COVID-19 Countermeasures: An Algorithm to Stay Unlocked

Abstract

We describe a visual algorithm to help prevent severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) contagion as well as manage COVID-19 disease according to categories of clinical severity. The algorithm is timely, with multiple countries worldwide declaring repeat surges in SARS-CoV-2 infections following the easing of lockdown measures. Its flowchart assimilates key effective interventions in a visual manner that will assist healthcare workers to manage COVID-19 disease algorithmically, and policymakers to suppress further SARS-CoV-2 waves. Importantly, we include the innovative use of topical p-menthane-3,8-diol spray by the British Army for COVID-19 Support Force personnel, which in light of its coronavirucidal properties, deserves wider dissemination. This algorithm has the potential to be updated as numerous studies are concluded globally.

Keywords: *COVID-19, dexamethasone, p-menthane-3,8-diol, vitamin C, vitamin D*

David Izadi,
Egidio J. Da Silva[1],
Miles E. Banwell[2],
Christopher G.
Wallace[3]

Pulvertaft Hand Centre,
Royal Derby Hospital, Derby,
[1]Department of Anaesthesia,
Royal Orthopaedic Hospital,
Birmingham, [2]St Andrews
Centre for Burns & Plastic
Surgery, Broomfield Hospital,
Chelmsford, [3]Department of
Plastic Surgery, Royal Devon &
Exeter Hospital, Exeter, UK

Introduction

The COVID-19 pandemic surges again in India, Iran, Australia, Spain, Belgium, and others, whilst countries like Brazil, the USA, and India are still experiencing large primary surges. Indeed, this public health crisis continues in multiple countries and regions around the world. We suggest an evidence-based algorithm-template [Figure 1] aimed at aiding policymakers and healthcare workers to protect their populations.

By the second week of August 2020, over 20 million confirmed infections and approaching 750,000 deaths attributed to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) had been reported globally by the Johns Hopkins University Coronavirus Resource Centre.[1] The World Health Organization (WHO) recommended social restrictions and lockdown measures to bring the reproduction number below one and "flatten the curve" to protect against overwhelming healthcare resources. However, the easing of lockdown measures internationally makes further COVID-19 surges almost inevitable. Although vaccine research continues, vaccination will not provide a fool-proof solution. Assimilating the most effective SARS-CoV-2 countermeasures remains essential.

An Algorithm for COVID-19 Prevention and Management

Our single-page algorithm [Figure 1] proposes the management of patients categorized by severity of clinical findings. Community compliance will reduce virus contagion; algorithmic management of infections may prevent clinical deterioration.

Individuals who are untested, test-negative, or recovered from COVID-19 must follow social distancing, hand hygiene, mask wear, and track-and-trace World Health Organization (WHO) recommendations. Notably, authorities worldwide have modified existing regulations in-light-of the pandemic emergency. For example, the US Environmental Protection Agency expanded its COVID-19 disinfectant list to include products, *"that although not specifically tested against SARS-CoV-2, have been tested and proven effective on either a harder-to-kill virus or against another human coronavirus similar to SARS-CoV-2"*.[2] Consistent with this approach and cognisant of high kill rates against SARS-CoV and valuable ongoing (residual) virucidal activity over several hours,[3] the British Army has adopted a naturally sourced spray, rich in

How to cite this article: Izadi D, Da Silva EJ, Banwell ME, Wallace CG. COVID-19 countermeasures: An algorithm to stay unlocked. Int J Prev Med 2022;13:73.

Address for correspondence:
Dr Miles E. Banwell,
St Andrews Centre for
Burns & Plastic Surgery,
Broomfield Hospital, Court
Road, Chelmsford, CM1 7ET,
United Kingdom.
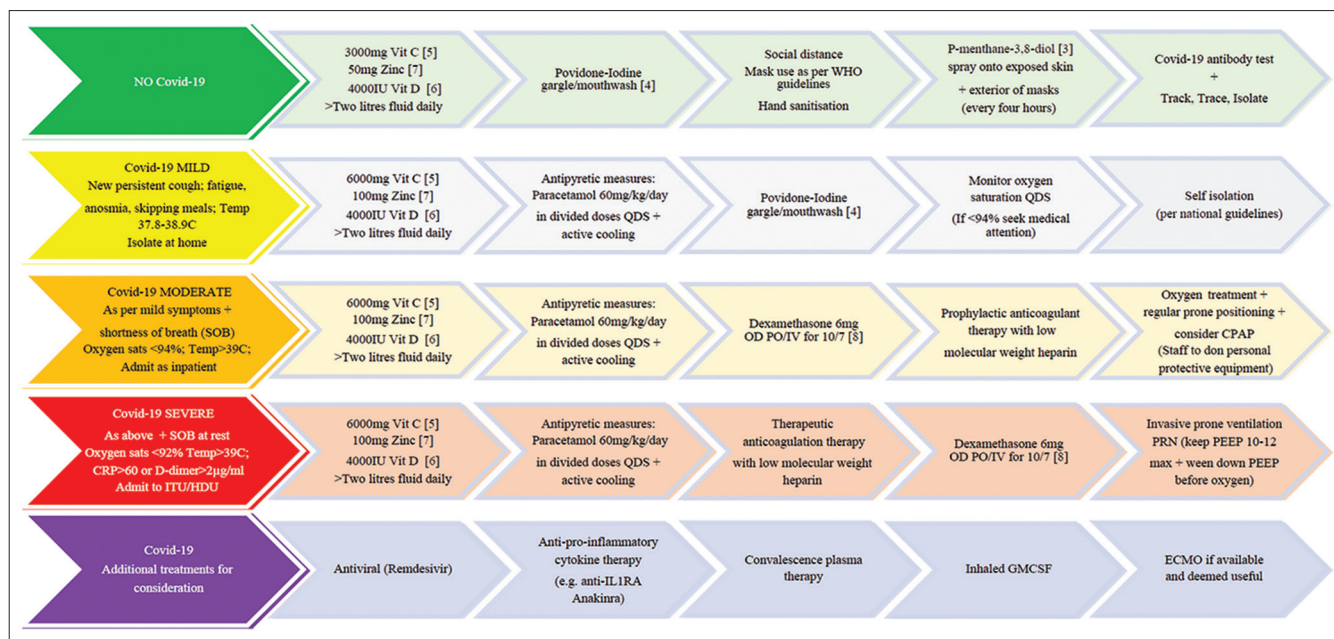*E-mail: miles.banwell@gmail.com*

Figure 1: COVID-19 prevention and treatment flow-chart. Depicting measures to suppress SARS-CoV-2 spread (green chevrons) and algorithmic management of infected individuals stratified by clinical severity of COVID-19 (yellow, orange, red and purple chevrons)

p-menthane-3,8-diol for its COVID-19 Support Force. This spray is applied four-hourly onto exposed skin and the exterior surfaces of masks. It serves as an enhanced measure over and above standard PPE precautions. Similarly, healthcare institutions are providing povidone-iodine gargle/mouthwash for COVID-19 patients and healthcare workers performing aerosol-generating procedures.[4]

Vitamin C,[5] vitamin D,[6,] and zinc,[7] essential to immune function, are being tested in clinical trials against SARS-CoV-2. High-dose intravenous vitamin C shortened intensive care unit stay by 97.8% and significantly reduced mortality; this experience was reproduced among patients with severe influenza.[5] Supplementary vitamin D reduced respiratory infection risk by approximately 42% in people with baseline levels of 25-hydroxyvitamin D below 25 ng/ml; a daily intake of 3000-4000iu was recommended.[6] Zinc slows the replication of SARS-CoV and coronaviruses that cause the common cold.[7] In June 2020, the "RECOVERY" (Randomized Evaluation of COVID-19 thERapY) trial chief investigators announced that low dose (6 mg per day for 10 days) dexamethasone reduced 28-day mortality rate, compared to usual care alone, in patients requiring respiratory support by ventilation or supplementary oxygen alone.[8] Pharmacological antipyretics, cold saline bladder irrigation, tepid sponging, and cooler treatment unit temperatures are also important.

Conclusion

The global research effort in terms of SARS-CoV-2 vaccine development continues and encouraging results from early phase clinical trials, reported in July 2020, offer grounds for cautious optimism.[9] The algorithm presented herein simplifies advice regarding the prevention and management of COVID-19 disease, providing a visual pathway to assist in suppressing surges in SARS-CoV-2 contagion. The algorithm can be updated as relevant clinical trials report their findings.

Financial support and sponsorship

Conflicts of interest

There are no conflicts of interest.

References

1. Johns Hopkins University Coronavirus Resource Center. Available from: https://coronavirus.jhu.edu/map.html. [Last accessed on 2020 Aug 09].

2. United States Environmental Protection Agency. Press release, 13th March 2020. Available from: https://www.epa.gov/newsreleases/epa-expands-covid-19-disinfectant-list. [Last accessed on 2020 Aug 09].

3. Clarke PD. Antiviral composition comprising p-menthane-3,8-diol. United States Patent Number: US 7,872,051 B2. Date of Patent: January 18, 2011.

4. Eggers M, Koburger-Janssen T, Eickmann M, Zorn J. *In vitro* bactericidal and virucidal efficacy of Povidone-Iodine gargle/mouthwash against respiratory and oral tract pathogens. Infect Dis Ther 2018;7:249-59.

5. Cheng RZ. Can early and high intravenous dose of vitamin C prevent and treat coronavirus disease 2019 (COVID-19)? Med Drug Discov 2020;5:100028.

6. Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, *et al*. Vitamin D supplementation to prevent acute respiratory tract infections: Systematic review and meta-analysis

of individual participant data. Br Med J 2017;356:i6583.

7. Te Velthuis AJW, van den Worm SHE, Sims AC, Baric RS, Snijder EJ, van Hemert MJ. Zn2+ inhibits coronavirus and arterivirus RNA polymerase activity *in vitro* and zinc ionophores block the replication of these viruses in cell culture. PLoS Pathog 2010;6:e1001176.

8. RECOVERY Trial Chief Investigators' press release, 16th June 2020. Available from: https://www.recoverytrial.net/news/low-cost-dexamethasone-reduces-death-by-up-to-one-third-in-hospitalised-patients-with-severe-respiratory-complications-of-covid-19. [Last accessed on 2020 Jun 16].

9. Folegatti PM, Ewer KJ, Aley PK, Angus B, Becker S, Belij-Rammerstorfer S, *et al*., Oxford COVID Vaccine Trial Group. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: A preliminary report of a phase 1/2, single-blind, randomised controlled trial. Lancet 2020;396:467-78.