

Assessment and therapeutic management of acute asthma: The approaches of nursing staff in patient care

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Abstract

Acute severe asthma describes serious asthmatic attacks, which remain a major treatment challenge and a significant source of morbidity in adults. It places the patient in danger of developing respiratory failure, a condition known as status asthmaticus. It is often fatal if not recognized and treated early. Many patients are at risk for numerous reasons; thus, the key issues are early detection, assessment and management. A multidisciplinary and collaborative approach is needed to effectively treat acute respiratory failure (ARF). Considerable research has investigated the range of opportunities available for treating asthma. Current treatment options include conventional agents, such as inhalational corticosteroids, β -agonists, leukotriene modulators, monoclonal antibodies, and oral corticosteroids (OCS). Nurses are in a perfect position to assess patients' risk of developing respiratory failure, monitor them, evaluate their care, and coordinate a multidisciplinary approach. In this review, we discuss acute asthma and the role of the nursing officer (NO) in the management of the illness. The review will also emphasize various current treatment approaches available for the NO that can effectively target and prevent respiratory failure. This review provides nurses and other healthcare workers with updated information on timely, effective and safe supportive management of patients with asthma.

Key words: assessment, drugs, nursing officer, status asthmaticus, therapeutic management

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Introduction

Asthma is a common and serious inflammatory illness of the airways characterized by fluctuating expiratory flow, respiratory symptoms and exacerbations (flare-ups) that can lead to hospitalization and even death.¹ In contrast to other respiratory conditions, airway obstruction in asthma is usually reversible.² An exacerbation is a change in the patient's prior state, which involves diminished respiratory function and a gradual rise in other related symptoms associated with an asthma episode. Asthma has significant morbidity, mortality and financial impact. It is generally a chronic condition; understanding the typical development and recurrence of symptoms in the past is critical.³ The history of current illness and complications show a recurrent pattern of wheezing, chest tightness, dyspnea, and cough. Symptoms of asthma are mostly aggravated during nighttime, after the awakening or due to the exposure to various asthma triggers (Fig. 1). Asthma is a complicated genetic condition according to both family-based and twin research. A variety of genetic and environmental variables influence how the condition manifests clinically, including the phenotypes of bronchial hyperresponsiveness, atopy and elevated immunoglobulin E (IgE). Most experts agree that gene–environment interactions play a role in the development of asthma. Several well-known risk factors for developing asthma include pollution, obesity, microbial exposure, occupation, nutritional factors, genetic predisposition, and stress.^{4,5}

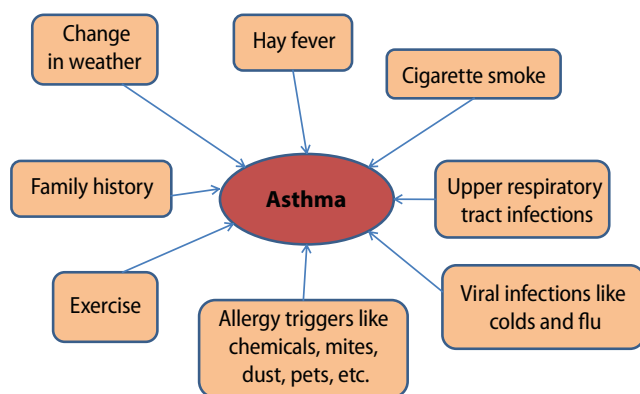


Fig. 1. Common triggers of asthma

Airway inflammation is the primary issue in asthma. Multiple inflammatory cells, mediators and tissues in the airways interact intricately to trigger asthma (Fig. 2). Most cases of asthma that become clinically noticeable are treated either outside hospitals or in emergency departments (EDs). Asthma exacerbations can also be severe enough to require hospital admission. Approximately 25,000–50,000 of the 2 million adult asthma patients treated in EDs require intensive care unit (ICU) treatment; however, the majority do not require intubation or mechanical ventilation.⁶

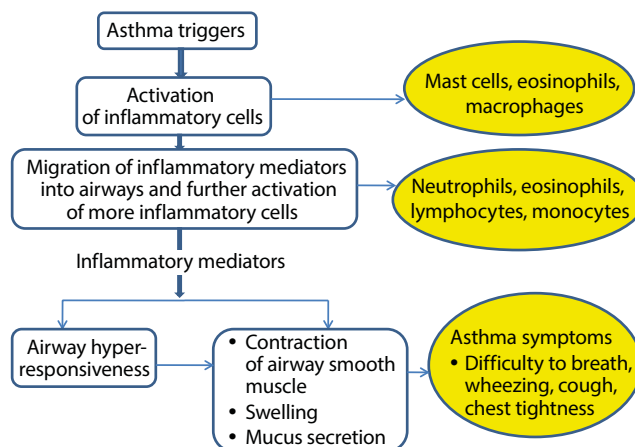


Fig. 2. Various inflammatory mediators, tissues and cell interactions in the airways

Objectives

This study aimed to provide a report on the clinical approaches and therapeutic management of nursing interventions in alleviating acute asthma. This review also gathered information regarding various pharmacotherapeutic agents that have been used to control asthma episodes. Moreover, the article focuses on the role of nursing officers (NOs) in the management of asthma.

Methodology

Data for this review were collected from different electronic scientific databases, including PubMed, Scopus, Science Direct, and Google Scholar. Various recent research and review papers were studied in order to gain insight into the therapeutic management of asthma and the role of NOs regarding various aspects of acute asthma management, such as intensive care providers and educators in self-management, as well as inhaler use during an asthmatic episode. After rigorous and thorough study, we identified significant information regarding various triggers, assessments, therapeutic agents, and role of NOs in the management of asthma. The gathered data were divided into several sections in accordance with the paper's objective. To find relevant articles, various keywords, including “nursing officer”, “acute asthma”, “status asthmaticus”, “respiratory failure”, “drugs”, and “asthma management” were used. Of all 94 studies, 25 focused on the introduction, assessment, diagnosis, and benefits of NOs as educators. Forty-five studies presented a brief introduction to the management of asthma, 7 studies highlighted the role of NOs in the ICU and in asthma self-management, and 17 studies investigated the role of NOs in inhaler education. The methodology adopted for conducting the structured literature review is presented in Fig. 3.

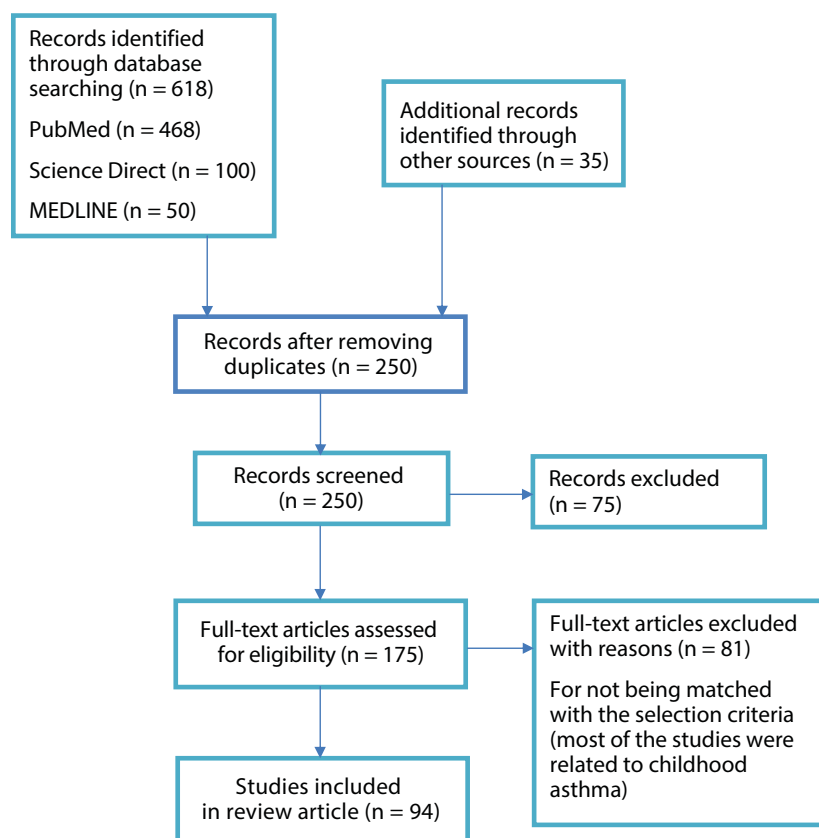


Fig. 3. Methodology adopted for conducting the review

Assessment

The Global Initiative for Asthma (GINA) has established various guidelines for assessing, preventing and managing asthma attacks.⁷ According to these recommendations, a patient with well-controlled asthma should not have any activity restrictions, no nocturnal or early-morning symptoms, and only sometimes require relief medication (less than twice per week). Inquiries on symptom frequency and intensity, exacerbation episodes, oral corticosteroid usage, and emergency room visits should be straightforward and precise. The Asthma Control Test (ACT) (QualityMetric/GlaxoSmithKline) and Asthma Control Questionnaire (www.qoltech.co.uk/acq.html) are validated questionnaires that are readily available and easy for patients to complete. They offer a useful framework that is objective and can be utilized to gauge therapy response over time.⁸ Asthma control refers to the extent to which asthma symptoms in a patient are observed, have decreased or been eradicated as a result of treatment.⁸ Before starting treatment, nurses must assess whether the patient's asthma is controlled (Fig. 4).

Diagnosis of asthma

In order to accurately diagnose asthma in teenagers and determine the severity of their condition, it is necessary to combine rigorous history-taking, clinical examination,

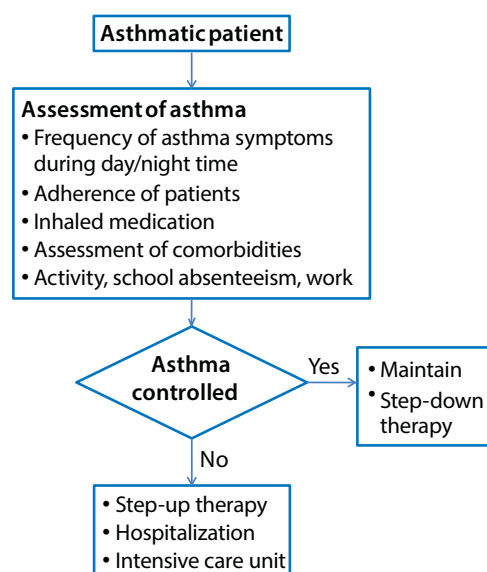


Fig. 4. Assessment of asthma

objective measurements of airway obstruction, airway hyperresponsiveness, and atopy. Basic diagnostic assessments include clinical history and examination, lung function tests (spirometry), exhaled nitric oxide tests (to assess airway inflammation), assessments of airway hyperresponsiveness, sputum eosinophil levels, blood eosinophil levels, and chest X-rays.⁹

Spirometry may be the most accessible test that can be performed to confirm an asthma diagnosis. Asthma

is consistent with an obstructive picture, a forced expiratory volume in 1 s/forced vital capacity (FEV₁/FVC) ratio of less than 70%, and related reversibility after bronchodilator treatment. This test is included as a “must perform” objective test in the National Institute for Health and Care Excellence (NICE) recommendations, which were released in the UK for all patients over the age of 5 years with a probable diagnosis of asthma (<https://www.nice.org.uk/guidance/ng80>). All individuals aged ≥ 17 years should undergo a bronchodilator reversibility test if an obstructive spirometry result is present; an improvement of $\geq 12\%$ in FEV₁ and an elevation of ≥ 200 mL is considered positive of reversible airflow obstruction. However, one of the main problems with using spirometry to diagnose asthma is that it must always be used and interpreted correctly.¹⁰ If this is not accomplished, there is a significant risk of both underdiagnosis and overdiagnosis.¹¹ Lack of consistency in terms of the definitions for the lower limit of “normal” can cause the interpretation of spirometry findings to vary even among specialized lung function laboratories.¹² The fact that the values may be normal when measured in the clinic during stable illness has an impact on how spirometry results are interpreted in the context of an asthma diagnosis. Adults who are examined in primary care often have minimal illness and well-preserved lung function.¹³

The exhaled nitric oxide test is another diagnostic test for asthma. This test is used to assess airway inflammation in asthma patients. Exhaled air can be used to track elevations in nitric oxide caused by inflammatory cytokines in the central and peripheral airways. This test for an increased percentage of exhaled nitric oxide (FeNO) reflects relatively good steroid responsiveness and possibly eosinophilic-mediated inflammatory pathways in asthma.¹⁴ The FeNO testing is considered a supplement to measurements of lung function as an indirect marker of airway inflammation, since the core pathophysiology underlying asthma includes eosinophilic airway inflammation as well as reversible airflow restriction. However, other variables, such as atopy, smoking and current steroid therapy, affect FeNO assessment. As a result, although considered helpful in assisting with an asthma diagnosis, it is clear that its clinical value and accuracy are highest for individuals who have never used steroids and who do not smoke. It is important to keep in mind that even though a high level is supportive of an asthma diagnosis, a level below 40 ppb does not eliminate the possibility of asthma because of the unpredictability of FeNO.¹⁵

Currently, measuring airway eosinophils is not necessary to diagnose mild to moderate asthma. Patients who are believed to have severe illness are more likely to benefit from induced sputum inflammation.¹⁶ The time and skill needed for the induction, processing and analysis of the sample make the use of sputum eosinophil levels to diagnose asthma difficult to put into practice. This is why it is preferable to utilize less intrusive biomarkers that might indicate airway eosinophilia.¹⁷ Since a blood

test is easier and can be conducted frequently in all clinical settings, it is more appealing to use peripheral eosinophils to diagnose asthma in both adults and children compared to airway eosinophils.¹⁸

For the usual evaluation or diagnosis of asthma, chest X-rays are not advised. An X-ray of the chest is often unremarkable or may only show hyperinflation, and is only advised when other illnesses beyond asthma, such as cardiovascular disorders in older persons, are suspected.¹⁹

The benefits of nursing officers as educators

Being on the front lines of patient care, NOs have a unique opportunity to examine patients at risk and provide them with additional care and knowledge.²⁰ Nursing officers have been recognized as important care providers and educators in the supervision of chronic illnesses, including asthma.²¹ The management of chronic illnesses is in the hands of nurses, who are frequently primary caregivers. In the majority of care programs for patients with asthma, both expert and nonspecialist NOs play a critical role in the delivery of care at the primary, secondary and tertiary levels. In certain contexts, prescribing nurses also make treatment choices and adjustments.²¹ According to a cross-sectional study, more than half of the patients favored nurse practitioners over general practitioners for the educational aspects of their treatment and were happy with the NO for the supportive components of care for themselves and their families.²² On the other hand, the patients preferred that their physician handle the medical aspects of their care. According to a qualitative interview study, specialist nurses' input aided practice nurses in identifying, monitoring and auditing the care of high-risk asthma patients.²³ Pediatric NOs have been found to be good care supervisors and educators in the inpatient setting. These results highlight the positive skill set provided when NOs and physicians collaborate for the benefit of their patients, demonstrating that this strategy may better address the desires of patients than the care provided by a physician alone. Consistent asthma management necessitates strong cooperation between the patient and the NO.²⁴ The NO can forge an active partnership with patients by fostering open communication, identifying and addressing patient and family concerns about asthma and asthma treatment, creating treatment objectives, choosing medications in conjunction with the patient, the patient's family and the patient's doctor, and promoting self-monitoring and treatment. It has been proven that self-management education in particular improves the status and quality of life of asthma patients.²⁵ A hospital-based investigation revealed that asthma-related discussions, specifically with an expert NO, increased patient self-management activities, which resulted in fewer symptoms, better lung function and fewer missed workdays.²⁴

Therapeutic management

The major goals in treating asthma patients are to alleviate symptoms, prevent exacerbations and allow them to continue their daily activities.²⁶ Nurses play a critical role in managing the course of asthma, and they should broaden their knowledge and abilities in order to provide appropriate treatment advice. Nurses' responsibilities include diagnosing asthma, managing acute exacerbations, supervising self-management programs, discontinuing therapy, adjusting medication dosage, and educating patients on inhaler technique.²⁷ The GINA established a number of guidelines for the diagnosis, prevention and treatment of asthma. Asthma control refers to how well a patient's asthma symptoms are controlled and whether they are visible or have been reduced or eliminated as a result of treatment.

The principal aim of asthma management is to control the disease (Fig. 5). By initiating treatment at the level most likely to produce peak flow, the stepwise strategy seeks to eliminate symptoms as quickly as possible. Patients should begin the treatment at the step that corresponds to the severity of their asthma. The goal is to achieve early control and maintain it by increasing medications as needed and decreasing treatment when control is satisfactory.²⁸ The most common classes of medications used to treat asthma are discussed below.

β_2 -adrenergic receptor agonists

Bronchodilators, especially short-acting beta agonists (SABAs), such as salbutamol (albuterol), terbutaline, levalbuterol, and pirbuterol, are the first-line medications and the cornerstone of acute asthma medications. The SABAs should be given repeatedly or continuously to people with acute severe asthma. The β_2 -adrenoreceptors (β_2 -ARs),

which are predominantly found on smooth airway muscle cells but also on certain airway cells, including inflammatory cells, are activated by these substances. Their most distinguishing feature is that they begin to work quickly while still being easily tolerated, even at large doses. The β_2 -AR agonists have been known for decades, but there is still much that can be done to improve their selectivity, so that they can have the desired impact with fewer side effects. All current asthma recommendations support SABAs as first-line therapy for acute severe asthma. Patients are encouraged to optimize their use as required in the early stages of increasing therapy during an exacerbation. Additionally, in the primary care environment and in the emergency room, it is recommended that SABAs be repeatedly provided by inhalation. In studies comparing the efficacy of nebulizers compared to metered-dose inhalers (MDIs), nebulized administration was shown to be ineffective. In a recent study, nebulized delivery had no effect on hospital admission, ED length of stay or pulmonary function.²⁹ The GINA 2021 states that a pressurized MDI (pMDI) with a spacer is the preferred mode of administration, with solid evidence (evidence A).³⁰ When discussing severe and nearly deadly cases of asthma, this evidence becomes less compelling. Several trials and meta-analyses have been unsuccessful in providing significant research in favor of continuous use of nebulized SABAs for acute asthma, despite the fact that it was initially a highly promising approach. There was no change in respiratory function evaluated in the first hours of administration or the risk of hospital admissions, according to a systematic review and meta-analysis.³¹ A Cochrane systematic review on the subject, which included a few more studies, found a remarkable variation equally in respiratory function and hospital admissions in favor of long-term use of SABAs, as well as demonstrated a high level of tolerance among patients who had no adverse effects with this

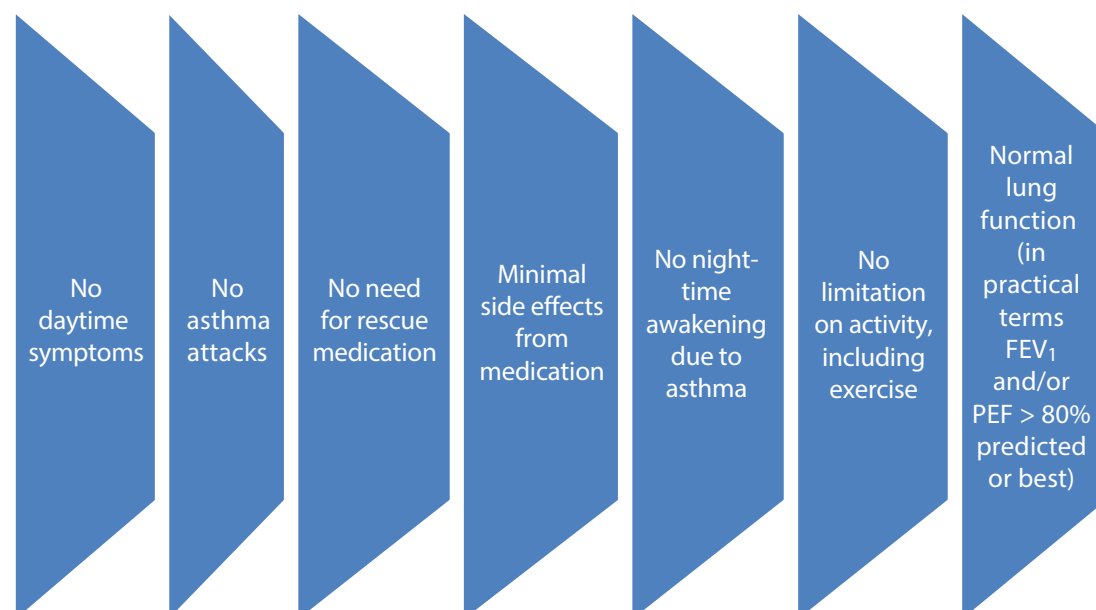


Fig. 5. The aims of asthma control

FEV₁ – forced expiratory volume in 1 s;
PEF – peak expiratory flow.

technique of administration.³² Salbutamol (i.e., albuterol) is the most often prescribed SABA, with an onset of action of less than 10 min and a duration of approx. 6 h. Levalbuterol is a relatively new addition to the list of SABAs, having the advantage of a lower dose that has a similar effect to salbutamol. There is currently no confirmation of its potential in treating acute severe asthma as an intermittent regimen; however, there is evidence of its usefulness as a continuous nebulization method.^{33,34} Another alternative for treatment, particularly for those who did not benefit from considerable bronchodilation, has been continuous intravenous infusions of β_2 -agonists. The use of intravenous β_2 -agonists^{35,36} or the technique of continuous subcutaneous infusions of terbutaline is not supported by any data.³⁷ Epinephrine has been considered in subcutaneous, nebulized, intravenous, and intramuscular forms, but its usage is now limited to acute asthma, according to current guidelines.

Anticholinergics

Anticholinergic drugs block acetylcholine from binding to the muscarinic cholinergic receptor. As a result, they suppress parasympathetic nerve impulses and cause airway smooth muscle relaxation, which is advantageous in acute asthma. Furthermore, they prolong the bronchodilator action of β_2 -agonist-mediated bronchodilation through intracellular mechanisms.³⁸ Ipratropium bromide is the most commonly used anticholinergic drug because of its specificity for airway smooth muscle receptors, which minimizes systemic side effects. According to current recommendations, patients with moderate to severe acute and critical asthma, as well as those who did not respond well to SABA therapy, should use anticholinergics.³⁹ However, they are not suggested as the sole treatment for acute asthma. Adding inhaled ipratropium bromide to SABA treatment has been proven to improve hospitalization rates and lung function while reducing relapse rates.^{40,41} The benefit of combination treatment is stronger for people with acute asthma who are at greater risk of hospitalization. A rise in the number of mild adverse effects, such as tremor and mouth dryness, has been observed.

Corticosteroids

Inhaled corticosteroids (ICS) have been shown to decrease the rates of hospitalization and mortality in asthma patients.⁴² Beclomethasone, prednisone, fluticasone, mometasone, and formoterol are some of the commonly used ICS. Current recommendations suggest that large dosages of ICS administered during the first hour of a patient's presentation to the ED lower the probability of hospital admissions for patients who are not receiving systemic corticosteroid therapy.³⁰ Recent research concerning the rate of hospitalization or changes in lung function without the use of systemic corticosteroids appears to be

contradictory.⁴³ Owing to their potent anti-inflammatory effects, systemic corticosteroids play a vital function in the treatment of acute asthma, mainly in patients who are experiencing exacerbations while taking oral corticosteroids (OCS) or those having a history of exacerbations requiring OCS. They are also indicated for people who have not had a long-term response to SABA therapy. They appear to control the activity and migration of eosinophils and other inflammatory cells, as well as increase the number and sensitivity of β -ARs, in addition to their role in preventing asthma-related inflammation. On the other hand, their lack of bronchodilatory effects precludes their usage as monotherapy for acute asthma.⁴⁴ Despite the unambiguous recommendations of current guidelines, a recent multicenter study found that a significant number of patients who are admitted to hospitals do not receive systemic corticosteroids.⁴⁵ In terms of the route of administration, intravenous injection does not appear to be more effective than oral medication.⁴⁶ In reducing the risk of recurrence, intramuscular regimens are equally effective as oral ones.⁴⁷ Because it is faster and less expensive, the oral route is more accepted and favored. Intravenous administration must be explored for individuals who are not able to swallow because of dyspnea, or who cannot absorb medication adequately due to gastrointestinal problems, such as vomiting, according to guidelines.³⁰

Magnesium sulfate

Magnesium sulfate (MS) has been found to be a key co-factor in enzymatic activities, and alterations in its content can cause smooth muscles to respond differently. Hypomagnesemia can produce smooth muscle contraction, whereas hypermagnesemia can cause smooth muscle relaxation and bronchodilation, presumably by inhibiting the influx of calcium into the muscles. Magnesium sulfate has recently been suggested as a second-line therapy for acute severe asthma exacerbations at a dosage of 2 g over 20 min.⁴⁸ It has been demonstrated to lower the hospitalization rate in patients with an FEV₁ of 25–30% upon presentation, as well as in those who are refractory to early treatment. It is also correlated with improved lung function.⁴⁹ Its administration has not been linked to serious side effects; however, it is contraindicated in patients with hypermagnesemia and renal insufficiency. Magnesium sulfate has also been tested in a nebulized form for cases of asthma exacerbation, although there is little evidence to support it. A recent systematic evaluation of the effectiveness and safety of magnesium inhalation found that while safe, it does not provide remarkable benefits when evaluated in comparison to first-line inhaled medications; hence, it is not regularly recommended.⁵⁰ The existing literature is hesitant to completely support the usage of magnesium, owing to the wide range of severity in asthma episodes seen in trials, particularly in the setting of optimal first-line therapy with corticosteroids and β_2 -agonists.⁵¹

Methylxanthines

Aminophylline and theophylline (methylxanthines) are key therapies used for acute asthma because of their anti-inflammatory characteristics. They have been excluded from current guidelines due to their reduced safety profile, which comprises considerable harmful effects, as well as their failure to demonstrate improved results, in terms of pulmonary function or hospitalization rates, when being used for severe acute asthma.⁵¹ However, a review and meta-analysis found data to support the effectiveness of aminophylline when used in conjunction with other bronchodilators, but additional research is required in this area.^{52,53}

Leukotriene modulators

Leukotrienes are naturally occurring inflammatory substances that tighten airway muscles and produce mucus. Leukotriene modifiers help regulate asthma by inhibiting leukotrienes. According to a previous study, these drugs improve airflow and reduce asthma symptoms.⁵⁵ Montelukast, zafirlukast and zileuton are some of the widely used leukotriene modulators. Although leukotriene receptor antagonists are used to evaluate asthma treatment, research on the efficacy of antileukotriene medications given intravenously or orally in acute asthma is limited. Zafirlukast and montelukast have been examined in cases of patients with acute asthma and have been shown to improve lung function.^{54,55}

Oxygen supply

Although severe hypoxemia is not frequently associated with asthma exacerbations, arterial PO₂ derangements are ordinary in acute severe asthma because of a substantial ventilation/perfusion (V/Q) mismatch. Oxygen should be delivered using a nasal cannula or mask, with a target arterial oxygen saturation of 93–95%, or to patients who do not have access to saturation monitoring.²⁹ Although not all guidelines agree on the desired target saturation level, various studies have revealed that in severe acute asthma, treatment with controlled low-flow oxygen administration and a target SpO₂ is associated with better outcomes than high-flow 100% oxygen delivery, as it has been linked to increases in PaCO₂ and lower peak expiratory flow (PEF) values.^{56,57} Because of the pulmonary vasodilation caused by β_2 -agonists, which causes an increased perfusion of poorly ventilated areas, there is some evidence that using oxygen-driven nebulization with SABAs can worsen V/Q mismatches.⁵⁸ A V/Q mismatch occurs when part of the lung receives oxygen without blood flow or blood flow without oxygen. This occurs because of an obstructed airway or obstructed blood vessels in the lung.

Heliox

Heliox gas is composed of helium (70–80%) and oxygen (20–30%). It can be utilized to treat severe asthma exacerbations resistant to normal treatment or in individuals who have blockages in the upper airways. Heliox has a lower density than air, and its Reynolds number is lower, which means that it is less resistant to airflow in turbulent flow. This impact has the potential to reduce breathing effort and increase ventilation. Heliox will not enhance airflow in smaller airways, which are most impacted during an asthma episode, since they are frequently laminar and dependent on gas viscosity rather than density. Despite its potential advantages, some studies have recommended that it may help with acute asthma; however, no human trials have shown that it is superior to normal oxygen therapy. Heliox has not shown consistent efficacy in asthma exacerbations, either with or without intubation.⁵⁹ It has been demonstrated to be the most effective in reducing symptoms when utilized as a nebulizing gas for β_2 -agonist medications. The benefits of therapy are usually visible within minutes.⁶⁰ According to another study that applied a mechanical model, using heliox as a carrier gas increased gas delivery by up to 50% for both MDIs and nebulizers. Because its efficacy is dependent on the percentage of helium present, it should not be given to patients who require FiO₂ levels greater than 40%.⁶¹

Ketamine

Ketamine is a well-recognized medication that has been used in the USA since the 1960s. It is a dissociative anesthetic that can have a variety of effects, depending on the dosage. Ketamine can act as a strong analgesic and anesthetic drug, but also as a bronchodilator. In asthma patients undergoing rapid sequence intubation, a dosage of 1–2 mg/kg has been shown to be an inductive agent.⁶¹ It has no sedative effects at dosages lower than this, but it can produce laryngospasm and apnea at greater doses. Its psychotropic properties make it even less popular as a recreational drug. There are no large randomized studies to investigate its effects on asthma patients. There is some indication of its bronchodilatory action, particularly in mild and moderate asthma exacerbations and at dosages lower than 1 mg/kg, but larger studies are needed to confirm its role in asthma.^{62,63}

Antibiotics

Unless the clinical evaluation and patient history suggest that there is an infection, there is no evidence to support the use of antibiotics for severe acute asthma. In a retrospective cohort analysis, it was discovered that antibiotic usage was related to longer hospital stay and greater hospital expenses in patients hospitalized with acute asthma

and receiving OCS, despite a similar probability of therapy failure.⁶⁴ In prior research conducted in the USA, 60% of patients brought to the hospital with asthma exacerbations were given antibiotics without any explanation.⁶⁵ Current recommendations advise against antibiotic use and recommend that they be used only when all treatment options have been exhausted and there is definitive evidence of infection.

Add-on therapies

Three distinct monoclonal antibodies, omalizumab (an anti-IgE antibody), mepolizumab (an interleukin 5 (IL-5) antagonist monoclonal antibody (IgG1 kappa)), and reslizumab (an IL-5 antagonist monoclonal antibody (IgG4 kappa)), are additional treatments for uncontrolled severe asthma. Due to the need for injections and the possibility of major side effects, these medications are usually only used by experts. Some common side effects of the drugs^{66,67} used in asthma treatment are mentioned in Table 1.

Noninvasive ventilation in asthma

Noninvasive ventilation (NIV) is a well-established treatment for acute respiratory failure (ARF), congestive heart failure and immunocompromised individuals to avoid intubation. The goal of mechanical NIV is to reduce the effort required to breathe. If clinical improvement is not seen with conservative therapy, endotracheal intubation and mechanical ventilation should not be postponed. According to a new study, NIV can be used quite safely in certain patients with asthma exacerbations who are being well-monitored in order to shorten their hospital stays and avoid the difficulties that come with invasive mechanical breathing.^{68,69} According to research, younger individuals with asthma exacerbations are more likely than older patients to require invasive mechanical breathing. Patients receiving NIV treatment had considerably shorter hospital stay than patients who did not receive it.⁷⁰

Role of nursing officers in guiding self-management of asthma

Nursing staff can help patients control their asthma on their own. Effective self-management, according to the GINA recommendations, can significantly reduce asthma mortality. Self-monitoring of symptoms, a written asthma action plan (WAAP) to detect symptoms and respond to them, as well as frequent assessment of asthma control and treatment by healthcare practitioners are considered critical components of asthma management.⁷¹ Without any take-home booklets, patient education is ineffective; therefore, the absence of a WAAP is even less helpful. To assist in reducing symptoms, each WAAP should increase communication between healthcare professionals and patients.⁷² Patients with chronic illnesses who use smartphones or tablets have reported an improvement in their quality of life as this technology can provide clearer, visual explanations.⁷³ Consequently, Thammasat University's Center of Excellence for Allergy, Asthma and Pulmonary Diseases created the Asthma Care Application (ACA). An asthma action plan with videos demonstrating inhaler device use, emergency numbers for ambulances, basic asthma knowledge, the ACT, a record of exacerbations, reminders for inhaler usage/medications, and future appointments are the main features of this application. In a recent study, Hirunyanitiwattana et al. discovered that, when compared to the present WAAP, ACA has a high potential for enhancing a patient's asthma knowledge and plan satisfaction.⁷⁴

Role of nursing officers in the management of asthma patients admitted to the ICU

The level of care required must be carefully determined when a patient having an asthma exacerbation is admitted to the hospital. Patients should be hospitalized for

Table 1. Drugs used in asthma – indications and side effects

Medication	Side effects
β-agonist	headache, tremor, nausea, increased insomnia and nervousness in children, bronchospasm, pain, dizziness, cough, allergic reaction, dry mouth, fever, chills, sweating, dyspepsia
Inhaled corticosteroids	nasopharyngitis, pharyngitis, bronchitis, respiratory tract infection, sinusitis, influenza, oropharyngeal pain, back pain, viral gastroenteritis, abdominal pain, oropharyngeal candidiasis, dysphonia, rhinitis
Magnesium sulphate	respiratory failure, epigastric warmth, pain at the site of infusion, numbness and tingling
Methylxanthine	seizure, skeletal muscle tremors, urinary retention, tachycardia, myocardial infarction, cardiac flutter
Leukotriene modulators	dyspepsia, cholestatic hepatitis, urticaria, allergic granulomatous angiitis, eczema, dizziness, bronchitis, sinusitis and rarely aggressive behavior
Omalizumab	upper respiratory tract infection, dermatitis, pyrexia, streptococcal pharyngitis, alopecia, bronchitis, arthralgia, sinusitis, pain, otitis, pharyngitis, fatigue and nasopharyngitis
Mepolizumab	injection site reactions, eczema, headache, systemic allergic reactions, fatigue, systemic hypersensitivity reactions, influenza, muscle spasms, upper abdominal pain, pruritus, urinary tract infection

examination and additional therapy if their pretreatment FEV or PEF is below 25% of anticipated or personal best, or if their post-treatment values are below 40% after ED treatment, according to recommendations. Patients should be admitted to the ICU if they have a poor response to treatment (10% increases in PEF/FEV), chronic or unresponsive hypercapnia, altered mental status, hypotension, or major concomitant diseases (myocardial ischemia, tachyarrhythmias or pneumonia). High levels of inspired oxygen, constant nebulization of β -agonists, intravenous corticosteroids, and respiratory support should all be included in the ICU management of poorly responding asthmatic patients.⁷⁵ Clinicians must be aware of the need to maintain optimal oxygenation while avoiding dehydration and hypokalemia. In contrast to patients with chronic obstructive pulmonary disease who require regulated limiting oxygen, unrestricted high quantities of oxygen (60–100%) must be provided to overcome hypoxemia. Hypokalemia is common, and fluid resuscitation as well as the use of β -agonist bronchodilators can exacerbate it. Potassium chloride infusions may be necessary on a regular basis, with careful monitoring of serum levels and continuous electrocardiogram (ECG) monitoring. On admission to the ICU, a fast assessment of previous asthma therapy should be performed to identify aspects that may be intensified or deficiencies corrected. The β -blockers, aspirin, nonsteroidal anti-inflammatory medications, and adenosine are all contraindicated in asthma.^{76,77}

Role of nursing officers in inhaler education

The mainstay of asthma treatment, inhalers, deliver inhaled medication directly to the lungs during asthma exacerbations with minimal adverse systemic effects.⁷⁸ This method can be used to deliver all of the most frequently used treatments, including corticosteroids, anticholinergic medications, and short- and long-acting β_2 -agonists. The efficacy of therapy and medical outcomes, however, are contingent on a patient's ability to follow their dose regimen and use the device correctly.⁷⁹ The most popular devices on the market can be grouped into 4 categories: pMDIs, dry-powder inhalers (DPIs), nebulizers, and soft mist inhalers, each of which have its own set of benefits. There are some typical mistakes made by patients when using these products.^{80,81} Preparation, preinhalation, expiration, speed and/or depth of inhalation, and postinhalation breath hold are all common faults with the majority of prescribed inhalers.^{82,83} The pMDIs are the most commonly recommended devices for asthma, but they can be challenging to operate because of the high level of harmonization needed to activate the device while inhaling slowly and deeply.⁸⁴ A study in almost 3,000 patients found that more than half of those tested made at least one mistake when using their inhaler.⁸³ Spacers, valved

holding chambers and nebulizers are commonly utilized for young children who are unable to self-manage their inhaler use. However, the practicality of these systems and convenience difficulties limit their attractiveness to a wider range of patients. Some inhalers are linked to a high number of patient mistakes. For many patients, it is difficult to breathe deeply and forcefully, which is a key requirement of the DPI procedure and has an impact on particle size, which affects deposition of the drug and its usefulness.⁸⁰ Patient mistakes can lead to poor disease control.⁸⁵ Despite advances in inhaler manufacturing and instructions, the high frequency of erroneous inhaler techniques has remained consistent over the last 40 years.⁸³ Care should be given in matching each unique patient with the appropriate medicine for efficient asthma management. The 3 critical components of this decision – patient, device and medication – form a triangle, and it is critical that they all work together. Each patient should be given the best prescription, be knowledgeable about how to use their device properly to enhance its efficiency, and be satisfied with using it.⁸⁰ Finding the right inhaler for a patient, whether a toddler or an adult, is difficult, and many criteria must be taken into account, including age, physical dexterity, cognitive disability, personal choice, convenience of use, inspiratory flow rate, and medication drug required.⁸⁶ The 3W-H strategy, suggested by Dekhuijzen et al., is an extremely useful way for prescribing inhalers. It evaluates 4 simple questions: Who? What? Where? How?⁸⁷ The comorbidities and inspiratory ability that may impair medication administration, as well as obtaining the correct diagnosis and determining illness severity are crucial patient factors to consider. Furthermore, the type of drug and the location in the lungs where it should have its effect must be determined. When choosing the device and delivery method to utilize for each patient, the answers to these questions can be applied. These questions should be revisited on a regular basis, as the answers could change over time, and drugs may need to be adjusted. The administration strategy for optimal inhaler choice for treatment of adult asthma patients was recently devised by a specialist panel that included a respiratory specialist, a general practitioner, a nurse, and a pharmacist. This dual-action approach includes determining a patient's inspiratory capability, which can help select a suitable device, as well as successful patient involvement, which includes observing inhaler technique closely.⁸⁸ If a patient's prescription is altered, it is important to realize that not all inhalers are created equal, and devices are not interchangeable, necessitating additional teaching.⁸⁹ Nurses are in a unique position to better supervise asthma patients due to frequent nurse/patient/caregiver communication at various phases of disease management. They can identify patients who are unsuitable for a given medication or inhaler by following the steps indicated above. Furthermore, nurse-led inhaler instructions for patients or caregivers can have a favorable impact on the decision triangle's critical "technique" part.⁹⁰

In asthma, nurse-led patient evaluation and inhaler teaching are linked to better technique, adherence and patient confidence, with long-term effects.⁹¹ A comprehensive review of randomized controlled trials in asthma found that nurse-led educational interventions significantly improved self-management and self-efficacy.⁹² Research has found that nurse-led patient education remarkably improved inhaler proficiency and reduced noncompliance behaviors in asthma patients.⁹³ Such advancements should improve clinical results while also lowering morbidity and healthcare utilization. The patient's inhaler technique must be observed regularly, since poor habits and technique can develop over time, necessitating a review and adjustment of technique at each visit, and anytime a new inhaler is implemented. The guidelines also indicate that inhaler technique should be observed whenever asthma control deteriorates, particularly after an asthma episode and whenever a patient needs a check-up.^{94,95}

Limitations

This review article provides information regarding clinical approaches and therapeutic management of nursing interventions in alleviating acute asthma by studying various reviews and research articles. Due to the inability to examine electronic records, the authors were unable to include recommendations for patients given by NOs for self-management of asthma. Due to prevailing pandemic conditions, we were also unable to visit the hospital and conduct personal interviews with patients and NOs to make this article more informative.

Conclusions

Health education by nurses can significantly improve a patient's physical activity and efficiency. Practice nurses and respiratory nurse specialists play a significant role in the care of asthma patients, and they are ideally positioned to identify and assist people who have severe asthma. To reduce the risk of disease exacerbation, the NO should counsel the patient on the techniques of eliminating allergens from their environment and educate them about stress management, as these are 2 main problems that can lead to exacerbations. Aside from OCS, a variety of specialty treatments are available exclusively through specialist asthma services; thus, prompt referral is critical for all patients with poorly controlled asthma. This ensures that patients receive the best therapy available, with guidance from clinical trials, in order to reduce the number of acute deadly and near-fatal exacerbations, enhance symptom management, and improve the patient's quality of life. The nurse monitors and controls the patient's medication intake frequency as part of their treatment responsibilities. The goal of this task is to guarantee that the therapy has the best possible results.

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