Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

3 Yang JC-H, Ellers-Lenz B, Straub J, Johne A, Wu Y-L. INSIGHT 2: tepotinib plus osimertinib in patients with *EGFR*-mutant NSCLC having acquired resistance to EGFR TKIs due to *MET*-amplification: a phase 2 trial in progress study. *Ann Oncol* 2019; **30**(suppl 9)**:** ix181.

4 Frigault MM, Markovets A, Nuttall B, et al. Mechanisms of acquired resistance to savolitinib, a selective MET Inhibitor in *MET*-amplified gastric cancer. *JCO Precis Oncol* **4:** 222–32.

5 Fujino T, Kobayashi Y, Suda K, et al. Sensitivity and resistance of MET exon 14 mutations in lung cancer to eight MET tyrosine kinase inhibitors in vitro. *J Thorac Oncol* 2019; **14:** 1753–65.

6 Huang M, Zhang D, Wu JY, et al. Wnt-mediated endothelial transformation into mesenchymal stem cell-like cells induces chemoresistance in glioblastoma. *Sci Transl Med* 2020; **12:** eaay7522.

7 Guo T, Zhao S, Wang P, et al. YB-1 regulates tumor growth by promoting MACC1/c-MET pathway in human lung adenocarcinoma. *Oncotarget* 2017; **8:** 48110–25.

8 An N, Xiong Y, LaRue AC, Kraft AS, Cen B. Activation of pim kinases is sufficient to promote resistance to MET small-molecule inhibitors. *Cancer Res* 2015; **75:** 5318–28.

9 Cui J, Xia T, Xie D, et al. HGF/MET and FOXM1 form a positive feedback loop and render pancreatic cancer cells resistance to MET inhibition and aggressive phenotypes. *Oncogene* 2016; **35:** 4708–18.

10 Nilsson MB, Sun H, Robichaux J, et al. IA34 The YAP/FOXM1 axis regulates EMT-associated EGFR tyrosine kinase inhibitor resistance and increased expression of spindle assembly checkpoint components. *J Thorac Oncol* 2020; **15:** S11.

Asthma in children during the COVID-19 pandemic: lessons from lockdown and future directions for management

Chassenet/BSIP/Science Photo Library

Published **Online**
June 25, 2020
https://doi.org/10.1016/S2213-2600(20)30278-2

See **Editorial** *Lancet Respir Med* 2020; **8:** 647

Shamefully, children still die from asthma,[1] and UK asthma outcomes are among the worst in Europe.[2] COVID-19 has wreaked havoc across the globe, and the world is having to re-evaluate almost every aspect of the daily living we took for granted in 2019. What has COVID-19 taught us about asthma in children? What are the implications for asthma management in children and for the asthma community as lockdowns are eased?

COVID-19 is generally a mild disease in children compared with adults, and although a few children get a severe respiratory or systemic disease, most do not need intensive care.[3] As a respiratory virus, we might expect severe acute respiratory syndrome coronavirus 2, which causes COVID-19, to increase asthma attacks; however, Kenyon and colleagues[4] reported a 76% drop in emergency visits for asthma of all severities during the COVID-19 pandemic, a similar drop to our own UK experience. Substantial falls have also been noted in visits for non-asthma respiratory and endocrine diagnoses and for trauma. This decrease in emergency visits is unlikely to be accounted for simply by parents managing mild attacks at home, but the causes for what is clearly a relevant change are uncertain. Reasons could include lockdown preventing transmission of conventional respiratory viruses, such as rhinovirus and respiratory syncytial virus, and reduced exposure to outdoor allergens. Another factor could be the striking reductions in atmospheric pollution,[5] a well established factor in asthma attacks.[6] It is also possible that parental supervision of asthma drugs, leading to better adherence, is a factor.[7] Research is needed to identify the contributing factors and to underpin future measures.

The societal challenge is that these huge reductions in asthma attacks have been achieved not with expensive new drugs but by behavioural changes. Can we maintain these post COVID-19? At the very least, we need to challenge ourselves about being more rigorous in preventing transmission of respiratory viruses. Before the COVID-19 pandemic and lockdowns around the world, most parents will have dosed their offspring with paracetamol and left them shedding respiratory viruses in the childcare facility. Do we need to be more ready to keep our children at home and stay off work, irrespective of whether they have asthma? More evidence is needed to study the wider implications of this behaviour for the child and family. There is also a need for sustained efforts to reduce air pollution globally.

During the COVID-19 pandemic, not only has the frequency of asthma attacks changed but also asthma management has been transformed, with virtually all routine checks in secondary and tertiary care being done remotely. This adjustment to practice has been facilitated by advances in home monitoring of lung function, which can be directly observed by a physiologist from the hospital. Home self-administration of biologicals can also be directly observed by mobile telephone. Remote consultation clearly has many advantages that will be important going forward, including minimising cross-infection risk, which is likely to be a long-term issue, and reducing disruption to normal life. However, there are frequently safeguarding concerns in children with severe asthma[8] that are difficult to assess remotely. Moreover, occasions will arise when a face-to-face consultation is needed,

typically to do advanced tests such as histamine challenge or skin prick. But the future default should be remote consultation, not face-to-face meetings.

Up to now, we have had to improvise, but telemedicine has gained huge momentum during the COVID-19 pandemic, and now we need to make ambitious plans. Preventable asthma deaths are still happening, and major factors include underuse of inhaled corticosteroids, overuse of short-acting β2 agonists, and above all, an asthma attack being treated as an isolated event instead of a red flag predictive of high future risk.[9,10] The imperative is to design remote monitoring systems not only to optimise distance outpatient consultations but also to improve outcomes.

Routine outpatient monitoring includes height, weight, spirometry, exhaled nitric oxide (in some cases), and physical examination including chest auscultation; all these measurements can be done at home. We have the technology for electronic stethoscopes on mobile telephones. Electronic dose counters for inhalers are also available, which could be used to identify underuse of inhaled corticosteroids and overuse of short-acting β2 agonists with remote Bluetooth technology. Our mobile telephones record where we have shopped and where we have dined, and they could potentially be used to record any unscheduled health visits, mandating an asthma review, with the permission of the family. We would need to devise an alert system so that contact is immediately made if agreed thresholds were met.

Remote collection of this information for all children with more than trivial asthma, combined with individual and societal behavioural change, could potentially reduce asthma attacks and improve outcomes. The challenge is to improve clinical practice post COVID-19, not default to the past.

We declare no competing interests. AB is funded by the Asthma UK Centre for applied research.

*Atul Gupta, Andrew Bush, Prasad Nagakumar
atul.gupta@kcl.ac.uk

Department of Paediatric Respiratory Medicine, King's College Hospital and King's College London, London SE5 9RS, UK (AG); Imperial College and Royal Brompton Harefield NHS Foundation Trust, London, UK (AB); Department of Paediatric Respiratory Medicine, Birmingham Women's and Children's Hospital NHS Foundation Trust & Birmingham Acute Care Research, Institute of Inflammation and Aging, University of Birmingham, UK (PN)

1 Levy ML. The national review of asthma deaths: what did we learn and what needs to change? *Breathe* 2015; **11:** 14–24.
2 Wolfe I, Thompson M, Gill P, et al. Health services for children in western Europe. *Lancet* 2013; **381:** 1224–34.
3 Docherty AB, Harrison EM, Green CA, et al. Features of 20 133 UK patients in hospital with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. *BMJ* 2020; **369:** m1985.
4 Kenyon CC, Hill DA, Henrickson SE, Bryant-Stephens TC, Zorc JJ. Initial effects of the COVID-19 pandemic on pediatric asthma emergency department utilization. *J Allergy Clin Immunol Pract* 2020; published online June 6. DOI:10.1016/j.jaip.2020.05.045.
5 Ierodiakonou D, Zanobetti A, Coull BA, et al. Ambient air pollution, lung function, and airway responsiveness in asthmatic children. *J Allergy Clin Immunol* 2016; **137:** 390–99.
6 Künzli N, Kaiser R, Medina S, et al. Public-health impact of outdoor and traffic-related air pollution: a European assessment. *Lancet* 2000; **356:** 795–801.
7 Kaye L, Theye B, Smeenk I, Gondalia R, Barrett MA, Stempel DA. Changes in medication adherence among patients with asthma and COPD during the COVID-19 pandemic. *J Allergy Clin Immunol Pract* 2020; published online May 3. DOI:10.1016/j.jaip.2020.04.053.
8 Nagakumar P, Gambir N, Sanghani N, et al. Role of a prolonged inpatient admission when evaluating children with problematic severe asthma. *Eur Respir J* 2018; **51:** 1701061.
9 Levy ML, Fleming L, Warner JO, Bush A. Paediatric asthma care in the UK: fragmented and fatally fallible. *Br J Gen Pract* 2019; **69:** 405–06.
10 Pavord ID, Beasley R, Agusti A, et al. After asthma: redefining airways diseases. *Lancet* 2018; **391:** 350–400.

COVID-19 recovery: potential treatments for post-intensive care syndrome

Published **Online**
October 13, 2020
https://doi.org/10.1016/S2213-2600(20)30457-4

The long-term effects of surviving COVID-19 have become a new focus of attention for clinicians and researchers. This focus has been driven partly by concerns about late ill-effects of a previously unknown virus, but recognised generic patterns of chronic disease after critical illness also exist. These patterns are termed PICS, an acronym both for post-intensive care syndrome and for persistent inflammation, immunosuppression, and catabolism syndrome. We recommend unifying post-COVID-19 research aims with those of PICS research and propose a novel approach to its management by repurposing drugs that are approved, inexpensive, and safe.

Severe COVID-19 pneumonia causes acute respiratory distress syndrome (ARDS). Intensive care unit (ICU) stays of patients with ARDS are lengthy and characterised by severe hypoxaemia, extrapulmonary organ failures, and a marked inflammatory response. Follow-up data from young (<30 years) populations with a range of critical illnesses and no comorbidities,