Use of anti-viral therapies in hospitalised COVID-19 patients in the United Arab Emirates: a cost-effectiveness and health-care resource use analysis

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Background

- In the United Arab Emirates, 742,438 cases of COVID-19 have been reported to date, with 2,149 deaths[1]
- Given limited resources, it is important to understand the value for money of treatments, especially for hospitalized patients
- This study investigated the cost-effectiveness of UAE guideline-recommended remdesivir (RDV) and favipiravir (FAVI) for treating patients who require low-flow supplemental oxygenation compared to standard of care (SOC)[2]

Methods

- This study used a hybrid decision tree and Markov modelling approach to estimate the cost-effectiveness of RDV+SOC versus SOC alone and versus FAVI+SOC in line with good modelling practice (Figure 1) [3]
- The population of interest is hospitalized COVID-19 patients with pneumonia who are receiving low-flow O2 in the UAE
- RDV+SOC has been studied in phase 3 clinical trials as well as in the real world. Effectiveness data in terms of mortality and recovery has been collected from the ACTT-1 study[4], real world evidence[5,6], and a meta-analysis of clinical trial data in the population of interest[7]
- Data for FAVI was gathered from a targeted literature review and one study[8] had the relevant outcomes to include in the model
- National data sources for epidemiology[9,10] and costs[11] were utilized and verified with local clinical experts, clinical data was taken from the literature
  - 207,818 cases in 2020 * 10% Hospitalization rate * 20% OS 5 at baseline = 6,235 cases treated
- Outcomes of interest included mortality, hospital bed days (ward, ICU, MIV+ICU), costs and cost per outcome
- Scenario analyses were conducted to investigate different epidemiological scenarios (+/- 50% case rate change) and a mortality scenario which reduced the SOC mortality rate by 75% to be more in line with observed death rates in the UAE

Figure 1: Simplified Model Diagram

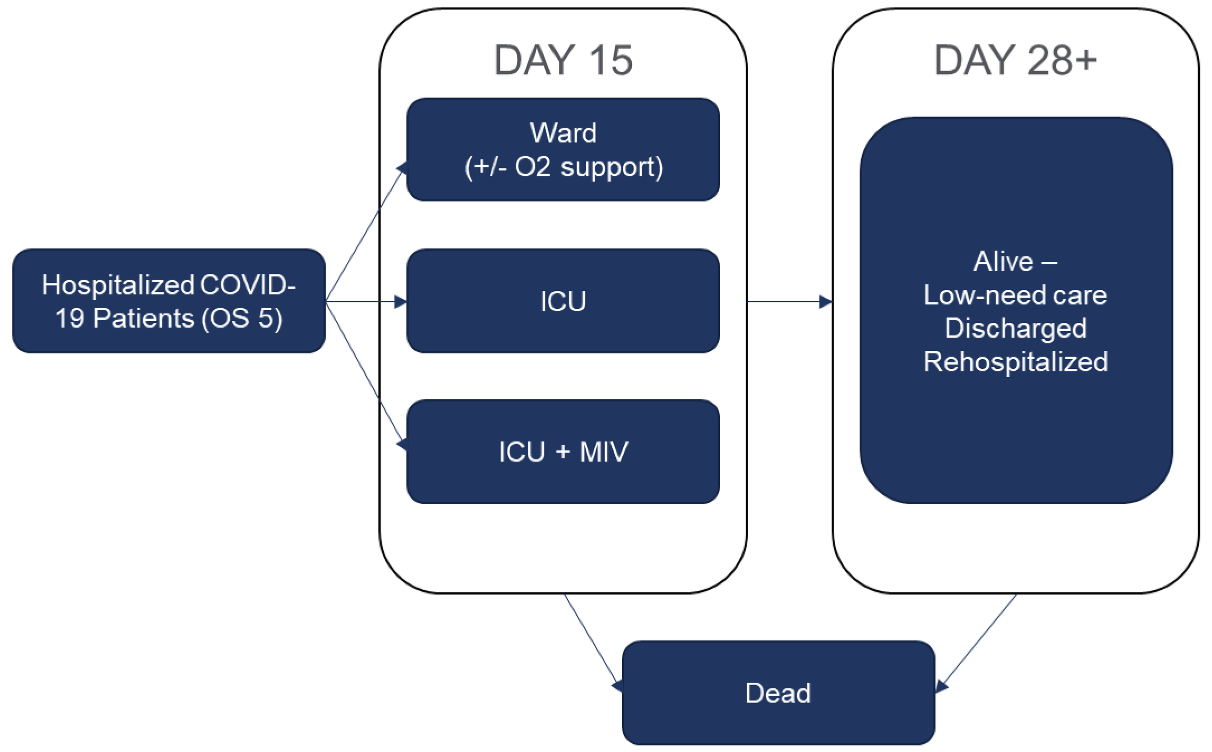


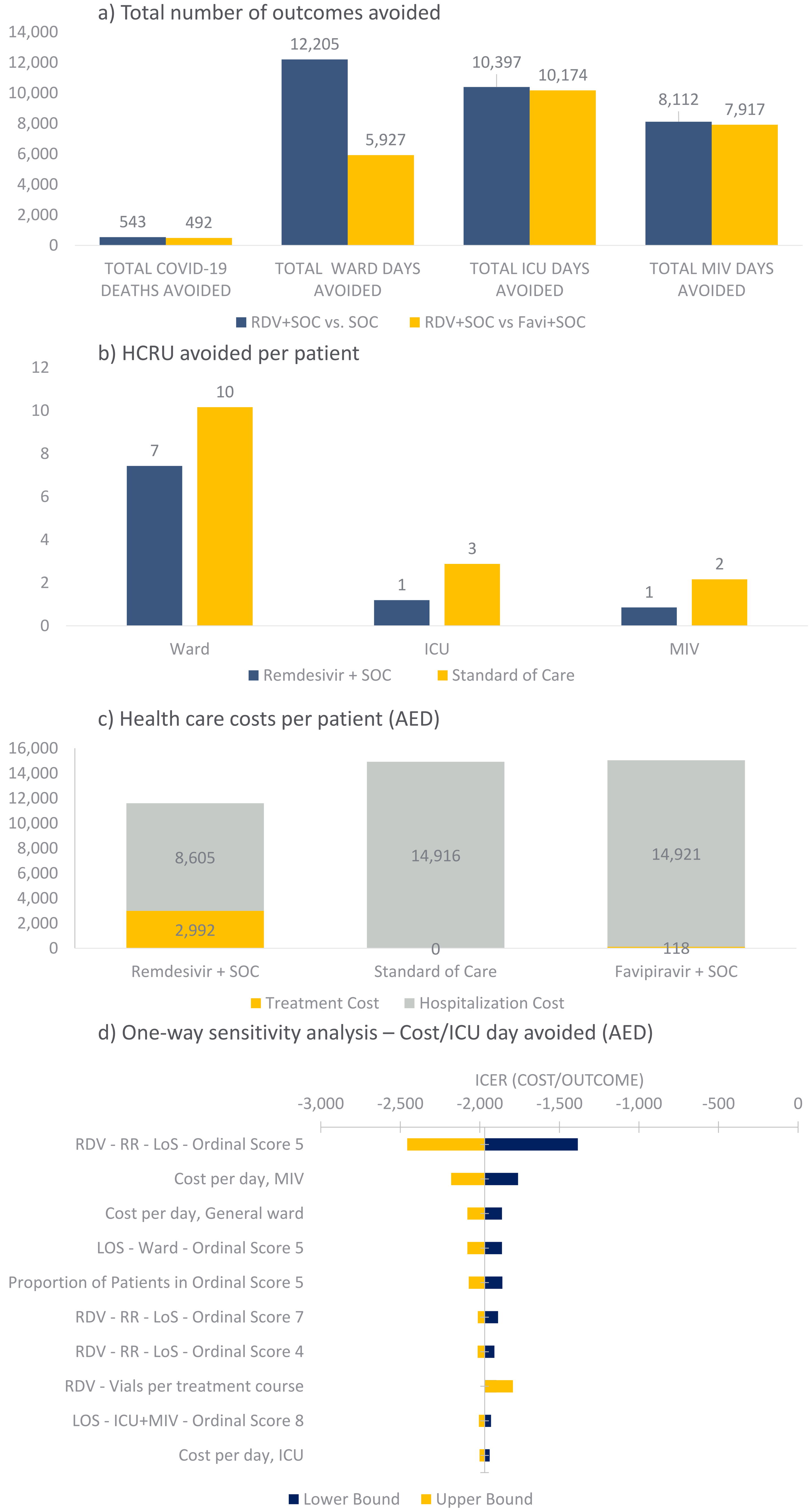
Table 1: Mortality Hazard Ratios (day 28) considered in the model (7)

Hazard ratio	ACTT-1 (95% CI)	NMA (95% CI)	Chokkalingham (95% CI)	Mozaffari (95% CI)	Bosaeed (95% CI)
OS 1-3	1	1	1	1	1
OS 4	0.42 (0.04,0.67)	0.4 (0.04,0.67)	0.87 (0.80,0.94)	0.80 (0.68, 0.94)	0.71 (0.10, 1.33)
OS 5	0.28 (0.12, 0.66)	0.24 (0.11,0.48)	0.78 (0.69, 0.87)	0.77 (0.68, 0.86)	0.71 (0.10, 1.33)
OS 6	0.82 (0.40, 1.69)	0.90 (0.51,1.56)	0.73 (0.66, 0.80)	0.97 (0.84, 1.11)	0.71 (0.10, 1.33)
OS 7	0.76 (0.39,1.50)	0.76 (0.39,1.50)	0.76 (0.66, 0.88)	0.81 (0.69, 0.94)	0.71 (0.10, 1.33)

Table 2: Costs and resource use considered in the model(7)

Cost Variables	Estimate (AED)	Source
Remdesivir (5-day course)	11,004	11
Favipiravir (7 day course)	432.90	11
OS 1-3 per diem	157.64	12
OS 4 per diem	239.31	12
OS 5 per diem	807.24	12
OS 6 per diem	1437.52	12
OS 7 per diem	2708.96	12
Readmission (assumed cost OS4)	239.31	12
Resource use (Length of stay)	**Estimate**	**Source**
OS 1-3	2.75 days (ward)	Assumption
OS 4	5 days (ward)	Assumption
OS 5	7 days (ward)	Assumption
OS 6	6.75 days (ward); 4.5 days (ICU)	Assumption
OS 7	2 days (ward); 3.5 days (ICU); 9.5 days (MIV)	Assumption
OS 8	1 days (ward); 2 days (ICU); 12 days (MIV)	Assumption

Figure 2: Results across outcomes



Results

- The model estimated that the use of RDV+SOC compared to both SOC alone and FAVI+SOC resulted in incrementally fewer deaths and fewer hospital days (Figure 2a)
  - This is the equivalent of approximately 3 fewer general ward days, 2 fewer ICU days, and 1 fewer MIV/ICU day per patient (Figure 2b)
- The reduction in ICU and MIV days is largely a result of patients not progressing when treated with RDV+SOC.
- The model estimated that RDV+SOC resulted in a substantial cost-savings, regardless of outcome (Figure 2c)
- As the data for FAVI did not show any difference in recovery time, it was assumed to be the same as SOC alone in terms of bed-days accrued and resulted in a small number of deaths avoided (5) compared to SOC, resulting in a slight cost increase (Figure 2c)
- The one-way sensitivity analysis shows that the model is sensitive to the RDV efficacy data, particularly on time to recovery (length of stay), however, the incremental cost-effectiveness ratio remains more effective and less costly regardless of outcome (Figure 2d shows the result of cost/ICU day avoided)
- The probabilistic analysis had similar results, with treatment with RDV+SOC being cost-saving in nearly 100% of iterations
- The results of this scenario analysis show that regardless of the size of the epidemic in the UAE, the use of RDV can potentially reduce the healthcare resource burden
- Reducing the SOC death rate by 75% results in approximately 143 deaths, or approximately 21% of the total observed deaths in 2020, which is reasonable considering the model population is only those requiring low-flow oxygen

Discussion/Conclusion

- RDV+SOC resulted in cost-savings and HRCU reductions compared to FAVI+SOC or SOC alone regardless of outcome considered
- The model was sensitive to clinical inputs on time to recovery, however the model always estimated a cost-savings and HCRU associated with RDV+SOC
- Data on FAVI+SOC was limited, therefore results for this comparator should be considered with caution

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