

Asthma Disease Management: A Provider's Perspective

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Abstract

Asthma is a highly prevalent problem in Singapore, with an increasing societal and economic burden. However, asthma is also an eminently treatable condition, with evidence that integrated education-treatment efforts directed at important patient sub-groups can be cost-effective. What is important is a comprehensive and integrated asthma management programme, aimed at reducing the burden of asthma at all levels of the healthcare system, with the long-term goal of improving asthma care cost-effectively. This refers to asthma disease management. Asthma disease management should focus on identifying deficiencies in asthma management across the population diagnosed with the condition and establish a partnership between the patient, provider and the healthcare system to improve the overall quality of asthma care. The framework for implementing such a programme bridges key concepts and programmes that are already in place in the various institutions. These include patient and physician education, the use of clinical practice guidelines, clinical pathways, outcomes management, quality improvement processes, information technology, case management and existing asthma shared-care programmes and resources. In order to significantly reduce asthma morbidity, an integrated approach is required, involving individuals providing asthma care at various levels of care delivery. There is also a need to co-ordinate the efforts of such individuals and institutions involved so that there is good horizontal and vertical integration of care. The disease management approach described is intended to raise the overall standard of asthma care across a spectrum of patients with asthma.

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Introduction and Nature of the Problem

The burden of asthma appears to be increasing worldwide, especially in societies undergoing rapid urbanisation, and both morbidity and mortality from asthma have increased in many parts of the world, making it a global health concern.¹ In Singapore, asthma is a highly prevalent problem, with an increasing societal and economic burden. It is estimated that 140,000 individuals in Singapore have current asthma, with a prevalence as high as 20% among school children,² and 5% among the adult population.³ The overall economic burden of asthma in Singapore was recently estimated at US\$33.9 million (S\$61 million) per annum, with in-patient hospitalisations accounting for the largest proportion of direct medical expenditure, at approximately US\$8.5 million (S\$15.3 million) or US\$238 (S\$428) per asthmatic person per year.⁴ In addition, more than 100 individuals die of the disease annually.⁴

There is also evidence that asthma management at the primary healthcare-hospital level was sub-optimal, as only 23% of asthmatics presenting to an Emergency Department (ED) were on maintenance inhaled steroids and about half had attended the ED at least once in the previous 6 months.⁵

A recent Family Health Service study on asthma management at the polyclinic level showed that over half of the patients who presented with acute asthma had poorly controlled disease, and a third of patients with poor asthma control were inadequately treated.⁶ The increases in asthma-related morbidity and care costs are occurring despite scientific advances in knowledge about the disease and its therapies, and the availability and use of evidence-based practice guidelines. Hence, there still is a need to reduce the burden of asthma, both in terms of morbidity and economic expenditure.

Definition and At-risk Groups

Asthma is defined as a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, including mast cells, eosinophils, T lymphocytes, neutrophils and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and cough, particularly at night and in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible, either spontaneously or with

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treatment. The inflammation also causes an associated increase in the existing bronchial hyper-responsiveness to a variety of stimuli. A comprehensive review of complications and special considerations related to asthma is found in the National Institutes of Health (NIH) Guidelines for the Diagnosis and Management of Asthma.⁷ These guidelines include recommendations for the proper use of a wide range of medications available for the treatment of this condition, as well as education to promote more effective self-management.

Besides children with poorly controlled asthma and the elderly with severe disease (both at-risk groups for fatality), ethnic differences in asthma mortality have been shown to exist locally in Singapore.^{8,9} A population-based comparative study reported that in the age group from 5 to 34 years, asthma mortality rates varied from 0.5 per 100,000 in Chinese to 1.3 per 100,000 in Indians and 2.5 per 100,000 in Malays, with similar 2- to 4-fold differences being observed in all other age groups.⁸ While no single reason can explain these differences, there are good reasons to believe that personal behavioural factors, such as a lower level of understanding and self-efficacy in asthma management, do play important roles in increasing the risk of fatal outcomes.

Patients at high risk of asthma-related death require special attention, particularly intensive education, monitoring and care. Asthma deaths have been associated with a number of avoidable factors that could potentially be remedied. Identifiable risk factors associated with an increased risk of asthma-related death include previous life-threatening attacks or intubation for asthma, two or more hospitalisations for asthma in the past year, three or more ED visits for asthma in the past year, hospitalisation or ED visit for asthma within the past month, use of >2 canisters per month of inhaled short-acting β_2 -agonist, current use of systemic corticosteroids or recent withdrawal from systemic corticosteroids, poor perception of airflow obstruction, significant medical co-morbidity, serious psychiatric disease or psychological problems and illicit drug use.⁷ A failure in management is often observed among young patients who die of asthma. Such deaths may be due to failure to use anti-inflammatory drugs appropriately, poor compliance, and inadequate evaluation of the severity of the disorder by both the patients and healthcare professionals.

To develop an effective programme for reducing morbidity and costs of asthma for a population, it is necessary to know the nature of the illness in the patients whose exacerbations drive so much of the cost. There are several different categories, but for purposes of illustration, two general categories are:

1) patients with chronic severe asthma with recurrent

severe attacks, and

2) patients who appear to have mild asthma but who deteriorate when they contract a viral respiratory infection, are exposed to high levels of allergen, or encounter some other agent or event that worsens their asthma.

The first category is easier to identify, while the second group is also at risk but requires more clues to identify. Because well-intentioned interventions are not always cost-effective, particularly when high-cost technologies are used in patients who have mild disease, better means are needed to identify high-risk patients who appear to have mild disease.

Asthma Disease Management Framework

Asthma is a chronic disease that is ideal for disease management. By reducing the frequency of acute episodes or exacerbations provoked by the chronic condition, clinical outcome, patient satisfaction and health-resource utilisation measures are improved. It is an eminently treatable condition with good evidence that specific interventions and adherence to treatment plans can be cost-effective and improve outcomes in the long-run.^{10,11} Although numerous studies show that specialists' care for asthma is cost-effective,¹²⁻¹⁴ it is also important that primary care physicians maintain overall management of their patients. The best care for the patient will not emerge from a competitive environment. Rather, high-quality care results when all providers who have something to contribute to the patient's improvement integrate their services seamlessly.

With these considerations in mind, the Ministry of Health (MOH) convened a professional workgroup to coordinate a National Asthma Shared Care Programme. This multifaceted and sustained intervention programme is aimed at reducing the overall burden of disease in asthma by emphasising long-term preventive treatment (mainly with inhaled corticosteroids) in the primary care and an optimised, closely monitored, stepped-up treatment plan for high-risk patients in hospitals. The rationale is to provide coordinated, evidence-based care that will improve care-delivery across the continuum of care at all levels.

The framework for implementing such an asthma disease management programme bridges key concepts and programmes already in place in some form in the cluster institutions. These include clinical pathways, patient and physician education, outcomes measurement, quality improvement, information technology, case management and the use of shared care programmes and other existing resources. The main thrusts of the shared care programme are:

1) public education for patients to expect quality preventive treatment,

- 2) a practical clinical guideline which provides basic tools to overcome barriers to appropriate treatment for the primary care doctor,
- 3) an enhanced asthma education and treatment programme at the polyclinics, and
- 4) a drug subsidy scheme for high-risk patients under specialist care at the restructured hospitals.

The National Asthma Shared Care Programme will involve a coalition of partners in advocacy of better asthma care in the community, including the active involvement of paediatricians, respiratory physicians, primary care doctors and the various asthma organisations. The main objective is to increase awareness and to put out consistent and coordinated messages to both patients and doctors. The theme for this year is “Action Against Asthma: Saving Lives and Cutting Costs”, and reiterating that simple steps can save lives and cut costs very effectively in asthma. By coordinating the activities of the various partners, the programme will be able to orchestrate a series of events and projects around this theme and share information and resources for a focused yet balanced approach to this problem.

Asthma Clinical Practice Guidelines

A set of asthma clinical practice guidelines (CPGs) with evidence-based recommendations on practical aspects of asthma management relevant to Singapore was produced by a workgroup of experts and distributed to all general practitioners (GPs) this year. The contents are available on the MOH website: <http://www.gov.sg/moh/pub/cpg/cpg.htm>. It should be noted that guidelines are based on the best available evidence at the time of development, and adherence to guidelines may not ensure successful outcome in all cases.

The 7 key recommendations of the MOH asthma CPGs are:

1. All doctors treating asthma patients should provide patient education to aid behaviour change,
2. Patients with persistent asthma (defined as needing relief medication one or more times per week) should be given inhaled corticosteroids to improve asthma control and reduce mortality,
3. Long-acting β_2 -agonists should be added in adults whose asthma is not controlled with 400 to 800 mcg of inhaled corticosteroids per day,
4. Low-dose inhaled corticosteroid is safe and therefore should be used in all children with persistent asthma,
5. Leukotriene receptor antagonist may be considered as an additional therapy in children on moderate dose (200 to 400 mcg per day) of inhaled steroids,
6. Doctors should avoid excessive use of short-acting β_2 -agonists (>2 units of metered dose inhalers per

month or home nebulisation) due to association with risk of asthma death, and

7. Drug treatment should be guided by regular assessment of asthma severity and control using a step classification system.

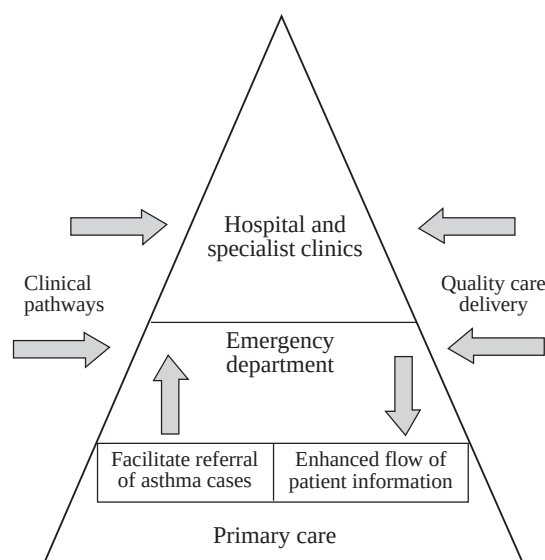


Fig. 1. Pyramid of asthma care.

Pyramid of Asthma Care

In the pyramid of asthma care-delivery, as the disease becomes more severe, there is an inverse relation between costs of care and the number of patients. It has been estimated that while most patients have mild to moderate disease, it is the 20% of patients with the most severe and potentially life-threatening disease that consume over 80% of healthcare costs for asthma.¹⁵ This is mostly related to the setting and intensity of their asthma treatment. Figure 1 shows the pyramid of asthma care, and the integration that occurs in asthma disease management.

However, a concerted attempt to reduce the health and economic burden of asthma by solely focusing on this small group of high-risk, high-cost generators may not yield significant long-term results. High asthma costs are in a way analogous to asthma mortality. Patients with identifiable clinical features of severe disease indeed have a greater risk of death from asthma, but because such patients make up a very small proportion of the total population of asthmatics, whereas people with mild disease, who individually have lower risks of expensive or lethal attacks, make up a larger proportion, even substantial reductions in the mortality rate or costs of care in most patients with identifiable clinical features of severe disease might have little impact on the total number of deaths or the total costs of asthma for the entire population.

To what extent do the 20% who account for so much of

the costs in one year again account for costs in the next year? Disease management interventions have in the past focused on patients who use the most resources or have the most severe and persistent symptoms in any given year (year one for example) and then amplified the success of such interventions through the impact of regression to the mean in year two. Such an approach unfortunately misses an opportunity to achieve better outcomes in the total population of subjects with asthma, and this phenomenon created by the tendency for patients with asthma to regress to the mean has been observed in many types of asthma patient populations. The key to a successful asthma disease management programme lies in a comprehensive and integrated approach, one that involves individuals providing asthma care at various levels of care delivery with good coordination of care.¹¹

Goals and Key Elements

The core elements of an asthma disease management programme consist of specific goals aimed at achieving improved global asthma control that is cost-effective. The primary goal may be to reduce the overall asthma morbidity and mortality in the population with the disease, with the long-term goal of ensuring cost-effective and high quality care. The secondary goals should comprise clinical, humanistic (provider/patient satisfaction) and financial outcomes. The key elements of an asthma disease management programme will include:

1. Establishing primary care and specialty practice guidelines,
2. The use of clinical pathways, ensuring uniformity of care delivery and to improve compliance with treatment guidelines,
3. Improving the cost-efficacy of treating asthma, including the identification of high-cost generators (recurrent ED visits, hospitalisations),
4. Special focus on 'difficult-to-control' asthmatics,
5. An asthma management programme at the primary care level with regimens appropriate for asthma severity,
6. Educational programmes for both patients and physicians,
7. A methodology for continuous quality improvement of the programme,
8. Clinical audit (asthma morbidity, mortality, quality of care delivery),
9. Enhancing the primary care-hospital interface, to provide seamless and coordinated care, and
10. The use of pre-determined monitoring instruments to evaluate outcomes.

Asthma Clinical Pathways

Clinical pathways have been developed to standardise the management of acute asthma with the aim of improving

asthma care.^{7,16} There is also the potential for safely reducing health-care costs with the institution of such guidelines and pathways. Although practice guidelines have been established to define optimum care, they have not always received enthusiastic support.¹⁷

The impact of an asthma care-path on the management of acute asthma exacerbations was recently evaluated at the Tan Tock Seng Hospital. The aim was to assess the effectiveness of an asthma in-hospital clinical pathway, based on standard asthma morbidity outcomes and indicators. Although the use of the asthma care-path did not significantly reduce length of hospital stay, it was associated with a significant reduction in the inappropriate use of sputum tests and antibiotics, with the potential for cost savings. Review of salbutamol nebulisations and oxygen as treatment was also more likely.¹⁸ A summary of the clinical pathway is shown in Figure 2. Several of our acute hospitals are currently running clinical pathways for asthma, either at the emergency department or at the ward level. Those developing the pathway best determine the components of a clinical pathway, so that local philosophies and practices can be taken into account. These components need to be reviewed regularly to assess the usefulness and applicability of the various components. A process of continual audit, outcome review and feedback will lead to a series of events that positively influence pathway development and implementation.

There are several essential components of the asthma care clinical audit process. They include a timeline, the categories of care or activities (to delineate the scope of care or service) and their interventions, intermediate and long-term outcome criteria (including the collection, organisation and analysis of data), the variance record and the actions taken to address adverse variances and quality improvement measures. The use of an asthma database or registry would be very useful in facilitating this process. The data collection would be automated, and 'real-time' or even online for up-to-date and easy access. The identification of high-risk cases and high-cost utilisers would be possible, as well as cases who default follow-up, or those who are faring poorly in the programme. A database would also facilitate an audit trail of medications prescribed and provide useful pharmaco-economic data on costs of asthma care.

Case Management

Case managers have been recruited and trained to coordinate asthma care at every level. They are also critical in developing, implementing and evaluating clinical pathways, carrying out discharge planning and assisting in drug utilisation reviews. Asthma case managers help to identify problems for the clinician, such as level of asthma control, compliance with existing medication, satisfaction

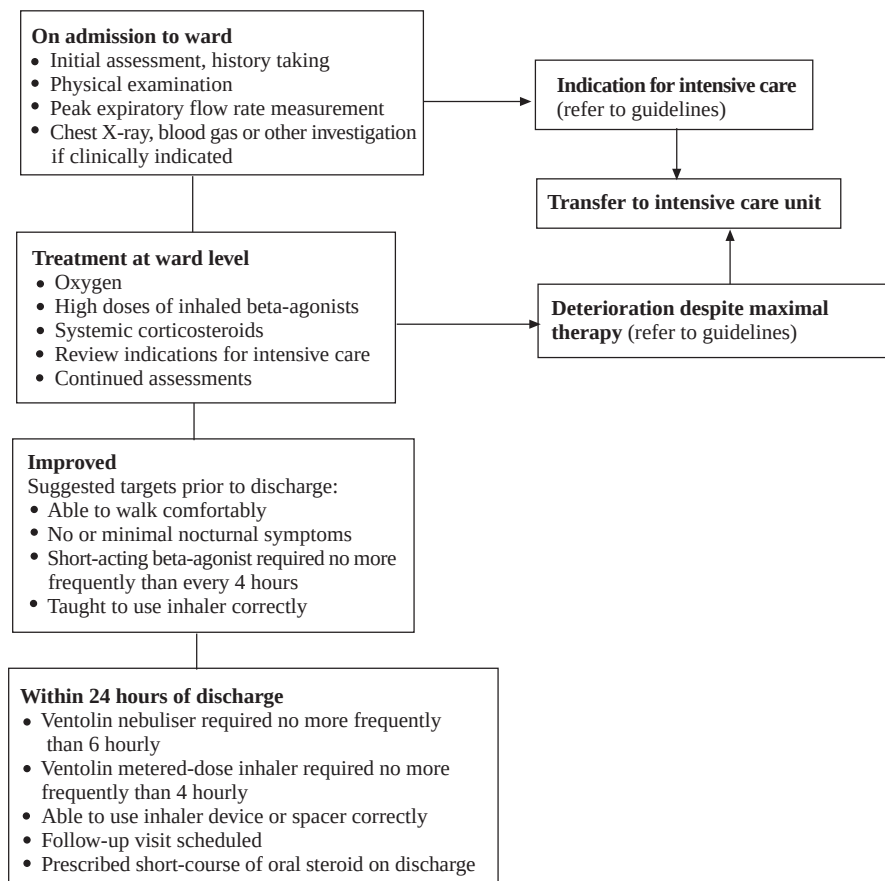


Fig. 2. Asthma clinical pathway.

with the treatment, patient-provider communication concerns and assist in the formulation of a written treatment plan. They help in developing clinical databases that would incorporate the tracking and monitoring of high-risk patients in the hospital, ED, specialist clinics and primary healthcare. Case managers are able to conduct training and impart knowledge to other case managers, nursing and paramedical staff to facilitate the implementation of new asthma initiatives. They also participate in IT developments for asthma programmes and data management, by assisting in the collection, collation and analysis of outcome measures.

One key strategy in asthma case management is the prevention of asthma attacks. To this end, case managers or nurse practitioners can do periodic phone-consults with their asthmatic patients to monitor their asthma so that patients can be proactive in preventing exacerbations. Case managers can also run intensive group educational activities for asthmatics, and this has also been found to be beneficial and cost-effective. In some centres, every asthmatic is encouraged to go through an educational programme, and case-management, either one-on-one or for the group, is discussed. The case managers work closely with doctors at every strata of care to manage and cost-contain asthma.

Asthma Education and Written Action Plans

Good asthma control often begins with having adequate knowledge of the disease and treatment goals. It subsequently requires behavioural changes and vigilance on the part of the asthmatic. This includes paying close attention to symptoms and adhering to treatment regimens which can be difficult for many patients due to multiple demands and stresses. To enhance adherence to treatment plans, patients and their families need to be actively involved in the development of written action plans, and physicians should address factors that can affect compliance and adherence.

By developing and using structured and standardised educational material on asthma, the multidisciplinary care team can provide clear and up-to-date patient education information. It is important to put out consistent and coordinated educational messages to patients, and everyone on the care team should reinforce these simple messages. To facilitate self-care and self-management, individualised written asthma action plans should be developed in partnership with patients. By providing a written action plan, patients will know what medications to take, when to take it and what to do in an emergency. Written action

plans, when included as part of a disease management programme, have been shown to improve asthma control, reduce hospitalisations and ED use, and improve patient quality of life.^{19,20} It is also important that physicians are proficient with current asthma guidelines and that they embrace the importance of patient involvement with asthma treatment decisions in improving adherence with therapy.

Outcome Measures

The effectiveness of an asthma management programme must be measured in terms of clearly-defined outcomes. While there is lack of consensus about the best outcome measure for asthma, the spectrum of acceptable outcomes for asthma care can no longer be considered a unidimensional component (e.g. reflected solely by physiologic measurement of pulmonary function). Important outcomes would be to assess how patients are being treated, how physicians are managing patients, measures of an individual's ability to cope with asthma and how health resources are being controlled without sacrificing quality of care to patients. Multidimensional outcome measures for asthma care include lung function, patient symptoms, functional status, health resource utilisation, satisfaction with care and cost-effectiveness studies.

Asthma Disease Management Triangle

For disease management programmes to be successful, it is necessary to view population-based interventions using a triad approach, with the patient, physician and disease management programme in mind. To the patient, asthma is a disease that causes recurrent attacks of shortness of breath, chest tightness, wheezing and cough. He needs to know about the disease, how to adhere to the treatment plan, and how to participate and take greater responsibility for the management of his asthma. He should have increased satisfaction through partnership with the physician.

The physician, or provider, assesses and manages asthma patients using current evidence-based guidelines and standards of care. He manages at the micro level. He develops individualised treatment plans that will empower

the patient to take greater responsibility for his condition. By involving the patient in his own management, he is better able to communicate with the patient and assess attitudes and behaviours, self-efficacy and overall asthma control. He should also identify patients who are considered to be high resource users, such as those with recurrent ED visits or hospitalisations, and those with severe persistent asthma. Such patients who fail to improve might require specialist evaluation and management.

The disease management programme assesses problems at the macro or population level. It tackles asthma morbidity from a multidisciplinary approach, utilising physician champions, case managers, nurse educators and pharmacists. Besides integrating care, it applies disease management interventions to motivate physicians and patients, and performs benchmarks and clinical audits to assess and track progress of the programme. Figure 3 summarises the triad approach to asthma disease management.

Barriers and Concerns

Asthma is a disease that spans the spectra of healthcare, from primary care to hospital-level management. As such, it requires a great deal of team co-ordination at every level of care for disease management to work. Physicians and caregivers at each strata of care will require adequate resources, guidelines and information systems in place so that they know exactly where they fit and what treatment plan to follow in the entire programme. However, it may be especially difficult to change physician's and patient's practice/treatment patterns.

It is also important to develop standards for diagnosis before patients are enrolled into a disease management programme, as many patients referred for asthma may have other diagnoses or significant co-morbidities.

Physician or asthma champions may also face barriers to management. While they may be given the responsibility to institute disease management interventions and new initiatives, they may not necessarily have the authority that goes with it, as so many stakeholders and caregivers are

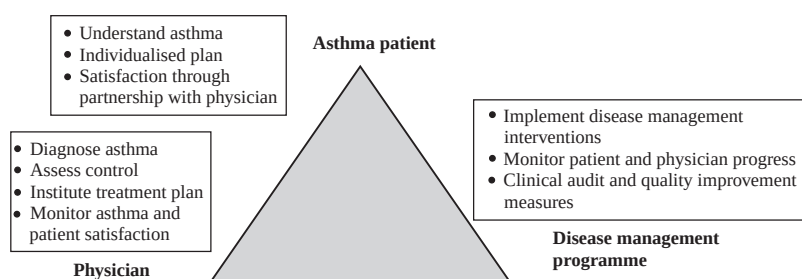


Fig. 3. Asthma disease management triangle.

involved in the asthma continuum. It may be difficult to mandate practice guidelines, especially when one is not directly managing or taking responsibility for the patient.

Programmes that concentrate on providing care solely for high-risk patients may show good results in the short-term and significantly reduce costs. This may be due to 'regression to the mean', and such efforts may also shift the burden of disease to another level. Population-based prevention and intervention teaches us that morbidity and mortality are best reduced by targeting larger number of patients at low risk, rather than the smaller number at high risk. Hence, targeting and monitoring the right group would be an important goal. Predicting next year's high-cost generators or high-risk patients would be a challenge. The success of disease management should not be looked upon by short-term cost containment or health improvement, but rather a secondary-prevention strategy to improve the overall health of a population of asthmatics within the community.

Conclusion

Asthma is a highly prevalent problem in Singapore, with an increasing societal and economic burden. Left unchecked, it could become an emerging problem of epidemic proportions in both children and adults in the near future. However, asthma is also an eminently treatable condition with good evidence that disease management and education-treatment efforts directed at specific patient sub-groups can be cost-effective in the long run. To reduce asthma morbidity significantly, an integrated approach is required, involving individuals providing asthma care at various levels of care delivery. There is also a need to co-ordinate the efforts of such individuals and institutions involved, so that there is good horizontal and vertical integration of care. The disease management approach described is intended to raise the overall standard of asthma care across a spectrum of patients with asthma.

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