



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

- 5 Nardone A, Casey JA, Morello-Frosch R, Mujahid M, Balmes JR, Thakur N. Associations between historical residential redlining and current age-adjusted rates of emergency department visits due to asthma across eight cities in California: an ecological study. *Lancet Planet Health* 2020; **4**: e24–31.
- 6 Krieger N, Wright E, Chen JT, Waterman PD, Huntley ER, Arcaya M. Cancer stage at diagnosis, historical redlining, and current neighborhood characteristics: breast, cervical, lung, and colorectal cancers, Massachusetts, 2001–2015. *Am J Epidemiol* 2020; **189**: 1065–75.
- 7 University of Michigan Center for the History of Medicine and Michigan Publishing. The American influenza epidemic of 1918–1919. <https://www.influenzaarchive.org/cities/city-baltimore.html#> (accessed March 4, 2021).
- 8 Anderson D. Redlining's legacy of inequality: \$212,000 less home equity, low homeownership rates for Black families. June 11, 2020. <https://www.redfin.com/news/redlining-real-estate-racial-wealth-gap/> (accessed Dec 27, 2020).
- 9 Leifheit KM, Linton SL, Raifman J, et al. Expiring eviction moratoriums and covid-19 incidence and mortality. *SSRN* 2020: published online November 30. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3739576 (preprint).
- 10 Centers for Disease Control and Prevention. County-level COVID-19 vaccination coverage and social vulnerability—United States, December 14, 2020–March 1, 2021. March 26, 2021. <https://www.cdc.gov/mmwr/volumes/70/wr/mm7012e1.htm> (accessed May 15, 2021).

Contextualising evidence-based recommendations for the second wave of the COVID-19 pandemic in India



During the second wave of the COVID-19 pandemic in India, which began in March, 2021, demand on the health-care system has far exceeded capacity. Despite crippling shortages, patients are prescribed a battery of ineffective therapeutic interventions.¹ Ivermectin, hydroxychloroquine, and herbal cocktails continue to receive state patronage.^{2,3,4} On May 8, 2021, 2-deoxy-D-glucose was given emergency authorisation, stating that it will “save precious lives” without any published evidence that it impacts mortality.⁵ An entrenched culture of polypharmacy and gestalt-driven practice among physicians has resulted in indiscriminate and unwarranted use of remdesivir, favipiravir, azithromycin, doxycycline, plasma therapy, and most recently bicitanib and bevacizumab, regardless of disease severity or drug efficacy. Excessive and inappropriate use of steroids could be contributing to the alarming rise of mucormycosis in patients recovering from COVID-19.

In rural India, where health-care infrastructure is threadbare, and families are poor, patients can ill afford such expensive mistakes. Honing in on the most high yield and affordable interventions, we propose recommendations for testing and management, optimised to India's current resource-constrained context (table). Every clinical touchpoint should be used to underscore masking, distancing, and vaccination.

Where RT-PCR test turnaround time is lengthy, or when tests are unavailable, CT scans are being routinely prescribed for diagnosing infection from SARS-CoV-2. Serial scans are prescribed for prognostication; high CT severity scores—regardless of clinical presentation—then inadvertently trigger unwarranted hospitalisations. This practice is neither standard of

care nor an option for most patients. In fact, we argue that in the throes of this surge, it would be prudent to initiate treatment for presumed infection if clinically warranted, and have all with mild symptoms isolate for 14 days or until a test result is available.⁶ In early May, 2021, national guidelines were finally relaxed to allow such syndrome-based diagnosis, ending a year of delayed or denied hospital admissions due to slow or unavailable testing.

When options for oxygenation or timely transport to higher levels of care are available, oxygen saturation, a reliable predictor of mortality in COVID-19, and measured via cheaply and widely available pulse-oximeters, should suffice for risk stratification.⁷ Routinely prescribed expensive laboratory tests such as C-reactive protein, ferritin, interleukin-6, and D-dimer, will have little bearing on clinical outcomes where there are no viable options for basic therapeutic care. Even in urban India, physicians must consider recommending such tests only when there is evidence that interventions are based on their interpretation change outcomes and are actually feasible.

For nearly a year, patients were being advised institutional isolation, regardless of disease severity or ability to isolate at home. For patients with mild disease, home-based care and self-monitoring with a pulse oximeter—as has long been appropriate—has finally gained widespread traction, from sheer necessity. Clear directives (and telemedicine support, where possible) will prevent unwarranted presentations to the hospital. Most patients with hypoxia might only need oxygenation and proning. Current evidence supports the use of steroids such as dexamethasone only among

Published Online
June 8, 2021
[https://doi.org/10.1016/S1473-3099\(21\)00329-7](https://doi.org/10.1016/S1473-3099(21)00329-7)

	Who	Where	How (impact optimisation strategies)
Mild disease*			
Treat			
Inhaled budesonide (might help)	Self-administered	Home	Instructional videos
Antipyretic	Self-initiated	Home	Specific drug name, dose, and frequency
Monitor pulse oximeter and respiratory rate	Self-initiated	Home	Instructional videos
Report test and clinical status	Care coordinator	Home	Community-based, private, or public sector central coordination
Other			
Masking	Self-initiated	Home	Instructional videos
Ventilate the isolation room, when feasible	Self-initiated	Home	Instructional videos
Reinforce the importance of completing or initiation vaccination after recovery, including for all family members	All providers	..	Instructional videos
Moderate disease†			
Treat			
Oxygenation via concentrator or cylinder (NB: potential risk to inadequately protected care providers); target SpO ₂ above 92%	Family assisted or trained personnel	Any	Instructional videos on caregiver PPE, correct use, and dosing
Oxygenation via non-invasive ventilation or high flow nasal cannula (NB: potential risk to inadequately protected care providers); target SpO ₂ above 92%; few will have access to this	Clinician	Any	
Pronation	Self-initiated or assisted	Any	Instructional videos
Dexamethasone (or other equivalents) only if requiring respiratory support	Clinician	Any	Dosage protocols for clinicians
Antipyretic	Self-initiated	Any	Specific drug name, dose, and frequency
Anticoagulation, for patients admitted to care facilities, and only under medical supervision	Trained personnel	Bridge facility or hospital	Instructional videos on administration
Do not use ivermectin and hydroxychloroquine
Test			
Random blood glucose	Trained personnel	Any	Decision support system or telemedicine to higher tier care provider if uncontrolled or new diabetes
CT not indicated in most cases
Report clinical status	Designated coordinator	..	Standardised daily logs of vital signs and interventions
Disease severity classification as per the Ministry of Health and Family Welfare, Government of India. PPE=personal protective equipment. SpO ₂ =oxygen saturation. *Patients with mild symptoms and SpO ₂ ≥94%. †Patients with SpO ₂ <94 and ≥90.			
Table: Evidence-base interventions for COVID-19 patients not requiring hospitalisation			

those needing oxygen or invasive respiratory support.^{8,9} A few patients might also benefit from prophylactic doses of anticoagulation that can be administered by trained family members.¹⁰ Patients can be taught pronation via effective educational aids. A severe shortage of beds and unreliable power availability threaten other key treatment possibilities in rural India, as oxygen concentrators will need continuous electricity or back-up generators, and oxygen cylinders are expensive to procure and transport. The justified, ad hoc, and self-organised measures to procure and administer oxygen, however, risk inadequate oxygen therapy, rendering these often Herculean efforts clinically futile. A vast number of oxygen concentrators

and ventilators have been mobilised internationally. On May 8, 2021, the Supreme Court of India appointed a task force to oversee oxygen allocation. It is imperative that recommendations for distribution be coupled with human-in-the-loop solutions where technical know-how to operate these devices is expanded expeditiously via online adjuncts. The government has also directed India's non-allopathic AYUSH doctors to provide COVID-19 care. It is crucially important that this expanded workforce not amplify missteps from the preceding year.

Hypoxic patients who do not need invasive mechanical ventilation can be cared for at makeshift but monitored, protocolised health-care facilities. Despite

the bed shortage, and revised national guidelines, many patients are not being discharged home until their RT-PCR test is negative. There is no evidence that patients need hospitalisation once they are clinically stable for discharge. When isolating at home is unfeasible, they could be sent to recovery centres. Indigenous rural solutions such as isolating patients elsewhere on the farm are not unreasonable, provided family members can provide care.

It is time to double down on effective interventions. The lack of critical care capacity necessitates open discussions about goals of care. We are all practicing physicians and recognise how hard it is to communicate futility to family members, especially in these desperate times. Truth, however, will protect families from crushing debt, and in some cases, financial ruin. Adherence to science, even now, will probably be the least destructive path forward.

ZU serves on the Maharashtra Covid Task Force and National Task Force constituted by the Supreme Court of India; and has received honoraria or grants from AstraZeneca and Glenmark. AG has received grants from Cipla, Glenmark, Pfizer, Sanofi, Astellas, Mylan, Natco, Biomerieux, Bharath Serum, and GlaxoSmithKline. All other authors declare no competing interests.

*Satchit Balsari, Zarir Udawadia, Ahmed Shaikh,
Abdul Ghafur, Sushila Kataria
sbalsari@bidmc.harvard.edu

Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, and Global Health and Population Department,

Harvard TH Chan School of Public Health, Harvard University, Cambridge, MA 02215, USA (SB); Department of Pulmonary Medicine, P.D. Hinduja Hospital and Medical Research Center, Mumbai, India (ZU); Department of Pulmonary Medicine, Breach Candy Hospitals & Research Centers, Mumbai, India (ZU); Department of Emergency Medicine, NewYork-Presbyterian Hospital, New York, NY, USA (AS); Department of Infectious Diseases, Apollo Cancer Hospital, Chennai, India (AG); Department of Internal Medicine, Medanta Hospital, Gurgaon, India (SK)

- 1 Pulla P. Covid-19: India's slow moving treatment guidelines are misleading and harming patients. *BMJ* 2021; **372**: n278.
- 2 López-Medina E, López P, Hurtado IC, et al. Effect of ivermectin on time to resolution of symptoms among adults with mild COVID-19: a randomized clinical trial. *JAMA* 2021; **325**: 1426–35.
- 3 Singh B, Ryan H, Kredt T, Chaplin M, Fletcher T. Chloroquine or hydroxychloroquine for prevention and treatment of COVID-19. *Cochrane Database Syst Rev* 2021; **2**: CD013587.
- 4 AIIMS Covid Information Portal. Clinical guidance for management of adult Covid-19 patients. <https://covid.aiims.edu/clinical-guidance-for-management-of-adult-covid-19-patients/> (accessed May 18, 2021).
- 5 Press Information Bureau Delhi. DCGI approves anti-COVID drug developed by DRDO for emergency use. 2021. <https://pib.gov.in/PressReleasePage.aspx?PRID=1717007> (accessed May 18, 2021).
- 6 Centers for Disease Control and Prevention. COVID-19: when to quarantine. 2021. <https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/quarantine.html> (accessed April 27, 2021).
- 7 Mejía F, Medina C, Cornejo E, et al. Oxygen saturation as a predictor of mortality in hospitalized adult patients with COVID-19 in a public hospital in Lima, Peru. *PLoS One* 2020; **15**: e0244171.
- 8 Caputo ND, Strayer RJ, Levitan R. Early self-proning in awake, non-intubated patients in the emergency department: a single ED's experience during the COVID-19 pandemic. *Acad Emerg Med* 2020; **27**: 375–78.
- 9 Horby P, Lim WS, Emberson JR, et al. Dexamethasone in hospitalized patients with Covid-19. *N Engl J Med* 2021; **384**: 693–704.
- 10 Sadeghipour P, Talasaz AH, Rashidi F, et al. Effect of intermediate-dose vs standard-dose prophylactic anticoagulation on thrombotic events, extracorporeal membrane oxygenation treatment, or mortality among patients with COVID-19 admitted to the intensive care unit: the INSPIRATION randomized clinical trial. *JAMA* 2021; **325**: 1620–30.