IPPV with raised inflation pressures. CO₂ retention is not usually aggravated by oxygen therapy in asthma. Salbutamol 5mg or terbutaline 10mg via an oxygen-driven nebuliser. Prednisolone oral 40–50mg or hydrocortisone IV mg or both if very ill. No sedatives of any kind. Chest radiograph only if pneumothorax or consolidation are suspected or patient requires IPPV. Discuss with senior clinician and ICU team. Add IV magnesium sulphate 1. Give nebulised Beta2 agonist more frequently e. Prednisolone oral 40–50mg each day or hydrocortisone IV mg 6 hourly. Nebulised Beta2 agonist and ipratropium 4–6 hourly. Continue oxygen and steroids. Discuss patient with senior clinician and ICU team. IV magnesium sulphate 1. Repeat blood gas measurements within 1 hour of starting treatment if: Transfer to ICU accompanied by doctor prepared to intubate if: Deteriorating PEF, worsening or persisting hypoxia, or hypercapnea. Exhaustion, feeble respirations, confusion or drowsiness. Coma or respiratory arrest.

Chapter 5 : Management of Acute Severe Asthma in Adults in Hospital

While most asthma patients with a milder form of disease are well controlled, treatment options for severe, refractory asthma patients have long been the key unmet need in this space.

She has been admitted to hospital 4 times this year, including one visit to the ICU. In fact, her lungs are silent to auscultation. Asthma is a respiratory problem not an airway problem. Unless the patient arrives in arrest, there is no reason to intubate immediately. Adding plastic to the airway only makes things worse. The immediate action is to start oxygen and bronchodilators. Give both albuterol salbutamol for most countries and ipratropium bromide. Also, stick to nebulizers in these patients. Asthmatic patients do not typically require a lot of supplemental oxygen. I apply nasal prongs to everyone, but typically skip the face mask because it is going to be replaced with a nebulizer anyway. Of course, nebulize with oxygen. Albuterol and lots of it: This often occurs simultaneously, as we have a large team in resus. However, if you are working with a smaller staff prioritize the breathing meds over the IV. Steroids will take a minimum of 6 hours to have a noticeable effect. Therefore, they are unlikely to help you in the resus room, but the earlier they are given the earlier they are able to work. In the critically ill asthma patient, other therapies e. Focus on the therapies that will help the patient immediately, but get a dose of intravenous steroids on board as soon as you have a minute. The final medication that I routinely include in the management of life threatening asthma is magnesium. The dose of magnesium sulfate is 2 grams IV repeated up to 3 times in the first hour. If the patient is not improving with these first line therapies, I consider two second line medications: Epinephrine can be safely given to asthmatic patients of any age see Cydulka in references. Some practitioners will use terbutaline instead of systemic epinephrine, and that is reasonable, but I prefer epinephrine because it is common medication we are all very comfortable dosing, it adds alpha effects, and I can provide push doses if needed. Ketamine is used to treat agitation, allow for proper pre-oxygenation of the patient, and get the rest of the medications on board. Non-invasive positive pressure ventilation can be used as part of this pre-oxygenation. There are reports of patients improving after the combination of ketamine and BiPAP, obviating the need for intubation. The plan is to use ketamine to pre-oxygenate and buy time to prepare for a safe, controlled intubation. If the patient is not improving with maximal medical management, it is time to start thinking about positive pressure ventilation and intubation. A common teaching is: If you are considering intubation, BiPAP should almost certainly be tried first. Remember that putting a piece of plastic in the trachea does nothing to help these patients. In fact, it increases airway resistance and dead space. The reason you considering intubation is because of respiratory fatigue and BiPAP can provide exactly the pressure support that these patients need. These patients need to be constantly reassessed All of your intubation equipment should be ready at the bedside The benefit of BiPAP comes from the pressure support. NIPPV only allows the patient to temporarily rest their respiratory muscles, it does not solve the underlying asthma pathophysiology. In emergency medicine, we love the airway, but asthma is one scenario that we should be wary of grabbing a laryngoscope. This physiology sets them up for hemodynamic collapse. Add to that hypercapnea, acidosis, and hypoxia and it is not hard to understand why the chances of a peri-intubation arrest are so high. Intubating patients with severe asthma There are some reasonable arguments to be made for an awake intubation, however, in this critically ill patient I want to stay within my comfort zone and ensure I am ideally set up for first pass success. Therefore, I use rapid sequence intubation. First, I prepare for post-intubation hypotension. We often ignore the vent and allow our RTs to be the experts. This is a situation where the wrong vent settings can kill the patient. The ventilator settings are essential. Ventilator Settings The goals are to main oxygenation while minimizing dynamic hyperinflation and barotrauma. The key is to allow as much time as possible to the patient to exhale. I would recommend starting with the following settings: However, be very careful if using assist control mode because if the patient is distressed and starts breathing on their own, they can quickly increase their respiratory rate, decrease their I: We are allowing hypercapnia to prevent significant autoPEEP and barotrauma. This can be very distressing, so significant sedation is required. If the plateau pressure is too high, decreasing the respiratory rate can help. ECMO Extracorporeal Membrane Oxygenation Removing the

lungs from the equation while continuing to treat the underlying inflammation and bronchospasm seems to make sense. There are obviously no randomized control trials to support the practice fortunately, asthma this severe is not common , but there are a number of case reports. If your center has an ECMO team, it is probably worth getting them on the phone to discuss the patient. The authors of the Cochrane review on the topic conclude: IV beta2 agonists are another treatment that is often discussed. There are two Cochrane reviews that conclude that there is very little evidence to support this. This section summarizes the dosing of the medications recommended above in children.

Asthma exacerbations can be classified as mild, moderate, severe, or life threatening. Criteria for exacerbation severity are based on symptoms and physical examination parameters, as well as lung.

Print While most asthma patients with a milder form of disease are well controlled, treatment options for severe, refractory asthma patients have long been the key unmet need in this space. Though prescribed to patients across different severities of asthma from mild to severe, these drugs have been of limited use to treat exacerbations associated with severe, refractory asthma. Over the last few years, pharmaceutical companies and physicians have increasingly realized the heterogeneous etiology behind the disease and that there is no panacea available for all asthma patients. They have recognized the dire need of a more customized approach and targeted medications to treat each asthma patient individually, especially the severe ones who face more frequent exacerbations. Big Pharma is therefore focusing primarily on the development of drugs that cater to the unmet need in severe asthma. The majority of these drugs in late-phase development target different cytokines involved in the inflammatory cascade of asthma pathophysiology. The launch of Nucala mepolizumab , an anti-IL-5 by GlaxoSmithKline in Q4 , the recent launch of Cinqair reslizumab , another anti-IL-5 by Teva , and the forthcoming anticytokines in the asthma pipeline further prove this point. There are only a few biologic therapies in late-phase development targeting biomarkers other than cytokines. Here are the few key biologic therapies that are under development for the treatment of severe, refractory asthma: Another anti-IL-5, benralizumab, a molecule from AstraZeneca , is under development for the treatment of severe, eosinophilic asthma patients who are 12 years old and above. Benralizumab is distinct from the currently marketed anti-IL-5s, Nucala and Cinqair, due to the fact that it specifically targets the alpha subunit of the IL-5 receptor, the binding site of IL-5, while the existing IL-5 antagonists aim to neutralize the circulating cytokine itself. In phase III, benralizumab is under development as a 30 mg subcutaneous dose every 4 or 8 weeks while Nucala and Cinqair are each administered every 4 weeks, giving benralizumab an anticipated competitive advantage provided 30 mg every 8 weeks receives regulatory approval. Following its anticipated filing by the end of this year, the initial launch of benralizumab is expected in . The results from a phase IIb study suggest that tralokinumab subcutaneous injection every two weeks significantly improved FEV1 levels compared with placebo. However, no significant reduction in the number of exacerbations was observed. Dupilumab is a humanized MAb being developed by Regeneron Pharmaceuticals in collaboration with Sanofi for the treatment of moderate to severe uncontrolled asthma patients. Currently in phase III trials, the drug has demonstrated promising efficacy through its significant reduction in exacerbations and improvement in lung function in phase II trials. QAW, also known as fevipiprant, is a CRTh2 antagonist being developed by Novartis for the treatment of severe, uncontrolled asthma. QAW is an oral agent with once-daily dosing that is currently in phase III trials to evaluate its efficacy and safety in patients suffering from severe, uncontrolled asthma with and without a high eosinophil count. While in one phase II trial in patients with high eosinophilic levels the drug showed a statistically significant reduction in eosinophils compared with placebo at 12 weeks, there was no improvement in the ACQ7 or trough FEV1. Given the strong unmet need in the severe asthma space, the trends in development, and positive clinical results demonstrated by multiple biologic therapies, this new emerging set of biologics will be a long yearned addition to the asthma armamentarium for pulmonologists and allergists, enabling them to adopt a customized approach to asthma treatment. Efficacy and safety of tralokinumab in patients with severe uncontrolled asthma: Fevipiprant, a prostaglandin D2 receptor 2 antagonist, in patients with persistent eosinophilic asthma:

Chapter 7 : Acute severe asthma - Wikipedia

When the diagnosis of asthma is confirmed and comorbidities addressed, severe asthma is defined as asthma that requires treatment with high-dose inhaled corticosteroids (ICS) plus a second controller and/or systemic corticosteroids to prevent it from becoming 'uncontrolled', or that remains.

They were updated in November. In common with other recommendations, these give guidance only up to the commencement of intensive care. Evidence for therapies in intensive care from randomized controlled trials remains sparse. Ongoing management of life-threatening episodes Fig. Complications of treatment are frequent. Pathophysiology The pathophysiological feature of life-threatening asthma is gas trapping with dynamic hyperinflation and the generation of intrinsic positive end-expiratory pressure PEEPi. This arises due to disproportionate increases in resistance to expiratory gas flow, rapid respiratory rates, changes in pulmonary elastic recoil, and asynchronous respiratory muscle activity. The consequences include impaired gas exchange, increased work of breathing with respiratory muscle fatigue, and increased risk of barotrauma. Hyperinflation may be so severe that lung volumes approach total lung capacity. Diaphragmatic flattening at such volumes reduces the efficiency of ventilation as inspiration becomes primarily by intercostal muscles rather than the diaphragm. Together, these factors reduce CO₂ elimination while increasing production. At a point, production will match and then exceed rate of elimination progressing to respiratory failure when there is inadequate alveolar ventilation. In addition, airway closure causes mismatches in ventilation-perfusion leading to hypoxaemia. Large negative intrathoracic pressures generated by the augmented inspiratory effort, as well as PEEPi through its effects on right atrial filling, can impede cardiac output. Dehydration from reduced intake and increased respiratory losses, along with the development of hypoxaemia, hypokalaemia, and acidosis may further exacerbate this. Management of life-threatening asthma Initial management A rapid ABC assessment should be undertaken and actioned. Many patients will be hypoxaemic, hypovolaemic, acidotic, and hypokalaemic. Oxygen Patients with acute severe asthma are hypoxaemic. A FiO₂ of 0. It is important to note that asphyxia remains the most common mechanism of death in severe asthma and should never be underestimated. Importantly, duration of activity and effectiveness are inversely related to severity of asthma; continuous administration is more efficacious in severe asthma. Side effects are minimal. Steroids Systemic steroids in adequate doses should be given to all patients with life-threatening asthma, as early as possible in the episode as this may improve survival. Steroid tablets prednisolone 40–50 mg daily have been shown to be as efficacious as intravenous steroids in acute severe asthma, provided tablets can be swallowed and retained. If in any doubt, the intravenous route should be used hydrocortisone mg stat followed by mg 6 hourly. Intravenous magnesium sulphate A single intravenous dose of magnesium sulphate 1. Magnesium is a smooth muscle relaxant, producing bronchodilation. Rapid administration may be associated with hypotension. Anecdotal evidence suggests repeated doses or infusions may be of benefit dose limited by twice normal serum magnesium concentrations ; however, hypermagnesaemia is associated with muscle weakness and may exacerbate respiratory failure in spontaneously breathing patients. An additional or alternative intravenous bronchodilator is aminophylline. Concern and controversy about its use arises from its side effects arrhythmias, restlessness, vomiting, and convulsions related to a narrow therapeutic window. Trials showing little overall benefit in lesser degrees of asthma may not be relevant when faced with impending asphyxia. Epinephrine The additional use of epinephrine adrenaline should be considered in patients not responding adequately to the measures outlined above via the subcutaneous 0. Mechanical ventilation Who should be intubated, and when and how should mechanical ventilation be initiated? The initiation of invasive ventilation in life-threatening asthma is a bedside clinical decision based on an assessment of the balance of risks and benefits. It can be life saving, but has a higher incidence of complications relative to other causes of respiratory failure. Absolute indications are coma, respiratory or cardiac arrest and severe refractory hypoxaemia. Relative indications include an adverse trajectory of response to initial management, fatigue and somnolence, cardiovascular compromise, and the development of a pneumothorax. Prior to initiation, vigilant observation is mandatory as fatal apnoea can occur suddenly and unexpectedly. In life-threatening asthma, the

induction of anaesthesia, tracheal intubation, and initial ventilation are all extremely hazardous as dramatic changes in physiology occur with the induction of anaesthesia, and with the switch from high intrinsically produced negative intrathoracic pressures to high positive pressures from extrinsic ventilation. Half of the life-threatening complications occur at or around the time of intubation in patients mechanically ventilated for asthma; consequently, intubation should be performed by the most senior and experienced member of anaesthetic staff available with the help of appropriately trained assistance. Where possible, pre-oxygenation should be performed diligently followed by a rapid sequence induction. Hypotension at the initiation of ventilation should be anticipated and attenuated by fluid pre-loading. Vasopressors should be immediately available for use post-induction. Hypotension can be severe enough to result in complete loss of cardiac output or mimic that occurring with a tension pneumothorax. Causes of hypotension are multifactorial, including vasodilatation and reduction in sympathetic tone on induction, absolute hypovolaemia and reduction in venous return consequent to high intrathoracic pressures precipitated by ventilating against high airway resistance. Initial hand ventilation is often over-enthusiastic and contributory; it should follow the principles outlined for the mechanical ventilation below and be kept to a minimum; rate should be kept low and no PEEP should be applied. If profound hypotension does occur when assisted ventilation has been initiated, consideration should be given to disconnecting the patient from the circuit possibly with the addition of pressure on the chest wall to assist expiratory flow to allow full passive expiration. A chest x-ray should be performed following intubation when it is safe to do so, to assess correct positioning of the endotracheal tube and exclude pneumothoraces. What are the initial goals of mechanical ventilation and how are they achieved? The initial goals of mechanical ventilation are to correct hypoxaemia, reduce dynamic hyperinflation and to buy time for medical management to work. Adequate sedation is vital and typically would be morphine and midazolam with ketamine. Morphine has a potential for histamine release so is avoided by some. Propofol and fentanyl, and ketamine plus midazolam alone are alternatives. The attraction of ketamine 0. Evidence of benefit is equivocal; use maybe limited by its effects on respiratory tract secretions and its sympathomimetic properties in a patient already in a heightened sympathetic state. Initial neuromuscular blockade is often required. Rocuronium or pancuronium is the agents of choice. Atracurium is associated with histamine release. Some concern has been raised over the relative likelihood of developing a neuromyopathy with vecuronium in this setting high-dose steroids, mechanical ventilation, and severe asthma, though the evidence is limited. The use of neuromuscular blockade should be discontinued as soon as possible. High airway pressures should prompt the exclusion of endobronchial intubation and pneumothorax, along with the re-evaluation of the adequacy of sedation. Plateau airway and end-expiratory pressures generally reflect the degree of gas trapping in severe asthma; in addition, total exhaled volume during an apnoea for 20–60s gives a measure of the degree of hyperinflation. Of note, barotrauma in the mechanically ventilated asthmatic including the risk of pneumothorax is proportional to end inspiratory lung volume. Additional complications of mechanical ventilation in life-threatening asthma include profound hypotension, cardiac stunning, arrhythmia, rhabdomyolysis, lactic acidosis, myopathy, and CNS injury. Cardiac stunning is thought to be consequent to massive sympathetic activation, arrhythmias generally tend to be benign, rhabdomyolysis is rare and is thought to stem from hypoxaemia in combination with extreme exertion; lactic acidosis in severe asthma is poorly understood. Management of hypercarbia Permissive hypercapnia is a well-proven protective lung strategy for limiting the deleterious effects of barotrauma in many causes of respiratory failure. During the mechanical ventilation for life-threatening asthma, our ability to correct hypercapnia is generally limited and fraught with hazards. The exception is in those with cerebral anoxia secondary to a respiratory arrest. Control of intracranial pressure requires management of hypercarbia; urgent consideration should be given to extra corporeal CO₂ removal in these circumstances see later. Where respiratory acidosis is extreme and its ventilatory management impossible, buffering can be considered acutely. Tromethamine THAM has some theoretical advantages over bicarbonate. Use with either agent is usually complicated by metabolic alkalosis on resolution of the acute bronchospastic episode. Ongoing ventilatory management The use of neuromuscular blockade and deep sedation should be discontinued as soon as the clinical situation allows and the return to spontaneous ventilation should be achieved as soon as is practical. During this process, patient ventilator

interactions become more important and the use of PEEP and the selection of appropriate trigger sensitivities assume important roles in reducing the work of breathing. Additional management methods

Inhalational anaesthetic agents Volatile inhalational anaesthetic agents e. Increased benefit may occur with earlier administration and their use should be considered in patients with life-threatening asthma not responding to standard treatments. Hypotension is their principal side effect. The delivery of volatile anaesthetic agents can be difficult in the intensive care unit setting and may force the use of a lower fidelity ventilator in a sub-optimal environment. In line devices for use with high fidelity ventilators are available, but scavenging and agent monitoring are absolute requirements. Extra-corporeal support Case reports of the use of extra-corporeal membrane oxygenation in life-threatening asthma suggest that this may be successful, but its limited availability and the risk profile limit its applicability. In contrast, the development of less complex systems of extra-pulmonary gas exchange that facilitate CO₂ clearance e. Their use should be considered particularly where the control of hypercarbia is imperative.

Bronchoscopy Bronchoscopy has a limited role in managing patients with persistent shunt consequent to mucus plugging. Lavage of the obstructed lung segments and the removal of mucus plugs may reduce the duration of ventilation, but is often complicated by bronchospasm. In general, patience and persistence with standard therapies and meticulous attention to the hydration and humidification are as effective.

Antibiotics The majority of episodes of acute severe asthma that has an infective precipitant follow a viral infection. The routine use of antibiotics in life-threatening asthma has no rationale and they should be considered only in selected cases.

Non-Invasive ventilation Although there is a sound evidence for the use of non-invasive ventilation NIV in acute exacerbations of chronic obstructive lung disease, its use in asthma is controversial. Objective evidence of benefit is very limited; a recent Cochrane review 7 could only find one well-conducted prospective, randomized trial of just 30 patients that showed improvements in the respiratory rates in asthmatics with mild to moderate exacerbations when NIV was added to the standard medical care. Currently, the use of NIV in even mild to moderate exacerbations of asthma cannot be recommended outside the randomized controlled trials. NIV has no role in the management of life-threatening exacerbations of asthma.

Heliox Heliox oxygen in helium reduces the density of the gas mix to improve turbulent gas flow. Use has been reported in less severe acute exacerbations of asthma where, in spontaneously breathing patients, it may reduce the work of breathing. This use is not, however, supported by an evidence base and its utility is further limited by a maximum oxygen fraction of 0. Use of heliox with a mechanical ventilator is complex, requiring the recalibration of the pneumotachographs and the use of density independent spirometry of exhaled gas flows.

Leukotriene antagonists Currently available leukotriene antagonists Montelukast, Zafirlukast have no role in management of life-threatening asthma.

Monoclonal anti-IgE antibodies Omalizumab is thought to be effective at reducing the number and possibly the severity of acute exacerbations of asthma in adults with moderate to severe allergic asthma that is inadequately controlled by inhaled steroids. It is a preventative measure and has no role in the management of acute life-threatening episodes.

Chapter 8 : Asthma - Diagnosis and treatment - Mayo Clinic

Managing acute asthma in children For more details on the initial management of life-threatening acute asthma, see Initial management of life-threatening acute asthma in adults and children Download as A3 Poster (PDF, KB).

Chapter 9 : Management of Acute Asthma Exacerbations - - American Family Physician

If your symptoms are severe and don't go away after you follow your asthma action plan and use your medications as directed by your doctor, then call and get emergency medical help.