

Managing adult asthma during the COVID-19 pandemic: A 2022 review and current recommendations

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ABSTRACT

Introduction: This review aims to examine asthma management during the COVID-19 pandemic.

Method: Relevant recommendations and articles were identified by respiratory professional societies and PubMed search using the terms “asthma” and “COVID-19”, and examined for relevance and inclusion in this study.

Results: Recommendations for the management of asthma have remained similar but are now supported by new evidence between the years 2020 and 2022. Patients with well-controlled, mild-to-moderate asthma are unlikely to be at increased risk of acquiring COVID-19 or having worse outcomes from COVID-19. All asthma patients should receive COVID-19 vaccination. Spirometry can be performed with the usual strict infection control procedures unless there is a suspicion of COVID-19. Mask-wearing and other health measures remain important for asthma patients.

Conclusion: While previous recommendations were largely based on expert opinion, the tremendous amount of literature published since the pandemic first emerged 2 years ago has helped guide respiratory professional bodies to update their recommendations. This study provides a timely review of the various recommendations and can be used to guide healthcare professionals in managing asthma patients, as the world prepares for a future with COVID-19 becoming endemic. The long-term consequences of COVID-19 infection in asthma patients and the ripple effects of COVID-19 remain uncertain and deserve ongoing study.

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INTRODUCTION

Asthma is the most prevalent chronic respiratory disease, estimated to affect more than 300 million people worldwide.¹ First recognised in December 2019, the coronavirus disease 2019 (COVID-19), which is caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has evolved into an ongoing global pandemic.² In May 2020, a summary of recommendations for the management of asthma during the COVID-19 pandemic was drawn up by appraising and comparing recommendations from several professional bodies.³ The article was born of an urgent need to provide preliminary guidance for healthcare professionals to manage their patients. Since then, there has been a torrent of studies and literature on asthma and COVID-19, with a plethora of new

information from both qualitative and quantitative research, given the concerted global efforts to combat the pandemic. Periodic and timely review of the available evidence will assist healthcare professionals in providing the best possible care for asthma patients, as the world prepares for a likely future in which COVID-19 becomes endemic. In addition, it is important to recognise that the impact of the COVID-19 crisis is highly heterogeneous across the globe, which in turn affects the responses by individual countries and policymakers.⁴

This article aims to provide an update on recommendations for managing asthma in the Singapore context. Healthcare professionals should complement these recommendations with shared decision-making with individual patients.

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CLINICAL IMPACT

What is New

- This review provides an update on the recommendations for the management of asthma during the COVID-19 pandemic in 2022.
- COVID-19 has not been shown to affect the safety and efficacy of current asthma therapies. Inhaled therapies and biologics should be continued.
- Patients with poorly controlled asthma are at risk of increased mortality from COVID-19.
- Holistic and optimal care to ensure good control of asthma during COVID-19 is pertinent.

Clinical Implications

- Healthcare professionals should continue to keep abreast of the COVID-19 situation and latest recommendations from asthma guidelines.
- Long-term consequences of COVID-19 infection in asthma patients and the ripple effects of COVID-19 remain uncertain and deserve ongoing study.

METHOD

COVID-19 guidance related to asthma published by various professional bodies was reviewed for updates by comparing with the versions accessed in May 2020. The guidance documents were, namely, the Global Initiative for Asthma (GINA) guidance about COVID-19 and asthma,⁵ and GINA's 2021 update to its Global Strategy for Asthma and Prevention,⁶ which included a section on advice on asthma management during the COVID-19 pandemic; the National Institute for Health and Care Excellence (NICE) COVID-19 rapid guideline for severe asthma;⁷ the British Thoracic Society (BTS) Advice for Healthcare Professionals Treating People with Asthma (adults) in relation to COVID-19;⁸ and the National Asthma Council Australia's section in the Australian Asthma Handbook on managing asthma during the COVID-19 pandemic.⁹ To supplement the information from the professional bodies, a search of the PubMed database using the Medical Subject Headings (MeSH) for the terms "asthma" and "COVID-19" was conducted. All articles published between January 2019 and December 2021 were included, with no restrictions on article type. The articles were screened for relevance and new information and, where appropriate, were discussed in the current review.

In the process, we sought to answer a few key clinical questions. These included but were not limited to the following:

1. Does having asthma affect the risk of getting infected with SARS-CoV-2, or increase the risk of worse outcomes in infected patients?
2. Is the treatment of asthma affected by the COVID-19 pandemic?
3. Is the management of patients with severe asthma affected by the COVID-19 pandemic?
4. What should be considered in terms of when and how to offer lung function testing to patients?
5. Is there new evidence regarding the use of nebulisers during the COVID-19 pandemic, or should nebuliser use continue to be avoided?
6. What are the recommendations for vaccinating patients with asthma, allergy, or both, against COVID-19? What other vaccines are recommended for asthma patients?
7. What are the recommendations regarding mask-wearing and social distancing measures for asthma patients?
8. Is there a role for telemedicine in managing asthma patients during the COVID-19 pandemic?

RESULTS

In addition to the review of recommendations from GINA, NICE, BTS and National Asthma Council Australia, the PubMed search yielded a total of 455 results.

Asthma and risks of COVID-19

Clinical question: *Does having asthma affect the risk of getting infected with SARS-CoV-2, or increase the risk of worse outcomes in infected patients?*

Key messages:

1. Asthma has not been shown to be associated with an increased risk of acquiring COVID-19.
2. Asthma patients who acquire COVID-19 do not appear to be at increased risk of hospitalisation or worse outcomes.
3. Some subgroups of asthma patients may be at higher risk, such as those with non-allergic asthma, those who had recently needed oral corticosteroids (OCS), hospitalised patients with severe asthma, and older patients with comorbid cardiovascular risk factors.

Much evidence on the association between asthma and COVID-19 has been accumulated, and asthma has

thus far not been shown to be associated with an increased risk of acquiring COVID-19.¹⁰ Data from a systematic review and meta-analysis of 150 studies worldwide similarly did not find clear evidence of increased risk of COVID-19 diagnosis in asthma patients.¹¹ Strengths of the review include the multiple meta-analyses performed to compare the various outcomes of interest, the large number of studies included in the analyses, the comparison of asthma prevalence in the studied populations against the known prevalence in the general populations of multiple geographical regions, as well as the use of multivariate analysis to account for confounding variables when investigating the association between asthma and COVID-19 mortality. There has also been no clear evidence of hospitalisation or worse outcomes due to COVID-19 in asthma patients.¹²⁻¹⁵ In a systematic review and meta-analysis of 389 studies that included clinical trials, observational studies, retrospective studies, case series and conference abstracts, asthma was not found to be associated with an increased risk of hospitalisation, length of hospitalisation, ICU admission or death among patients with COVID-19.¹⁶

However, limited evidence suggests that some subgroups of asthma patients may be at higher risk. The World Health Organization (WHO) proposes that non-allergic asthma was associated with worse outcomes compared with allergic asthma.¹⁰ This suggestion is based on a propensity score-matched nationwide cohort study performed in South Korea, which found that individuals with non-allergic asthma had a greater risk for severe outcomes of COVID-19 (adjusted odds ratio 4.09, 95% confidence interval [CI] 1.69–10.52) than those with allergic asthma (adjusted odds ratio 1.40, 95% CI 0.83–2.41).¹⁷ GINA notes that the risk of COVID-19 death increased in people who had recently needed OCS for their asthma¹⁸ and in hospitalised patients with severe asthma,¹⁹ suggesting that poorly controlled asthma might result in an increased risk of COVID-19-related death. In addition, as with the general population, the risk of more severe outcomes may be increased in some subsets of asthma patients, for example, older patients with comorbid cardiovascular risk factors such as hypertension, dyslipidaemia and diabetes.²⁰

The current evidence is nevertheless reassuring for patients with well-controlled asthma. It remains important to continue good asthma management with strategies to maintain good symptom control, reduce the risk of severe exacerbations and minimise the need for OCS use.

General management of stable asthma

Clinical question: Is the treatment of asthma affected by the COVID-19 pandemic?

Key messages:

1. Physicians should continue to manage asthma according to recommendations from current asthma guidelines, including those from Singapore guidance where applicable
2. All asthma patients should continue all of their prescribed medications, especially inhaled corticosteroids.
3. Where indicated, short courses of OCS should be given, such as for acute exacerbations of asthma.
4. Patients should be provided with updated written asthma action plans to help them manage any worsening asthma and to reduce the need to visit healthcare facilities.

Recommendations by the various professional bodies remain similar but are now supported by new evidence that has emerged.^{6,8,9} Therefore, key recommendations in the previous review remain relevant.³ Physicians should continue to manage asthma according to current asthma guidelines, including those from Singapore guidance where applicable, and continue to ensure optimal control of asthma. It is recommended that all asthma patients continue their prescribed medications, especially inhaled corticosteroids. An updated written asthma action plan should be provided for self-management of asthma, to reduce the need to visit healthcare facilities. When indicated for exacerbations, short courses of OCS should be given. Patients should also continue to follow other advice for the general public (e.g. observing good personal hygiene, avoiding crowded areas where possible, and wearing masks especially in crowded areas and when indoors).

Management of severe asthma

Clinical question: Is the management of patients with severe asthma affected by the COVID-19 pandemic?

Key messages:

1. Where appropriate, biologic therapies should be used in eligible severe asthma patients to reduce OCS exposure and complications arising from long-term use.
2. There is currently no evidence that biologic therapies for asthma suppress immunity.
3. At-home administration of biologics can be considered, particularly during periods when community transmission rates are high.

The previous recommendations for the management of asthma in the COVID-19 pandemic from the asthma management guidelines remain relevant.³ As with all asthma patients, all treatments, including maintenance OCS, should be continued in those with severe asthma to reduce the risk of severe exacerbations. Where appropriate, biologic therapies should be used in severe asthma patients who qualify for such treatment, to reduce OCS exposure and complications arising from long-term use. To date, there is no evidence that asthma biologic therapies are associated with a higher risk of SARS-CoV-2 infection or more severe COVID-19.^{8,21} As the risk of COVID-19 death may be increased in people who had recently needed OCS for their asthma¹⁸ and in hospitalised patients with severe asthma,¹⁹ patients with severe asthma should continue to receive all therapies according to current guideline recommendations in order to reduce the risk of COVID-19-related death.

To further reduce the risk of getting infected with SARS-CoV-2 in the course of travelling to and visiting healthcare facilities, at-home administration of biologics can be considered. The professional bodies currently do not mention this aspect of treatment. However, there is increasing evidence that at-home administration of asthma biologics, with the availability of newer self-injectable forms of the biologics, is as equally efficacious and safe as in-office administration, while increasing patient convenience.²² This convenience has to be balanced against the benefits of in-office administration, such as the ability to monitor for safety concerns, confirm adherence, and allow patients to have their questions addressed, which may improve asthma care.²³ The place of administration ultimately needs to be individualised, but at-home administration could be a useful option, particularly during periods when community transmission rates are high.

Role of spirometry

Clinical question: *What should be considered in terms of when and how to offer lung function testing to patients?*

Key messages:

1. Lung function testing should not be curtailed indefinitely and should be resumed within the constraints of a COVID-19 endemic scenario.
2. Patients should be screened for infection prior to performing spirometry.
3. Protection of healthcare workers should be a priority. This includes implementing strict infection control procedures and, where possible, the use of equipment with extra safety features, such as the SpiroBooth.

GINA, the Australian guidelines and NICE previously recommended that lung function testing should be avoided, as spirometry can propagate viral particles and expose staff and patients to the risk of infection.^{6,7,9} However, even with good history-taking and physical examination, spirometry remains an essential objective measure to establish the diagnosis of asthma.^{6,24}

To date, there is no evidence that the SARS-CoV-2 virus can remain viable in the air, compared to other infectious diseases such as tuberculosis, measles and chickenpox.²⁵ However, given the inconclusive evidence on whether lung function tests carry a risk of virus transmission and considering that SARS-CoV-2 variants may have higher transmissibility, heightened safety precautions are still recommended.

The COVID-19 pandemic is likely to become endemic.²⁶ With this scenario in mind, non-COVID-19 medical care cannot be held back indefinitely.²⁷ In terms of lung function testing, it is important to reconsider how best to operate within the constraints of a COVID-19 endemic scenario.

Precautions should be undertaken to protect lung function staff and minimise cross-infection risk, given the ongoing need to perform testing.²⁸ Innovations such as the SpiroBooth, which is a self-contained, purpose-built booth to safely perform spirometry that features a high-efficiency particulate air filter and an automated ultraviolet disinfection system, have also emerged during the pandemic to maintain capacity and operational efficiency while ensuring patient and staff safety during lung function testing.²⁹ To test its effectiveness, the study attempted to replicate real-world conditions by using infectious airborne particulate matter for their validation process, confirming a 99.89% efficiency of the high-efficiency particulate air filter. However, considering its space requirements and cost of SGD20,000 (approximately USD15,000), it has been recommended that the SpiroBooth should be used only if there is a high volume of spirometry tests performed.²⁹

In this regard, spirometry can be performed but patients should be screened for and deemed unlikely to have COVID-19 or any other acute respiratory infection.^{6,9} The same strict infection control procedures previously recommended should be adhered to.³ Hand hygiene should be performed before and after each test. Appropriate personal protective equipment, including gowns and gloves, N95 or P2 masks, and protective eyewear, should be used. A high-efficiency inline filter should be used. Spirometry should be performed in a designated area with minimal fixtures that should be regularly cleaned and disinfected, and with a minimum number of people present. Disinfection of all surfaces of

the spirometer and the surroundings in between patients should also be judiciously performed.³ Spirometry should be deferred after COVID-19 infection as a precautionary measure until further supporting evidence is available, and a wait of 30 days has been recommended.²⁵

Use of nebulisers

Clinical question: *Is there new evidence regarding the use of nebulisers during the COVID-19 pandemic, or should nebuliser use continue to be avoided?*

Key messages:

1. SARS-CoV-2 transmission through aerosolised respiratory droplets during nebuliser use cannot be ruled out but the evidence is uncertain.
2. Pressurised metered dose inhalers in combination with a spacer are at least as effective as a nebuliser for the delivery of respiratory medications and should be considered first.
3. If necessary, nebulisers may be used, but proper precautions should be taken to reduce the risk of viral transmission.

Nebuliser use was generally recommended against during the pandemic, in view of the risk of transmitting infection to other patients and healthcare workers.³ However, there were discrepancies in recommendations from professional bodies. While GINA, the Australian guidelines, and the American College of Allergy, Asthma and Immunology adopted the stance, NICE and BTS advised that patients may continue to use their nebulisers, as they were of the view that the aerosol comes from the fluid in the nebuliser chamber and will not carry virus particles from the patient.³

To date, the potential risk of SARS-CoV-2 transmission through aerosolised respiratory droplets during nebuliser use cannot be ruled out, but the evidence is uncertain. The existing literature, limited to several small studies, was reviewed by Woods, who concluded that there was no conclusive evidence of such transmission.³⁰ In addition, historically, the risk of transmission of acute respiratory infections due to nebuliser use was not significant.³¹ Studies specific to other coronaviruses also did not indicate an increased risk.³²

Nevertheless, pressurised metered dose inhalers, in combination with a spacer, are at least as effective as a nebuliser for the delivery of respiratory medications in most cases, even during symptomatic exacerbations, and should remain as the first choice in most patients.³

The use of home nebulisation is regarded as safe for the patient using the nebuliser. To reduce the possible risk of infecting other people, patients should follow

social distancing guidelines and undertake precautions such as increased cleaning and disinfection of nebulisers, ensuring proper distancing from others while using nebulisers, and using nebulisers only in properly ventilated areas.^{32,33}

In the case of nebulisers being administered to patients by healthcare personnel, strict adherence to infection control measures such as the use of personal protective equipment is recommended.³³ It is also recommended to use negative pressure rooms, dispose or disinfect equipment after each use, and maintain an appropriate distance from the patient during nebulised treatment.^{32,33}

COVID-19 vaccines and asthma

Clinical questions: *What are the recommendations for vaccinating patients with asthma, allergy, or both, against COVID-19? What other vaccines are recommended for asthma patients?*

Key messages:

1. All patients with asthma should get vaccinated against COVID-19 if eligible.
2. The usual precautions for vaccination of the general population apply to patients with asthma.
3. Severe asthma patients on biologic therapy can and should also be vaccinated against COVID-19, with a 1–7-day interval between the biologic and the vaccine.
4. Second-dose administration appears to be safe even in patients who report immediate and potential allergic reactions after the first dose of the Pfizer-BioNTech or Moderna vaccines.
5. Patients with asthma should continue to be encouraged to receive the influenza and pneumococcal vaccines.

The first vaccine to be listed for the WHO Emergency Use Listing was the Pfizer-BioNTech/Comirnaty vaccine, which was listed on 31 December 2020, and since then, several other vaccines have also gained Emergency Use Listing.³⁴

Both the GINA⁶ and the Australian guidelines⁹ recommend that patients with asthma get vaccinated against COVID-19 if eligible, while BTS³⁵ even classifies severe asthma patients as clinically vulnerable patients who should be prioritised for vaccination. There is no evidence that having asthma, allergic rhinitis, or taking treatments for these conditions increases the risk of adverse reactions from current approved vaccines.^{9,35} A study in severe asthma patients has shown that few patients reported side effects and that there was an absence of asthma exacerbations,

demonstrating that the SARS-CoV-2 vaccine is safe and well-tolerated in this population.³⁶

The usual precautions apply to patients with asthma, as with the general population. The vaccines should be administered in a healthcare setting where patients can be actively monitored after administration, and any adverse reactions, including anaphylaxis, can be promptly treated.⁶ The vaccines should not be administered to patients with a history of severe allergic reaction to the vaccines and their components.^{6,9} Examples of the vaccine components include polyethylene glycol in the Pfizer-BioNTech/Comirnaty vaccine, and polysorbate 80 in the AZD1222 (ChAdOx1-S [recombinant]) vaccine against COVID-19 developed by the University of Oxford and AstraZeneca.^{6,9}

Severe asthma patients on biologic therapy can and should also be vaccinated against COVID-19.^{6,9,35} BTS advises a 7-day interval between the vaccine and asthma biologic, while GINA⁶ and the Australian guidelines⁹ state that simply not giving biologic therapy and a COVID-19 vaccine on the same day is acceptable. These recommendations are not based on any proven interactions but were made on the basis of allowing adverse effects of either the asthma biologic or COVID-19 vaccine to be more easily distinguished.^{6,9,35} The 7-day interval may be reasonable, as most adverse events would have occurred in this period, at least for the mRNA vaccines. In a phase 3 clinical trial of the Moderna mRNA-1273 vaccine, injection-site events lasted a mean of 2.6 days and 3.2 days after the first and second doses, respectively, while systemic adverse events lasted a mean of 2.6 days and 3.1 days after the first and second doses, respectively.³⁷ Delayed injection-site reactions (those with onset on or after day 8) were rare, occurring in 244 participants (0.8%) after the first dose, and 68 participants (0.2%) after the second dose.³⁷ The reactions were also not severe, typically resolving over the following 4–5 days, and such reactions are not contraindications to subsequent vaccination.^{37,38} In an ongoing multinational, placebo-controlled, observer-blinded, pivotal efficacy trial of the BNT162b2 (Pfizer-BioNTech) vaccine, similar results were observed, with most adverse events being transient reactogenicity events that resolved within a couple of days after onset.³⁹ While there were reports of lymphadenopathy, which can last for up to 10 days, the overall incidence was low, with 64 vaccine recipients (0.3%) and 6 placebo recipients (<0.1%) affected.³⁹

Even in patients who reported immediate and potential allergic reactions after the first dose of the Pfizer-BioNTech or Moderna vaccines, second-dose

administration appears to be safe.⁴⁰ In a multicentre, retrospective study conducted in the US, 159 patients tolerated the second dose despite having a first-dose reaction. This included 19 patients who had anaphylaxis following the first dose. While 32 (20%) of the patients reported immediate and potentially allergic symptoms from the second dose, these were mild, self-limiting, and/or could be treated adequately with antihistamines.⁴⁰

For patients who already had COVID-19 and recovered, it is unclear if they would be protected from getting infected again, and such patients may therefore still benefit from vaccination. The Centers for Disease Control and Prevention (CDC)⁴¹ and BTS³⁵ advise that patients who have recovered from COVID-19 still get vaccinated. BTS recommends that vaccination should be deferred until clinical recovery to around 4 weeks after onset of symptoms or 4 weeks from the first confirmed positive specimen in those who are asymptomatic, as clinical deterioration can occur up to 2 weeks after infection,³⁵ while the CDC recommends a 90-day interval for patients who were treated for COVID-19 with monoclonal antibodies or convalescent plasma.⁴¹

Vaccination against influenza and pneumococcal disease is still recommended for all patients³ and patients with asthma should be reminded to receive such vaccines. By protecting patients against these respiratory diseases, their need for visits to healthcare facilities is reduced, thereby decreasing their risk of exposure to SARS-CoV-2. By reducing these respiratory infections, healthcare resources can also be conserved for managing the COVID-19 pandemic. In terms of separation between COVID-19 vaccination and other vaccinations, GINA recommends a 14-day interval between COVID-19 vaccination and influenza vaccination, while the Australian guidelines⁹ and BTS³⁵ recommend a 7-day interval between inactivated influenza vaccines and a COVID-19 vaccine, with BTS advocating the same 7-day gap between giving a pneumococcal vaccine and a COVID-19 vaccine.³⁵ As with asthma biologic therapies, these recommendations were made out of an abundance of caution rather than due to any proven interactions. The Australian Technical Advisory Group on Immunisation accepts a shorter interval (i.e. less than 7 days, or even co-administration) in certain scenarios, such as when COVID-19 transmission rates are high, or when other vaccines are urgently indicated to prevent disease (e.g. when there is an influenza outbreak or a tetanus-prone wound). In addition, should there be logistical concerns due to scheduling issues, not having a 7-day interval is better than risking not administering the vaccine at all.⁴²

Some unanswered questions remain regarding the adequacy of serological response to COVID-19 vaccination in asthma patients and, in particular, severe asthma patients on biologics or long-term OCS. As with the general population, the efficacy of existing vaccinations against emerging SARS-CoV-2 variants and the role of booster shots in patients with “inadequate” responses also remain unknown. These are critically important topics, and more evidence is needed to provide clinical guidance in the coming months.

Mask-wearing and social distancing measures

Clinical question: What are the recommendations regarding mask-wearing and social distancing measures for asthma patients?

Key messages:

1. Mask-wearing and social distancing measures may contribute to reductions in asthma exacerbations and influenza-related illness.
2. Wearing a face mask is unlikely to increase the risk of adverse effects for those with chronic respiratory disease.

Mask-wearing has become an important part of public health measures to help reduce the community spread of COVID-19, complementing other strategies such as physical/social distancing and hand hygiene. As vaccination rates increase, some countries have also relaxed their guidance regarding mask-wearing. However, health advice in different countries and regions has varied widely; even within the same region, the advice given may change rapidly or is frequently confusing, with differences in mask mandates, and levels and timelines of reopening.⁴³ For instance, the CDC recommendations on mask-wearing differ depending on the number of COVID-19 cases in the area, the setting and activity, and the individual’s health status.⁴⁴

Nevertheless, current evidence suggests that the benefits of mask-wearing outweigh the potential harms when COVID-19 is spreading in a population, with the main trade-off being personal freedom.⁴⁵ For the general public, mask-wearing is very safe. Common complaints may include skin problems (e.g. itch, rash, flare-ups of existing problems like acne or dermatitis) and headache, but can be easily improved with prevention measures, such as the use of moisturisers and ensuring that masks are well-fitting.⁴⁶

With regards to patients with asthma, the professional bodies do not have specific guidance on mask-wearing. GINA defers to individual countries and regions for

localised health advice regarding hygiene strategies and personal protective equipment.⁵

Notably, GINA states that many countries have seen a reduction in asthma exacerbations and influenza-related illness, which may be partly due to mask-wearing and other COVID-19-related measures.⁵ In the UK, a large cohort study was done to analyse a database of an estimated 10 million patients, comparing pre-lockdown and post-lockdown records. The analysis found that exacerbation rates among asthma patients were reduced by 0.196 episode per person-year, which represents about 20 episodes for every 100 asthma patients per year.⁴⁷ In terms of admission rates, a Hong Kong study compared admission rates in 2020 against baseline data from 2015 to 2019 and found a decrease in admissions for asthma exacerbations by 53.2%.⁴⁸ This trend is likely to be a true reduction in exacerbations rather than a reluctance to initiate face-to-face provider contact or healthcare system avoidance during the pandemic.⁴⁹ In a study that included exacerbations not resulting in a visit to a healthcare provider but were reported remotely, there was a 40% decrease in asthma exacerbations with the onset of the COVID-19 pandemic.⁴⁹ While these effects are likely to be multifactorial, the findings suggest that existing practices may be beneficial for asthma patients. Significant reduction in inappropriate attendances to emergency departments during the COVID-19 pandemic was also reported in a study from Singapore, highlighting some of the unexpected beneficial knock-on effects from the pandemic.⁵⁰

Concerns of increased risks of adverse effects of mask-wearing in patients with chronic respiratory diseases are also largely unfounded. In an evidence review by Alberta Health Services, the health authority for the Canadian province of Alberta, the risks of wearing a face mask were not found to be increased for those with chronic respiratory disease.⁴⁶ A recent study also noted that mask-wearing does not affect oxygen saturation levels in both asthma and non-asthma patients, with oxygen saturation levels reported to be between 93% and 100% among the study participants, and averaging 98% for people with asthma.⁵¹

In view of the current available evidence, it is important that patients with asthma continue to wear masks and adhere to stricter standards of protective measures against COVID-19, as the benefits are very likely to outweigh any potential harms. Some patients, such as those with severe asthma who may feel it is difficult to breathe while wearing a face mask, should continue to stay home or avoid public places as much as possible.

Role of telemedicine in the management of asthma

Clinical question: Is there a role for telemedicine in managing asthma patients during the COVID-19 pandemic?

Key messages:

1. Telemedicine is a useful option for providing patient care that is more convenient while reducing in-person visits, but many barriers may prevent successful implementation.
2. Healthcare providers should continually improve on the delivery of asthma care using new models of care. A combination of telemedicine and in-person visits may be employed.

In the face of the COVID-19 pandemic, telemedicine, which is defined as the “remote delivery of health care services and clinical information using telecommunications technology”, has offered a safer and effective alternative for patients to continue to receive care remotely without the need to leave their homes.⁵² Telemedicine has increasingly been used to care for patients with asthma and allergies in response to the pandemic.⁵² However, this concept is not new and has been used with favourable outcomes for patients with asthma even before the pandemic. Telemedicine has been shown to improve quality of life while improving medication adherence and decreasing the use of healthcare resources.⁵² In the first systematic review and meta-analysis of telemedicine that investigated the effects of telemedicine activities in asthma patients, results from 22 studies showed that a combination of different telemedicine approaches led to significant improvements in asthma control and quality of life in adult asthma patients when compared with usual care.⁵³

Patients also appear to report high satisfaction with telemedicine, although this finding was based on data from an allergy and immunology practice in New York instead of from asthma patients only.⁵⁴ In this study, data provided by 4 physicians on 518 patient visits by children and adults from 13 April to 8 May 2020, including 290 telemedicine encounters, were analysed.⁵⁴ Among the 177 patients who completed the follow-up telephone survey, 97% were satisfied with their virtual visit, and 77% found the appointment as satisfactory as an in-person visit.⁵⁴ Despite the high patient satisfaction, there might still be a preference for in-person consultations. The most important factor that led to a preference for in-person visits was the desire for a more personal interaction, which was cited by 45.3% of patients. Moreover, when treating physicians were asked to assess the patient encounters, 42.4% of the encounters

were deemed to be incomplete, although there was no elaboration of what was lacking in these encounters.⁵⁴

Overall, telemedicine serves as a useful option for providing patient care that is more convenient while reducing in-person visits. Despite the potential benefits, many barriers may prevent successful implementation. These may include a lack of access to the required technology, complexity in billing and documentation, and difficulties in conducting a thorough physical examination.⁵⁵ In Singapore, there is a lack of telemedicine integration into the hospital information technology ecosystem, and its use may add to the physician administrative load.⁵⁶

In the current climate, telemedicine is likely to continue to expand and play an important role in providing care to patients remotely to complement in-person visits. Healthcare providers should continue to build on current experience and improve on the delivery of asthma care using a combination of telemedicine and in-person visits.

DISCUSSION

This review summarises the recommendations from the various professional bodies on the management of asthma during the COVID-19 pandemic and provides additional information from the literature to justify the recommendations.

In general, healthcare professionals should continue to manage asthma according to accepted asthma guidelines and recommendations. Key themes are highlighted in Fig. 1. In summary, the key points are:

1. Patients with well-controlled, mild-to-moderate asthma are unlikely to be at increased risk of acquiring COVID-19 or having worse outcomes from COVID-19. However, a subset of patients with poorly controlled asthma may be at increased risk of COVID-19-related death.
2. All patients with asthma, even those with severe asthma as well as those treated with biologic therapy, should receive COVID-19 vaccination. Other vaccinations, such as those for influenza and pneumococcal disease, should also continue to be part of the routine care for asthma patients.
3. At-home administration of asthma biologics can be considered for selected patients to reduce the risk of getting infected with SARS-CoV-2, but this should be balanced against the benefits of in-office administration.
4. Spirometry can be performed unless there is a suspicion of COVID-19. When spirometry is

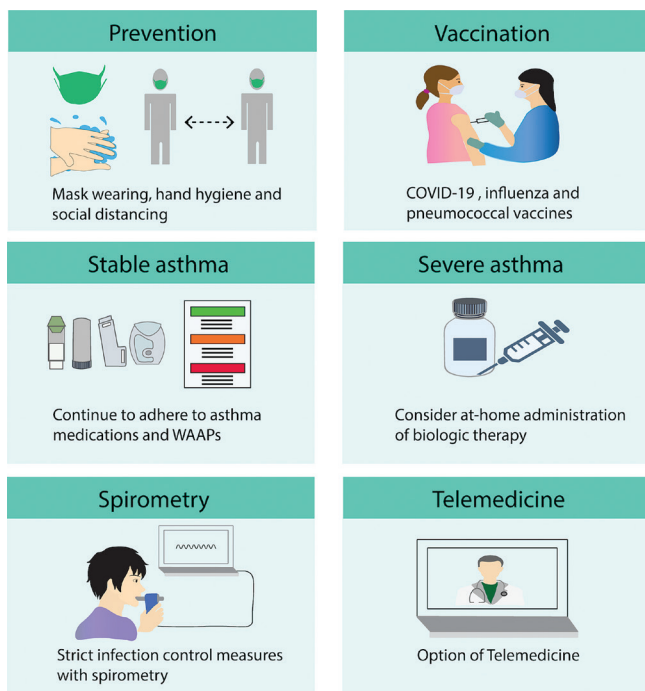


Fig. 1. Key themes in asthma management.
WAAPs: written asthma action plans

performed, strict infection control procedures as previously recommended should be adhered to.

5. As with the general population, measures to reduce the spread of COVID-19 are recommended. These include screening for COVID-19 and isolating suspicious cases, as well as general measures such as mask-wearing, personal hygiene, social distancing and testing of selected high-risk persons who are otherwise asymptomatic.
6. Mask-wearing and other measures to reduce transmission risk should continue for patients with asthma as these precautions may reduce the risk of asthma exacerbations and are unlikely to cause any adverse effects.
7. Telemedicine is a useful option for providing asthma care. It may be convenient and reduces in-person visits and could be used to complement in-person visits.

There is limited evidence of whether the standards of asthma care have changed during the pandemic. There is significant variation across countries and care settings in how the pandemic has impacted the management of different non-communicable diseases.⁵⁷ Services may be disrupted owing to resource diversion and disruption to healthcare delivery. However, various alternative strategies, including systems for triaging patients and

the increased use of telemedicine, have helped to ensure that patients continue to receive appropriate treatment.⁵⁷ As many countries have seen a reduction in asthma exacerbations and influenza-related illness without an increase in asthma mortality, it is unlikely that the quality of care has declined significantly during this period. Nevertheless, defining quality of care is complex, hence it is important that practices based on the best available evidence are implemented, highlighting the importance of continual timely review of the literature.

This review has some limitations that need to be considered. The objective of the review was to summarise recommendations by professional bodies and provide additional information beyond the recommendation statements, supplemented by a literature search. Thus, a rigorous, systematic search of the literature was not conducted, and the quality of the evidence was not appraised. Nevertheless, it is reassuring that the professional bodies have a high level of agreement in their recommendations, even though the recommendations may be based on different supporting literature, and are mostly based on expert opinion. In addition, the most relevant source was referenced for each topic of interest for the purpose of this review. Several aspects of asthma management were also not discussed and may warrant a further review of the literature. These may include COVID-19's impact on asthma comorbidities, asthma complications such as viral/bacterial pneumonia and pneumothorax, and asthma triggers such as exposure to cleaning and disinfectants that may be used with increased frequency for surface cleaning. Nevertheless, some topics, such as the management of concomitant allergic rhinitis, were already discussed in the previous review.³

CONCLUSION

Our understanding of how asthma may be affected by COVID-19 continues to evolve. While previous recommendations were largely based on expert opinion, the tremendous amount of literature published since the pandemic first emerged 2 years ago has helped guide respiratory professional bodies to update their recommendations. This study provides a timely review of the various recommendations and can be used to guide healthcare professionals in managing asthma patients as the world prepares for a future with COVID-19 becoming endemic. The long-term consequences of COVID-19 infection in asthma patients and the ripple effects of COVID-19 remain uncertain and deserve ongoing study.

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