Costs versus prices for new re-purposed drugs to treat COVID-19 infection

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Introduction

Global incidence of COVID-19 is accelerating with **over 500,000 new cases per day**, resulting in 1.3 million deaths at the time of writing[1]. Although vaccine development is well advanced, there remains an urgent need for effective treatments for patients already infected, whether to stop disease progression in mild-moderate cases, or to improve mortality in severe disease through modulating immune dysregulation and ameliorating lung function.

Repurposing existing drugs to treat COVID-19 has been an important pillar in the fight against the ongoing pandemic with many potential drugs being tested in clinical trials globally. Although some such as hydroxychloroquine have been rejected following negative results, new candidates continue to be proposed.

If any are found to be effective, **mass availability at an affordable cost would be essential** to ensure equity and access, especially amongst LMICs with unfavourable wider determinants of health and limited or fragile healthcare system capacity. Any **effective treatment must also be readily available** and able to meet the growing demand at the same time as protecting supply to existing patients.

Methodology

Costs of production and current availability were estimated using established methodology[2,3] based on active pharmaceutical ingredients (API) export data from India between 2016-19[4]. API costs are key determinants of generic medicine production costs[5]. Estimated costs were compared against list prices from selected low, medium and high-income countries[6].

Where API data was unavailable, published routes of synthesis were analysed to estimate costs[6].

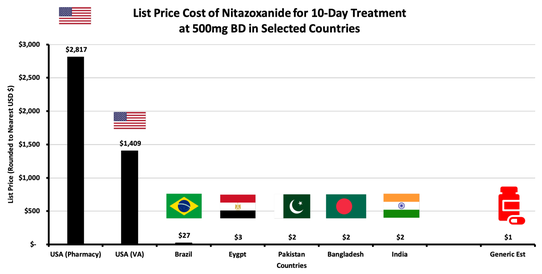
Results – "the three tests"

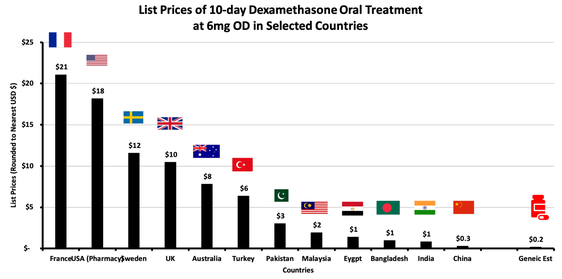
Three tests must be met for any potential treatment to be successful:

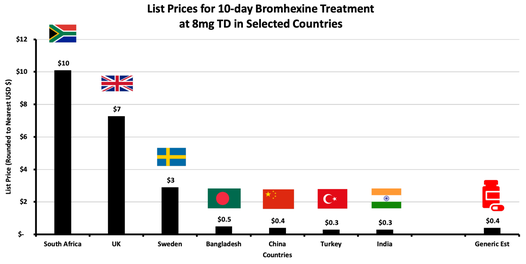
1. **Potential affordability –** of the 11 drugs analysed, all could be produced generically for significantly less than average list prices, ranging from $0.20 per 10-day course of oral dexamethasone and losartan, to $15 per course of favipiravir.
2. **Current availability** – where API data were available, we find overall excellent availability based on 2019 data. API sufficient for 1.18 billion 10-day courses of losartan, 150 million courses of bromhexine, and 126 million courses of dexamethasone
3. **Clinical efficacy and safety** – a large number of clinical trials are currently underway or being planned. Favipiravir alone has 40 studies registered as currently recruiting[7], and a critical mass of clinical data will become available for most drugs in the coming months. However, this constantly evolving trials landscape is outside the scope of this poster.

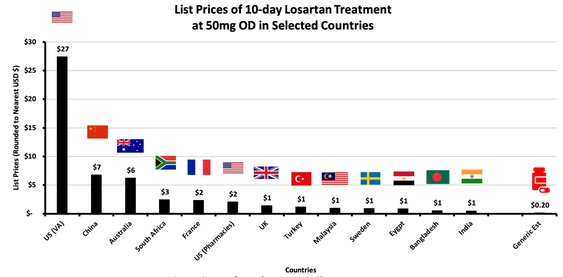
Limitations

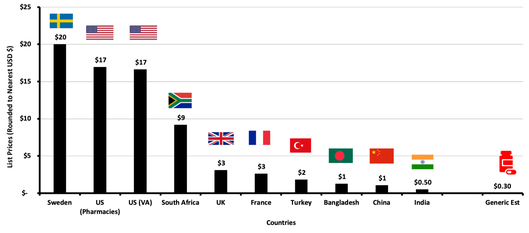
1. API costs are subject to market conditions, and therefore may change suddenly[8]. Similarly, list prices quoted may change due to market fluctuations or in-country negotiated discounts.
2. Notably, although India was chosen for analysis due to its dominance in the generic medicines sector[9], other countries may have local domestic production not captured by our estimates.
3. Different doses and course lengths are being investigated in clinical trials. Colchicine for example is being tested in some studies using 0.5mg BD for 3 days and then 0.5mg OD for 27 days (total of 16.5mg per course) and 1mg per day for 30 days (30mg total per course) in others. We have selected the most common average total course dosage for analysis, adjusted to show 10-day costs for ease of comparison.











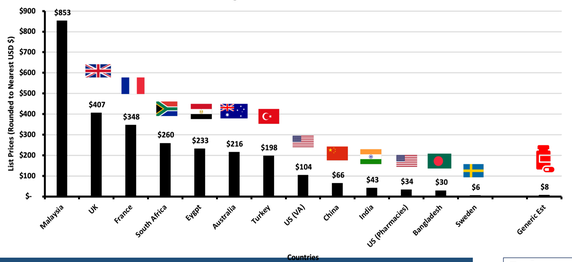


Figure 1: Bar charts illustrating the list prices in a range of countries compared to the estimated costs of production for a selection of analysed drugs.

Clockwise from top left: Nitazoxanide, an anti-protozoic; dexamethasone, a corticosteroid shown here as an oral formulation; losartan, an anti-hypertensive, imatinib, a tyrosine kinase inhibiting chemotherapy agent; colchicine, used to treat gout; and bromhexine, a mucolytic,.

Drugs (10-Day Treatment Course)	List Prices			Estimated Cost of Production	Estimated Annual Global Production Capacity
	US	UK	India		
Remdesivir	$5,720	$5,720	$438	$9	Several million 10-day courses*
Tocilizumab (per dose)	$3,383	$914	$806	$84	N/A
Nitazoxanide	$2,817	N/A	$2	$1	7.92 million 10-day courses
Baricitinib	$1,583	$367	$5**	N/A	N/A
ATV/RTV	$137	$136	$14	$4	1.61 million 10-day courses
Imatinib	$34	$407	$43	$8.49	3.43 million 10-day courses
Dexamethasone (Oral)	$18	$10	$1	$0.20	126 million 10-day courses
Colchicine	$17	$3	$0.50	$0.30	74.2 million 10-day courses
Losartan	$2	$1	$0.60	$0.20	1.18 billion 10-day courses
Favipiravir	N/A	N/A	$31	$15	N/A
Bromhexine	N/A	$7	$0.30	$0.35	150 million 10-day courses

Table 1: Comparison of list-prices vs estimated cost of production and estimated current production capacity for potential COVID-19 treatments in selected countries.

*Estimated production in 2021 by Gilead Sciences[10] **Price in Bangladesh

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