

The FACES of INNOVATION Meeting the Challenge of chronic respiratory diseases





Data released by the World Health Organization(WHO) in 2016 showed that the number of deaths due to the world's four major noncommunicable diseases, including cardiovascular diseases, cancer, diabetes and chronic respiratory diseases, accounted for about 79% of the global noncommunicable disease total deaths¹ (Figure 1). Based on the 2015 report on Chinese Nutrition and Chronic Disease issued by the prior National Health and Family Planning Commission, the mortality rate of chronic respiratory diseases in China was 68/100,000, which had become the third cause of death among major chronic diseases in China.

Due to the aging of population, smoking and second-hand smoke, air pollution, use of biofuels, and large differences in drug accessibility in different regions (Figure 2), the management status of chronic respiratory disease in China is very challenging. At present, chronic respiratory diseases represented by chronic obstructive pulmonary disease (COPD) and asthma are showing a trend of increasing incidence, but the management, diagnosis and treatment status is not satisfactory. The standard treatment rate of COPD and control rate of asthma are low, mainly manifested by low public awareness; disease prevention, screening and long-term management system not fully established; clinical diagnosis and treatment not standardized; poor awareness and ability of disease diagnosis and treatment by grassroots doctors; basic medical equipment such as pulmonary function testers and atomizing inhalation devices not widely used; and the poor accessibility of therapeutic drugs.



Figure 1 Percentage of deaths due to four chronic diseases among global noncommunicable disease total deaths

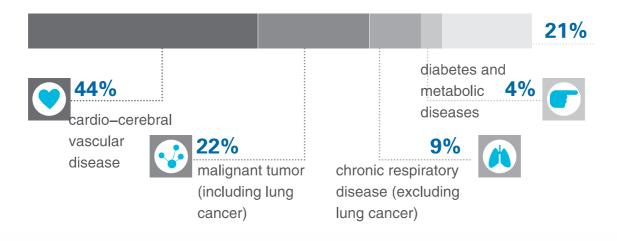


Figure 2 Risk factors for chronic respiratory diseases

air pollution

smoking/
second-hand
smoke

large regional
differences in drug
accessibility



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Part 1 COPD epidemiology and challenges

1.1 Global COPD disease burden: prevalence, morbidity, mortality and trends

The global disease burden data for COPD and asthma in 2015 showed³ that 174.5 million people had COPD, including 104.7 million male and 69.7 million female(note: the number of people with COPD in the world may be underestimated), accounting for 2.6% of the global disease burden. From 1990 to 2015, the prevalence of COPD increased by 44.2%, and the age-standardized prevalence rate decreased by 14.7%.

In 1990, COPD was the sixth leading cause of death in the world⁴, causing about 2.8 million deaths; in 2015, COPD was the fourth leading cause of death (causing about 3.2 million deaths, an increase of 11.6% compared with 1990)⁵, ranking after ischemic heart disease, stroke and lower respiratory tract infections. COPD is expected to be the third leading cause of death (approximately 4.57 million deaths) by 2030, after ischemic heart disease and stroke⁵.

1.2 China's COPD disease burden: prevalence, morbidity, mortality and trends



Figure 3 The number of COPD patients in China is about 100 million constituting a huge disease burden.

1.2.1 Prevalence of COPD in China

According to the Chinese Adult Pulmonary Health Studyled by Chinese Academy of Medical Sciences & Peking Union Medical College Academician Wang Chen, the prevalence of COPD in China was 8.6% among people aged 20 and over, 13.7% among people aged 40 and over, and 27.4% among people aged 60 and over⁶. The burden of COPD disease has been comparable to that of hypertension and diabetes (Figure 3), and the prevalence of COPD has increased significantly with age (Figure 4). Another nationwide cross-sectional study showed that the prevalence of COPD in people aged 40 years and over in different regions of China ranged from 10.2% to 20.2% between 2014 and 2015, suggesting that COPD has become a major public health problem⁷.

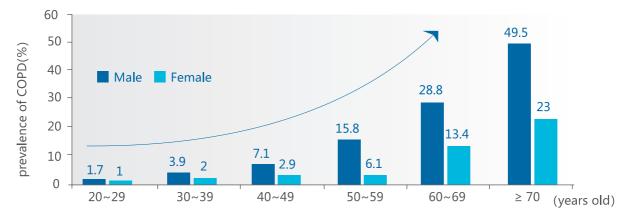


Figure 4 The prevalence of COPD in China increases significantly with age

1.2.2 Changes in incidences of COPD in China

From 1990 to 2013, the number of both male and female COPD patients increased year by year (Figure 5); the number of COPD cases increased sharply from 32.4 million in 1990 to 54.8 million in 2013⁸. According to the Chinese Adult Pulmonary Health Study in 2018, the number of COPD patients in China was 99.9 million, the number of male patients was 68.4 million, and the number of female patients was 31.5 million⁶.

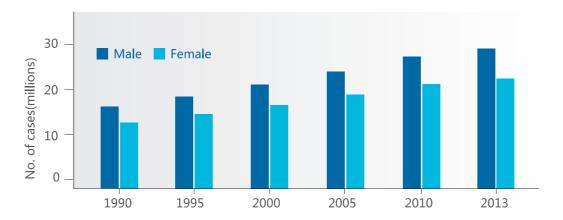


Figure 5 Incidences of COPD in different sex groups in China from 1990 to 2013

1.2.3 Changes in COPD mortality trend in China

In 2013, the number of deaths due to COPD in China was 910,809, accounting for 31.1% of the global death toll from COPD. From 1990 to 2013, China's COPD age-standardized mortality rate was higher in male than in female, but both male and female mortality rates were decreasing year by year⁸ (Figure 6).

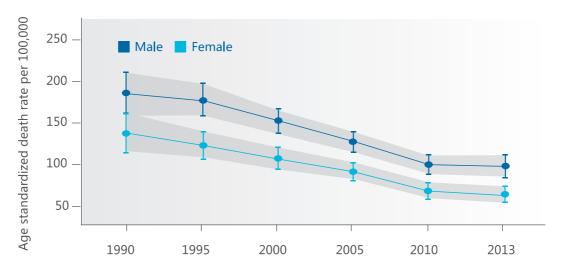
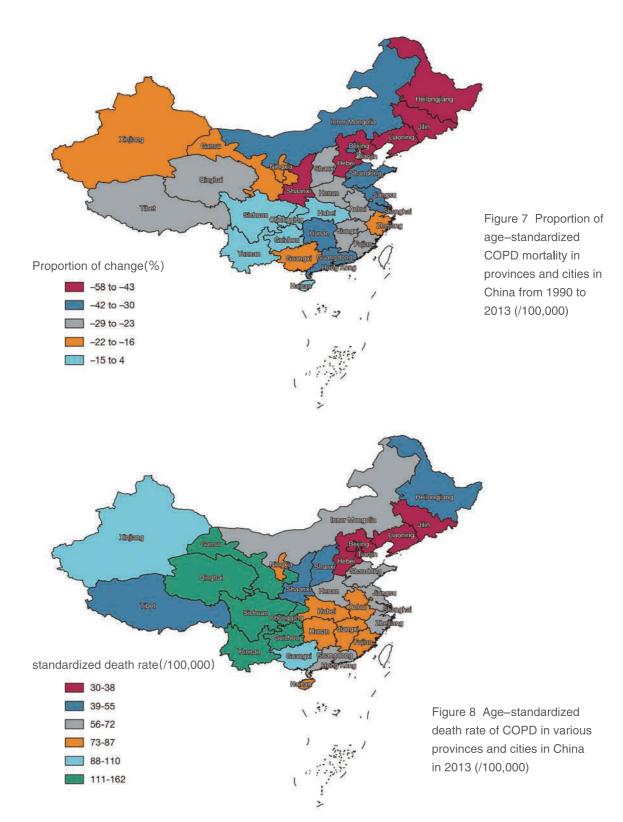


Figure 6 Age-standardized COPD mortality in different sex groups in China from 1990 to 2013

1.2.4 China's COPD age standardized mortality rate

From 1990 to 2013, the age-standardized mortality of COPD in all provinces of China showed a downward trend⁸, with the largest declines in Heilongjiang Province (70.2%) and Jilin Province (70.0%), and the smallest decline (26.8%) in Guizhou Province (Figure 7). In 2013, the highest male mortality rate in China was in Guizhou Province (196.0/100,000), the lowest was in Tianjin (34.0/100,000); the highest female data was in Gansu Province (141.1/100,000), and the lowest was in Beijing City (23.7/100,000)⁸ (Figure 8).



1.3 COPD imposes a heavy financial burden on Chinese patients and society

The economic burden analysis of patients with COPD in tertiary referral hospitals in China showed⁹ that with reference to the classification criteria proposed by the Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD)¹⁰, 6.9% of patients in Group A had a medicine cost lower than average daily wages, and in other groups (B, C and D groups) only 1.6% to 2.3% of patients had a medicine cost lower than average daily wages (Table 1). Overall, more than a quarter of the monthly income of COPD patients was used to purchase medicines, which exerted a heavy economic burden.

Patients with COPD at an extremely high economic risk accounted for 24.4% to 24.8%. The average number of hospitalizations per patient was 0.56, the average length of hospital stay was 10.38 days, and the average hospitalization cost was RMB 6390.24 per year. The direct economic burden of diseases including outpatients and inpatients was RMB 12,552.38, and the average work loss was RMB 613.86 per year (Table 2).

Table 1 Economic affordability of therapeutic drugs for patients in different GOLD groups

Patient groups	Patient ratio	Treatment cycle cost (RMB)	Treatment cycle cost / average daily wage	Proportion of patients who can afford medicines
Α	11.30%	424.42	6.67	6.90%
В	22.80%	480.84	8.44	2.30%
С	8.30%	493.32	8.33	1.60%
D	57.70%	509.88	8.98	1.90%

Table 2 Annual total disease economic burden for patients with COPD in different GOLD groups (RMB)

Patient group	Direct economic burden	Indirect economic burden	Total economic burden
А	6636.67	3980.98	10617.65
В	8324.80	6747.34	15072.14
С	12471.33	4003.70	16475.03
D	15402.86	9181.36	24584.22

1.4 Awareness, treatment and control rates of COPD in China

1.4.1 Patients with COPD have a lower level of disease-related knowledge

A national multicenter survey on treatment status and self-cognition in patients with COPD showed that 59.1% of patients considered that the goal of COPD treatment was to alleviate symptoms; 72.0% of patients followed the doctor's advice to take medicines; more than 80% of patients did not know whether medications of anticholinergic drugs, β_2 receptor agonists, inhaled corticosteroids (ICS), long-acting β_2 agonists (LABA), and theophylline had any adverse effects; 37.4% of patients were concerned about ICS adverse effects; 42.2% of patients often took antibiotics; 60.1% of patients did not have oxygen supply equipment at home; 70.5% of patients had not received respiratory rehabilitation training; 77.4% of patients believed that COPD requires long-term regular treatment; 79.6% of patients thought that efficacy (good effect, fast onset and long duration) ranked first among ideal drugs.



1.4.2 COPD is inadequately diagnosed and undertreated

The survey showed¹² that only 35.1% of patients with COPD had previously been diagnosed with COPD, suggesting that COPD was inadequately diagnosed (Figure 9). 82% of doctors believed that most patients with COPD had better treatment compliance, but in fact about 50% of patients would reduce medications on their own, especially when symptoms were relieved¹³ (Figure 10).

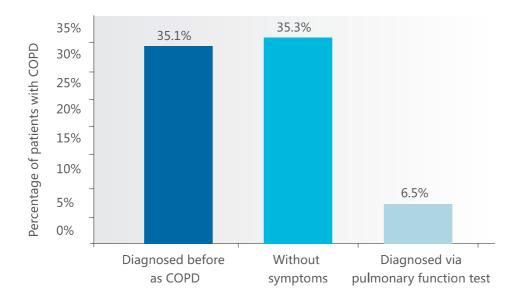


Figure 9 COPD is inadequately diagnosed

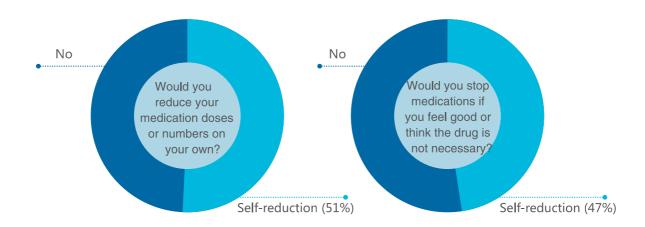


Figure 10 Poor compliance in Chinese COPD patients

456 patients with COPD were followed up every 3 months while patients were routinely treated for one year in a study¹⁴. The dyspnea scores at the time of enrollment and at 1 year of follow-up, as well as the number of acute exacerbations within 1 year of follow-up were recorded. The results of the analysis showed that the number of acute exacerbations and dyspnea scores in the good compliance group were lower than those in the poor compliance group within 1 year of follow-up (P<0.05). The compliance differences may affect the frequency and clinical symptoms of the patients with acute exacerbations (Figure 11).

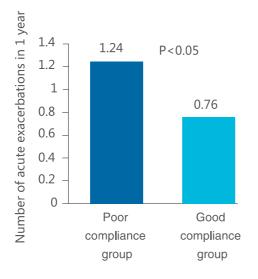




Figure 11 Comparison of the number of acute exacerbations and dyspnea scores in groups with good and poor compliances

1.4.3 Status of non-standard treatment of COPD in China

As a significant number of physicians in our country have low awareness of COPD diagnosis and treatment, their treatment options and recommendations are often contrary to the standardized prevention and treatment of the GOLD guidelines. According to the survey, only 20% of primary care physicians are fully aware of the drug treatment options for COPD. According to the 2019 GOLD guidelines, bronchodilators are still the basis for the stable treatment of COPD; long-acting anticholinergic drugs (LAMA) are preferred monotherapy for patients of all groups; LAMA prevention for acute exacerbation is superior to LABA and LAMA/ LABA combination as the recommended regimen for patients in B~D groups. A survey of approximately 700 patients with stable COPD in China found that the most frequently prescribed were expectorants, followed by β_2 agonists and anticholinergic drugs; more than half of the patients who took bronchodilators used a short-acting or intermediate-acting drug. In addition to the above problems, the irregular treatments commonly observed in clinical practices include merely focusing on the treatment of acute exacerbations of COPD while neglecting the management of stable phase of COPD; focusing on the reduction of symptoms and short-term effects while neglecting the long-term treatment and the goal of controlling future risks; and reducing treatment levels at will as well as premature drug discontinuation.¹⁵

1.4.4 Common errors in using inhalation devices

Up to 90% of patients with COPD in China have problems with correct inhalation techniques, especially when using a fixed-pressure aerosol device, which may increase the risk of acute exacerbations¹⁶.



Part 2 Asthma epidemiology and challenges

2.1 Global asthma disease burden: prevalence, mortality and trends

The 2018 Global Initiative for Asthma (GINA) shows that the global prevalence of asthma is 1% to 18%17; the average prevalence rate in countries with high prevalence is 15% to 18%, and the average prevalence rate in countries with low prevalence rates is 7%18; and the prevalence of asthma in most countries or regions is on the rise19 (Figure 12). According to the global disease burden of COPD and asthma in 2015³, a total of 358.2 million people suffered from asthma, including 168 million males and 190.2 million females. A total of 400,000 people worldwide died of asthma, down by 26.7% from 1990, and the age-standardized death rate dropped by 58.8 %. Analysis of data from the WHO mortality database from 1993 to 2012 in 46 countries showed that the global decline in asthma mortality may have stalled²⁰ (Figure 13).

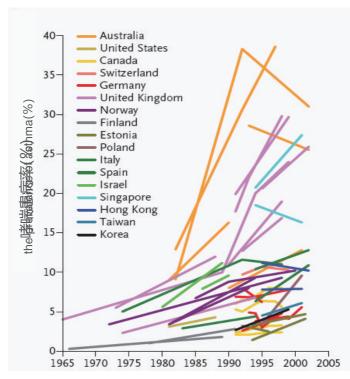


Figure 12 Changes in the prevalence of asthma in different countries (children and young people)

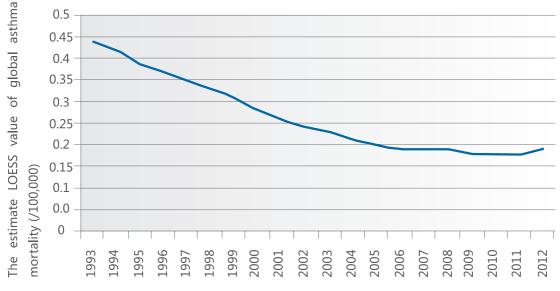


Figure 13 International trends of asthma mortality from 1993 to 2012

2.2 China's asthma disease burden: prevalence, mortality and trends

It is estimated that there are about 30 million²¹ asthma patients in China and the mortality rate is 36.7/100,000, much higher than that of developed countries. From 1990 to 2010, the prevalence of asthma in children aged 0-14 years in China showed an upward trend²²⁻²³ (Figure 14). A summary of previous survey reports showed that the prevalence of adult asthma in different regions was 0.38% to 3.38%²⁴ (Figure 15).

In 2010, the prevalence of asthma in people aged 14 and over was surveyed in 8 provinces and cities in China. The prevalence rates in Beijing, Shanghai, Guangdong and Liaoning were higher in 2010 than that from 1998 to 2000 in the same region, respectively, with an increase of 14.5%~190.2%²¹ (Figure 16). The prevalence of asthma in China has increased year by year, and asthma control should not be delayed.

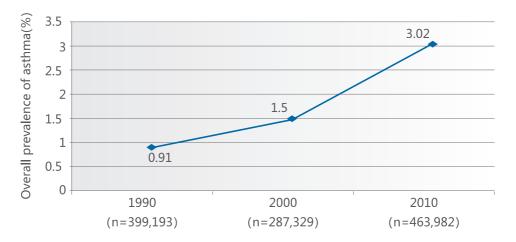


Figure 14: Prevalence of asthma in children aged 0–14 years in China (1990–2010)

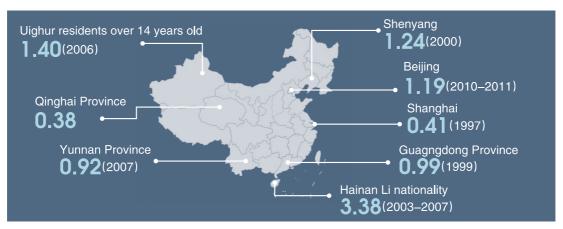


Figure 15 Prevalence of adult asthma in regional China(%)

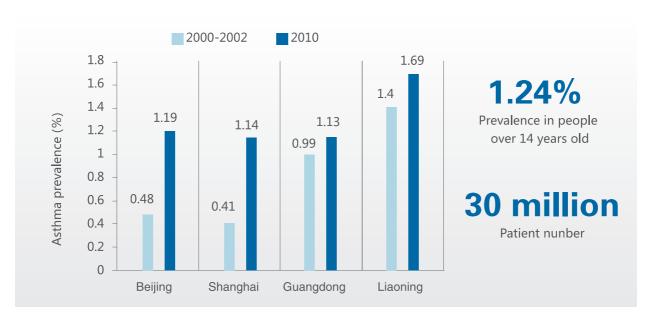


Figure 16 10-year changes in asthma prevalence in people over 14 years old in different regions

2.3 Risk factors associated with acute asthma attacks

2.3.1 Risk factors for acute asthma attacks

A retrospective survey of the cost and related conditions of hospitalized patients with acute asthma in urban areas²⁵ revealed the influencing factors for acute asthma attacks: comparing with the mild and moderate episode group, the ratio of patients that are over 60 years old, male, with a disease duration more than 10 years, a history of smoking and hospitalization or emergency visit for acute asthma attacks within a year is significant higher. (Figure 17)

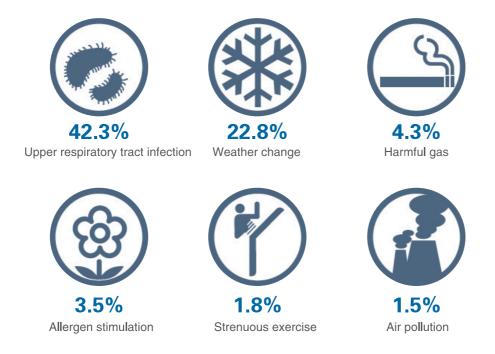


Figure 17 Risk factors for acute asthma attacks

2.3.2 Acute asthma hospitalization peaks in March and September, higher in the north than the south According to the monthly analysis²⁴ of the proportion of hospitalized patients with acute asthma onset accounted for all hospitalized patients during the same period, the highest proportion was found in March, it gradually decreased from April to June, began to rise month by month from July and reached the second peak in September and decreased again afterwards monthly. The proportion of patients with acute asthma attacks in northern cities is higher than those in southern cities.

2.4 Asthma imposes a heavy financial burden on Chinese patients and society

The National Asthma Research Collaborative Group conducted a multi-center retrospective survey²⁵ among 3,240 patients, 1369 males (42.3%) and 1871 females (57.7%), admitted to 29 Level A Tertiary hospitals in 29 provinces, autonomous regions, and municipalities from 2013 to 2014(Figure 18). The results of the study showed that women who were hospitalized for acute asthma attacks accounted for the majority of patients, and there was a high proportion of patients with irregular medications. The cost of a single hospitalization for patients with acute asthma attacks is several folds higher than the cost of maintenance treatment for asthma patients throughout the year.



Figure 18 Population and gender distribution of the Survey on the Status of Asthma Control and Disease Awareness

Studies have shown that the average hospitalization cost for all patients is RMB 11,051, of which 52.1% is for medicines, 27.6% for auxiliary inspections, and 9.6% for treatment. Among drug costs, asthma treatment drugs accounted for only 22.7%, while antibacterial drugs accounted for 44.0%(Figure 19).

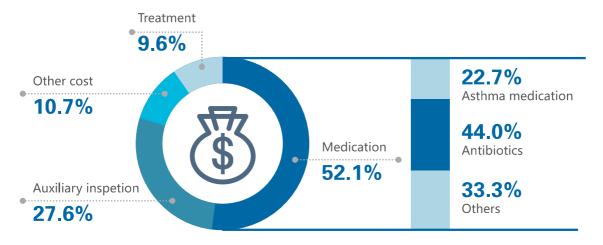


Figure 19 Single hospitalization costs for patients with acute asthma attacks are significantly higher than annual maintenance costs

The average cost of mechanical ventilation patients was RMB 26,740, which was 2.42 times that of non-mechanical ventilation. It is estimated that the cost of a medium-dose ICS combined with LABA for one year is about RMB 3,000. The cost of an acute episode of hospitalization far exceeds the cost of maintenance treatment. Therefore, the promotion of standardized asthma treatment which can reduce the number of acute attacks will reduce the economic burden of asthma patients.

Furthermore, the worse the asthma is controlled, the more frequently the acute attack occurs. The more severe the attack is, the higher the medical treatment costs. The average hospitalization cost of patients with mild, moderate, severe and critical illness was in a ratio of 1:1.13:1.28:2.87.

In terms of hospitalization expenses, drug costs accounted for the highest proportion, in which asthma treatment costs only 22.7%, including intravenous and oral glucocorticoids, ICS, long-acting and short-acting bronchodilators, ICS/ LABA compound inhalation preparations and various aerosolized drugs, etc., while the cost of antibacterial drugs is about half of the total drug costs. The hospitalization cost of asthma patients with pneumonia is higher than those without pneumonia. The application of antibiotics may be one of the reasons for the cost increase.

2.5 Chinese asthma patients control status and disease awareness

From October 2015 to May 2016, the National Asthma Research Collaboration Group conducted a Survey on the Status of Asthma Control and Disease Awareness ²⁴in urban areas for outpatients with asthma in 30 centers in 30 provinces and cities nationwide. The main conclusions are as follows.

2.5.1 At present, the overall level of asthma control in China is not satisfactory. The poor control of asthma leads to an increase in emergency treatment, hospitalization, work loss and missed school

Analysis of 3,875 outpatients with asthma based on the classification of asthma control defined by GINA indicated that the overall control rate of asthma in urban areas in China was 28.5%. A separate analysis of data from 10 cities that participated in the 2008 Asthma Control Survey showed that the asthma control rate in the 10 cities was 39.2%, a significant improvement from the 28.7% asthma control rate in 2008. Although the overall level of asthma control in China is not ideal, lagging developed countries, but in some cities, the level of asthma control has been significantly improved. This suggests that the implementation of asthma education and asthma management across the country was effective in improving asthma control.

Poor control of asthma has led to an increase in emergency visits, hospitalizations, missed work and missed school. The survey found that 26.4% of patients were hospitalized for acute asthma attacks, and 22.3% of patients paid emergency visit for an asthma attack. 18.4% of patients missed work due to asthma attacks; 63.6% of students missed school due to asthma attacks. In the 2008 Asthma Control Survey, the rate of hospitalization was 20.0%, and the rate of emergency visits was 33.9%. Despite regional differences, overall rate of emergency visits has decreased significantly since 2008(Figure 20).

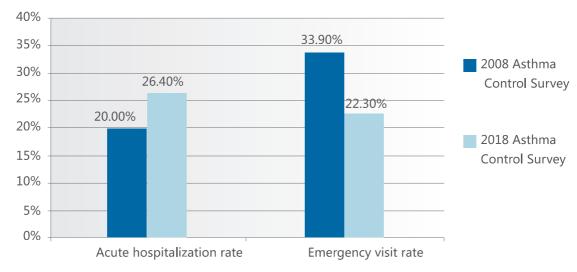
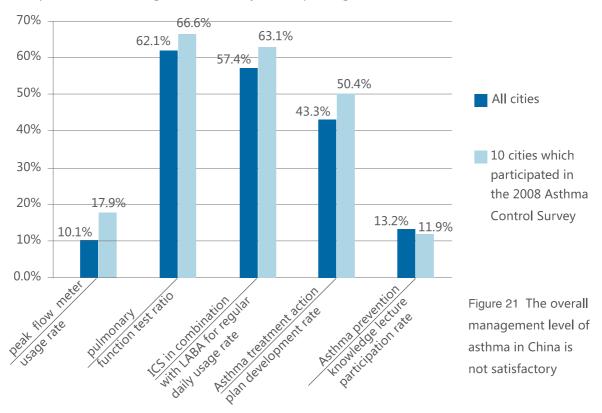


Figure 20 The poor control of asthma leads to an increase in emergency treatment and hospitalization

2.5.2 The overall management level of asthma in China is not satisfactory, but the level of asthma management in some cities has improved

10.1% of patients have used a peak flow meter,62.1% of patients had pulmonary function tests, and 57.4% of patients chose ICS combined with LABA for daily regular control. 43.3% of patients had an asthma treatment (follow-up) action plan developed by a specialist. Only 13.2% of patients participated in the asthma prevention knowledge lecture held by the hospital.

The 2008 Asthma Control Survey in ten cities included 1,362 asthma patients in this study, of which 17.9% used peak flow meters, 66.6% of patients had pulmonary function tests, 63.1 % of patients chose ICS in combination with LABA as managing medicine for regular daily use, and 50.4% of patients had an asthma treatment (follow-up) action plan developed by a specialist. 11.9% of the patients participated in the asthma prevention knowledge lecture held by the hospital(Figure 21).



The above data suggest that the overall management level of asthma in China is still not ideal. There are differences in cities with different socioeconomic development levels. However, in some cities, the improvement of asthma management level can be seen. The use of asthma action plan and peak flow meter should be vigorously promoted.

2.5.3 Most asthma attacks have clear signs or symptoms. Asthma attacks have a significant impact on the life of patients, and the proportion of patients who can self-manage is low

Studies have shown that 83.0% of asthma patients have experienced asthma attacks, 78.1% of asthma patients would restrict or stop exercises and daily activities when symptoms worsened. 82.5% of asthma patients had clear signs or symptoms when they last experienced asthma attacks. The three most frequent symptoms were: cough (60.5%), chest tightness (58.8%), and shortness of breath (54.8%). The median time from symptom occurring to the onset of asthma was 2 hours, with an average of 90 hours.

When asthma symptoms worsened, only 4.4% of patients had confidence in asthma control. 23.3% of asthma patients with asthma symptoms worsening or obstructing daily life used asthma medication. In terms of drug use, 45.8% of asthma patients selected to receive a combination of fumarate and glucocorticoid inhalers, and 23.9% of asthma patients selected short-acting β_2 agonist inhalers.

Part 3 China's COPD and asthma treatment accessibility

3.1 COPD

Pulmonary function tests are an important method for diagnosing COPD, but compared with sphygmomanometers and blood glucose meters, the spirometry is extremely rare in primary health facilities. In 2012, the Department of Science and Education of the Ministry of Health organized the Health Department of 10 provinces (autonomous regions and municipalities directly under the Central Government) to carry out investigations of COPD patients in rural primary health care institutions. The commonly used examination items for outpatients and hospitalized patients with COPD are electrocardiogram and chest X-ray, without pulmonary function tests. At present, ventilators and rehabilitation equipment are mainly concentrated in secondary and tertiary hospitals, and the corresponding facilities in primary medical institutions need to be upgraded.

In January 2017, the State Council issued the "13th Five-Year Plan for Health and Wellness". The plan clearly pointed out that the pulmonary function test would be included in routine physical examinations, and it was the first time for pulmonary function test to be included in routine physical examinations. In February 2017, the State Council issued the "China Medium and Long-term Plan for Prevention and Treatment of Chronic Diseases (2017-2025)", which proposed that community health service centers and township health centers should gradually provide services such as simple lung function tests, and ratio of lung function tests for residents over 40 years old shall rise up to 15% in 2020 and to 25% in 2025.

In addition, at present, there is a lack of commonly used drugs for treating chronic respiratory diseases in primary health care institutions. In the current National Essential Drugs List, antiasthmatic drugs are mainly oral and nebulizable short-acting β_2 agonists and short-acting anticholinergics. Better long-acting inhaled β_2 receptor agonists and long-acting inhaled anticholinergic drugs are falling behind in the process of entering the primary health care institutions due to the high price. At the same time, theophylline drugs and other inexpensive short-acting agents are also in short supply in many primary medical institutions. Academician Wang Chen has advocated the release of policies to include the control of chronic respiratory diseases in grassroots public health management system, and to increase the number of medications for the treatment of chronic respiratory diseases in the National Essential Drugs List²⁶.

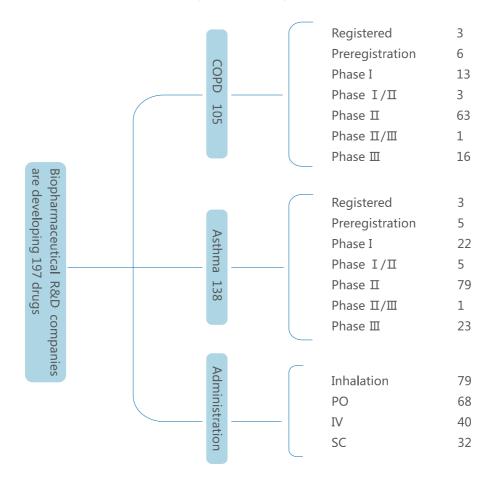
3.2 Asthma

At present, atomized inhalation therapy has been widely used in the treatment of respiratory diseases including asthma, because of the advantages of rapid onset, favorable therapeutic effect, less systemic adverse reactions, and easier patient cooperation. It is recommended by domestic and foreign guidelines and has been widely used in large cities in China. However, primary hospitals are limited by diagnosis levels and medical equipments, therefore atomized inhalation therapy's penetration rate is less than 50% and many children are unable to undergo full-course treatment, thus delaying treatment of the disease.

At present, there are many kinds of drugs for clinical treatment of asthma, which are mainly divided into control drugs (such as ICS, LABA, etc.) and palliative drugs (such as short-acting β_2 receptor agonists). However, incorrect usage or ineffective treatments, poor drug inhalation techniques, irregular or poor compliance lead to poor asthma control. In addition, asthma is a heterogeneous disease and there is currently no targeted treatment, which is one of the key reasons for poor asthma control²⁶.

Part 4 The current status of global development of COPD and asthma treatment drugs

According to the latest data from the world of IQVIA, there are 197 drugs under development worldwide for COPD and asthma, among which are 105 COPD drugs and 138 asthma drugs. All these drugs are in the clinical trial phase, pre-registration or registration phase.



The report on the Epidemic Situation and Prevention Strategy for Chronic Respiratory Diseases²⁶ in China published in 2018 pointed out that the lack of research and development of new drugs related to chronic respiratory diseases and the lag of production are the problems faced by the prevention and control of Chinese chronic respiratory diseases. Although a variety of new bronchodilators and other therapeutic drugs for chronic respiratory diseases have emerged internationally, but overall the cure rate of chronic respiratory diseases such as COPD and asthma is still low.

October 2017, the Organization Department of the CPC Central Committee and the General Office of the State Council issued the "Opinions on deepening the reform of the review and approval system to encourage the Innovation of drugs and medical Devices", encouraging the development of new drugs and innovative medical devices, and giving priority to review and approval. The National Drug Administration (NMPA) has issued a series of supporting policies to optimize the review and approval procedures. The pace of the approval of new drugs into China has been greatly accelerated. The latest data from IQVIA shows that 14 COPD/asthma drugs were approved worldwide from 2011 to 2018, and five of them have been approved by NMPA.It is hoped that the advent of more and more innovative drugs will provide better choices for the control of COPD/asthma.



Part 5 Strategies for addressing the challenges of chronic respiratory diseases

5.1 Six strategies to improve the status of diagnosis and treatment of COPD^{27~28}

5.1.1 Improve the accessbility to effective treatment for patients with COPD

The WHO's work on COPD is part of the organization's overall work to prevent and control noncontagious diseases, one of which is to improve the accessbility to effective treatment for patients with COPD. The GOLD guidelines and "the guidelines for the prevention and treatment of COPD in China" emphasize that the first-line drugs for COPD treatment should be inhalation dosage form. However, the most effective long-acting inhaled β_2 agonists and long-acting inhaled anticholinergic drugs are in short supply in many primary health care facilities. COPD has not been included in basic public health services as a major chronic disease while diabetes and high blood pressure are included. As a chronic disease, COPD requires long-term medication, but it has not been supported in the outpatient medical insurance reimbursement policy, resulting in poor patient compliance and repeated acute exacerbations. In further policy adjustment, due attention and consideration should be given.

5.1.2 The awareness and ability of primary doctors for COPD prevention and treatment needs to be improved

At present, grassroots doctors have a poor awareness of the prevention and treatment of COPD, and have insufficient knowledge about the disease, evaluation and usage of various drugs, pulmonary function tests, and treatment and management of COPD stable phase. It is necessary to strengthen the education and training of primary doctors' knowledge and skills, and to improve the standardized prevention and control of COPD and other respiratory diseases.

5.1.3 Promote basic pulmonary function tests, which can effectively reduce the rate of misdiagnosis and missed diagnosis

At present, most primary health care institutions lack adequate pulmonary function testing equipment. At the same time, grassroots doctors have low cognitive level of lung function tests, and lack of continuing education and application guidance for technical operations, leading to misdiagnosis and missed diagnosis. Promoting the application of pulmonary function in grassroots hospitals can effectively reduce the rate of misdiagnosis and missed diagnosis, which will contribute to the early detection and treatment of COPD.

5.1.4 Increase research funding for chronic respiratory diseases

The Ministry of Science and Technology has increased its investment and attention to COPD research. As a chronic disease, COPD has been included in the national key research and development plan for the first time. At present, there are more than a dozen research projects for COPD disease cohort studies, different phenotypic studies, and studies on acute exacerbation treatment methods and strategies, which will improve the level of research, diagnosis and treatment of COPD in China.

5.1.5 The road to COPD development: individualized medicine is the trend

Based on the epidemiological and clinical characteristics of Chinese patients, scientifically developing individualized diagnosis and treatment strategies for Chinese patients is a challenge that every Chinese clinician must face at this stage.

5.1.6 Pay attention to the early prevention of COPD and carry out extensive awareness and education programs

COPD is preventable and controllable. In 2017, the results of the world's first large-scale clinical trial of Tie-COPD, led by Guangzhou Institute of Respiratory Diseases Academician Zhong Nanshan, were published in the New England Journal of Medicine. The study showed that the use of tiotropium in the treatment of early COPD patients can effectively improve lung function, improve the quality of life, reduce acute exacerbations, and delay the progression of the lung function decline²⁹. Therefore, Academician Zhong Nanshan pointed out that the results of this study are of great significance for the diagnosis and treatment of early COPD. It indicates that in patients with early or no symptoms of early COPD, the use of the long-acting bronchodilator tiotropium can bring significant clinical benefit. This provides a very valuable inspiration for the treatment of early COPD. We need to change the concept of COPD diagnosis and treatment, and make early diagnosis and treatment of COPD, just like early treatment of hypertension and diabetes, so as to save the lung function of COPD patients as early as possible and to delay the progression of the disease.

5.2 Four strategies to achieve asthma control

5.2.1 GINA 2018 still recommends managing asthma based on control levels

GINA 2018 still recommends the management of asthma based on control levels, and symptom control assessment and future risk assessment should be performed for each asthma patient¹⁷. The guidelines state that once asthma diagnosis is established, lung function is the most effective indicator for assessing future risks. Pulmonary function assessment should be performed at the time of diagnosis or initiation of treatment; the individual's best forced expiratory volume in one second (FEV₁) should be assessed 3 to 6 months after treatment, and thereafter. GINA 2018 clearly recommends ICS/LABA as the drug of choice for the treatment of moderate to severe asthma.

5.2.2 In view of the current situation of asthma prevention and control in China, we should strengthen the long-term standardized management of asthma

In view of the current status of asthma prevention and control in China, we should strengthen the long-term standardized management of asthma²⁸. Determine the danger of acute asthma attacks, focusing on high-risk groups of acute attacks; Ouse ICS/LABA for maintenance control which can reduce severe asthma attack risk by 56% compared with low-dose ICS monotherapy; Follow the GINA guidelines which strictly stipulate that degraded treatment could be adapted only after asthma has been controlled for more than 3 months and lung function is stable, but ICS discontinuation is not recommended; Strengthen asthma patients' self-management, which will play an important role in achieving overall control of asthma.

5.2.3 To achieve the overall control objective of asthma, a variety of factors need to be considered in drug treatment strategies

At the group level, it is necessary to pay attention to factors such as the effectiveness, safety, accessibility and potency/price ratio of drugs. At the individual level, it is necessary to consider the patient's clinical phenotype, preferences, mastery of inhalation techniques, medication compliance, economic ability, etc. Besides, the use of novel research and development drugs also provides a better choice for asthma control.²⁰

5.2.4 To point out that asthma is a heterogeneous disease

"Guidelines for the Prevention and Treatment of Bronchial Asthma (2016 Edition)"²¹ pointed out that asthma is a heterogeneous disease that may not presents same clinical courses and treatment responses. Identifying specific phenotypic characteristics will not only contributes to the prognosis assessment of asthma but also facilitates the choice of individualized treatment strategies.

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