

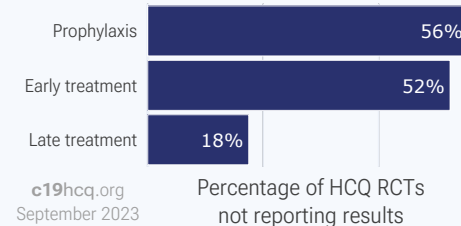
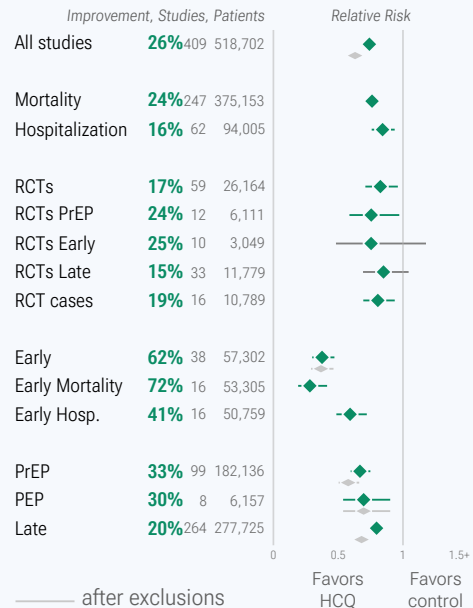
HCQ for COVID-19: real-time meta analysis of 409 studies

@CovidAnalysis, Sep 23, 2023, Version 272
<https://c19hcq.org/meta.html>

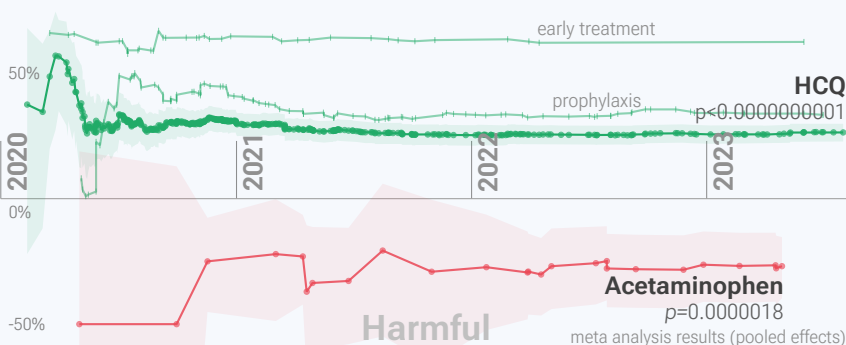
TLDR: evidence for efficacy

- **Early treatment** shows 62% [53-70%] lower risk with pooled effects in 38 studies. Results are similar for higher quality studies and for peer-reviewed studies. The 16 **mortality** and 16 **hospitalization** results show 72% [59-81%] lower mortality and 41% [28-51%] lower hospitalization.
- Late treatment is less successful, with 20% [16-25%] lower risk from 264 studies. Very late treatment may be harmful, especially with excessive dosages.
- Randomized Controlled Trials show 17% [4-29%] lower risk, or 23% [9-36%] when excluding late treatment.
- There is substantial **bias towards publishing negative results**. Prospective studies show higher efficacy. Negative RCTs received priority treatment at top journals, while positive trials report difficulty publishing. There is a strong geographical bias, with significantly more negative studies from **North America**.
- **Results are missing** for 54% of early treatment and prophylaxis RCTs, compared to 18% for late treatment, consistent with the higher prevalence of positive studies for early treatment and prophylaxis, and bias against publishing positive results.
- No **treatment** or intervention is 100% effective. All practical, effective, and safe means should be used based on risk/benefit analysis. **Multiple treatments** are typically used in combination, which may be significantly more effective. Lung pharmacokinetics show high inter-individual variability *Ruiz*.
- All data to reproduce this paper and the sources are in the **appendix**. Multiple other meta analyses show efficacy for early treatment or prophylaxis *García-Albéniz, Ladapo, Landsteiner de Sampaio Améndola, Prodromos, Risch, Risch (B), Stricker*.

HCQ for COVID-19 c19hcq.org Sep 2023



Evolution of COVID-19 clinical evidence



HIGHLIGHTS

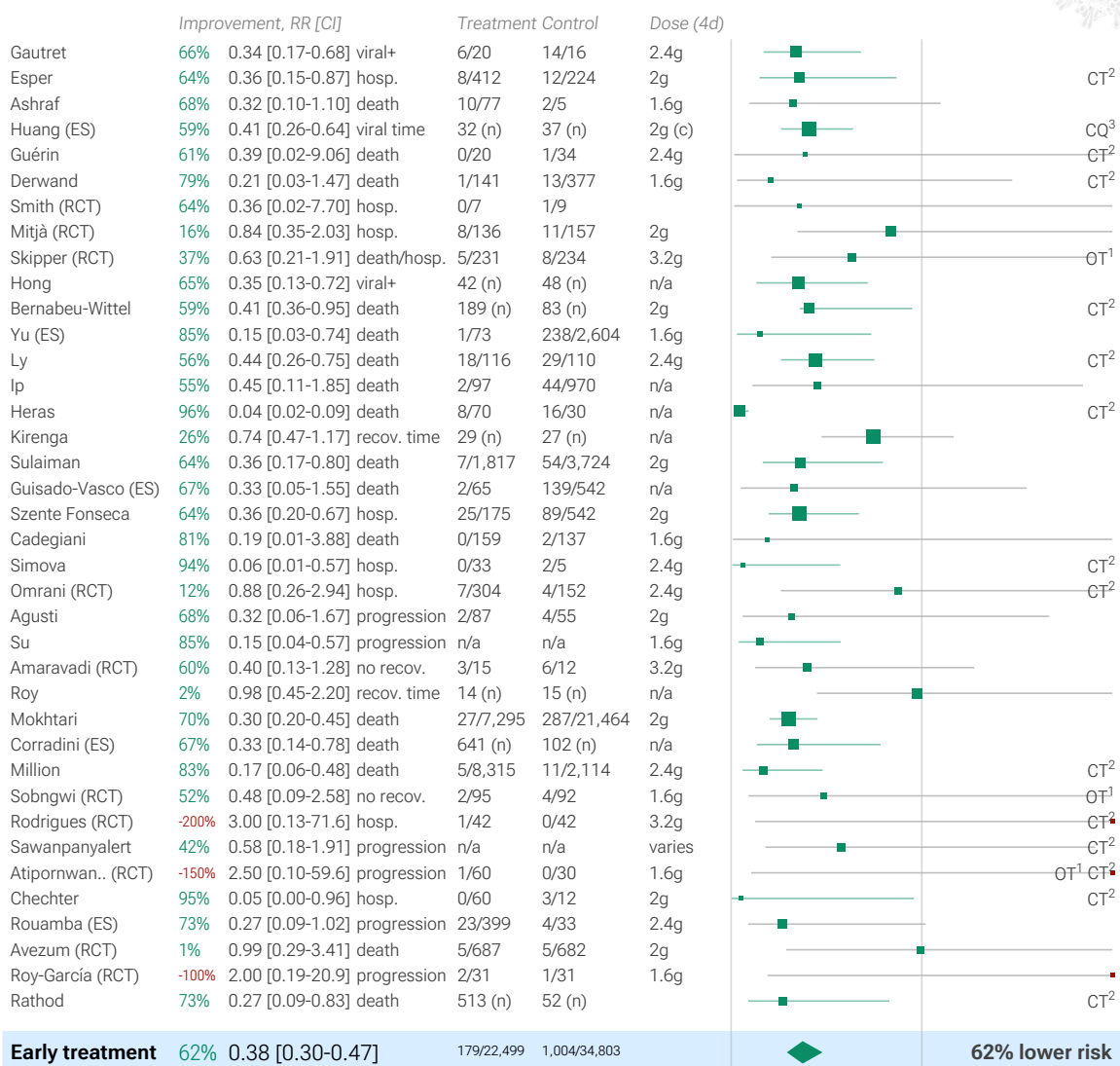
HCQ reduces risk for COVID-19 with very high confidence for [mortality](#), [hospitalization](#), [cases](#), [viral clearance](#), and in [pooled analysis](#), however increased risk is seen with very low confidence for [ventilation](#).

We show traditional outcome specific analyses and combined evidence from all studies, incorporating treatment delay, a primary confounding factor in COVID-19 studies.

Real-time updates and corrections, transparent analysis with all results in the same format, consistent protocol for 56 treatments.

All 38 HCQ COVID-19 early treatment studies

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¹ OT: comparison with other treatment

² CT: study uses combined treatment

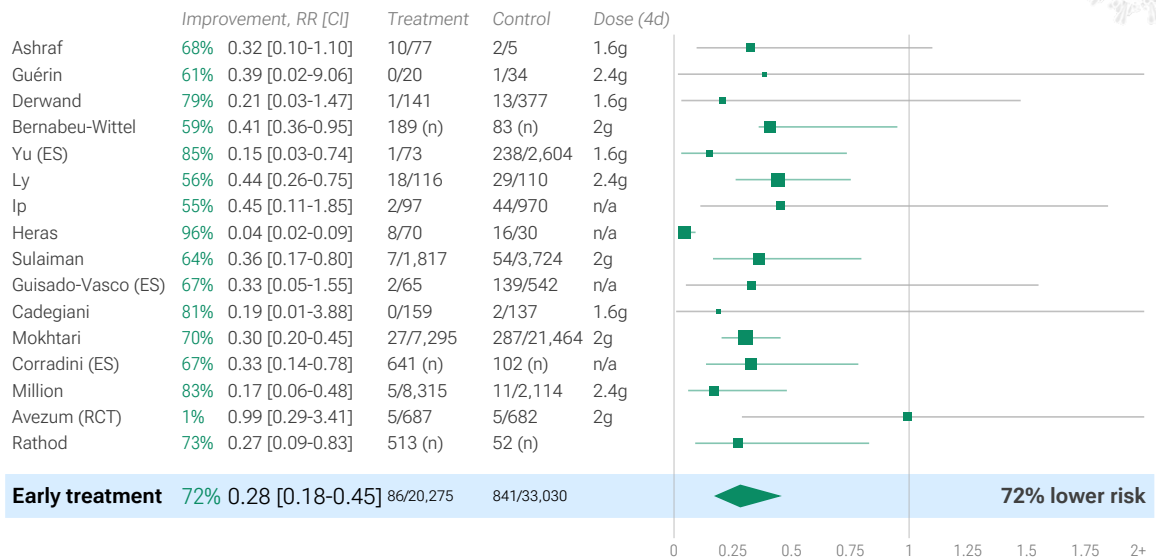
³ CQ: study uses chloroquine

Tau² = 0.19, I² = 49.1%, p < 0.0001

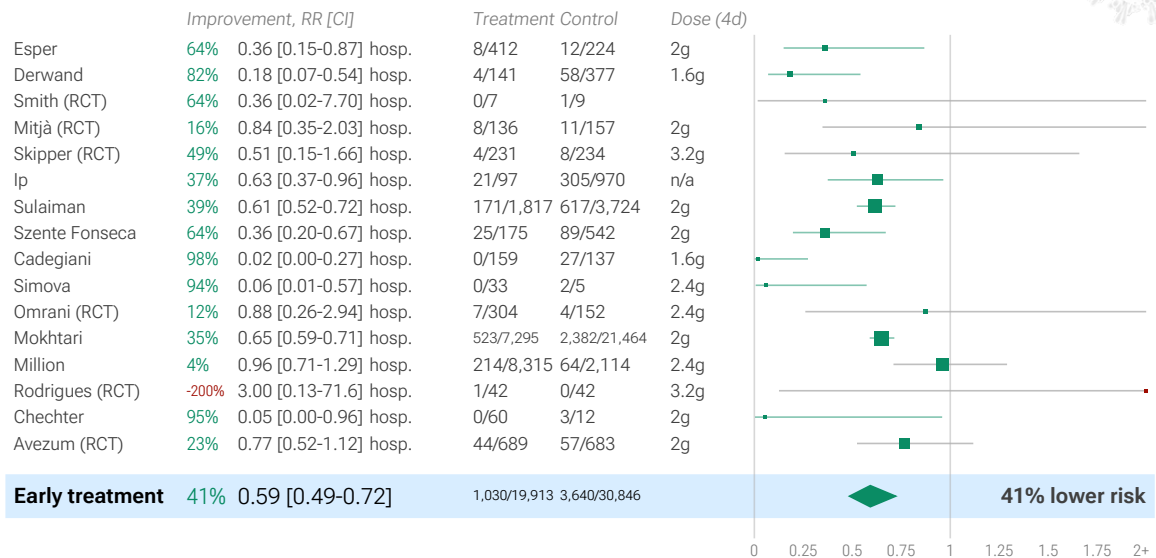
Effect extraction pre-specified, see appendix

Favors HCQ Favors contr A

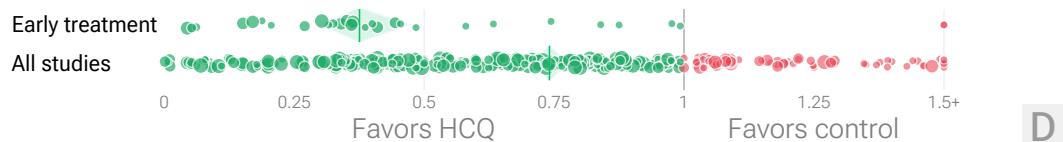
All 16 HCQ COVID-19 mortality early treatment results c19hcq.org Sep 2023



All 16 HCQ COVID-19 hospitalization early treatment results c19hcq.org Sep 2023



Efficacy in COVID-19 HCQ studies (pooled effects) c19hcq.org Sep 2023



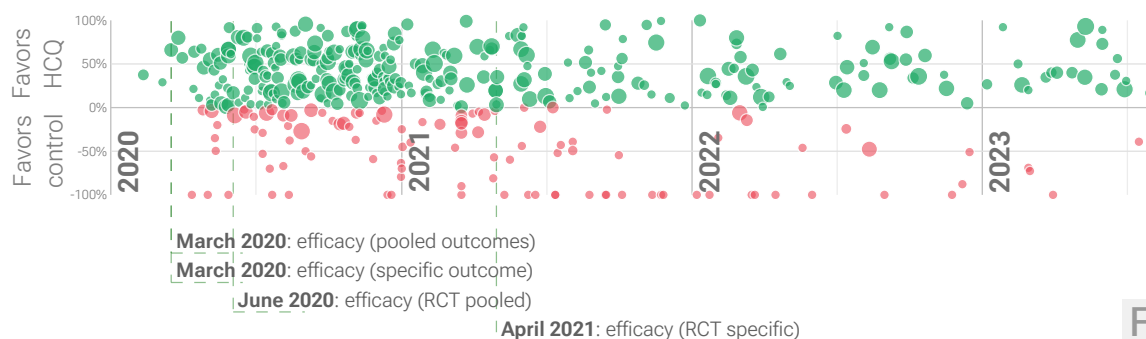
Efficacy in COVID-19 studies (pooled effects) c19hcq.org Sep 2023



E

Timeline of COVID-19 HCQ studies (pooled effects)

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F

Figure 1. A. Random effects meta-analysis of all early treatment studies. This plot shows pooled effects, analysis for individual outcomes is below, and more details on pooled effects can be found in the heterogeneity section. Effect extraction is pre-specified, using the most serious outcome reported. Simplified dosages are shown for comparison, these are the total dose in the first four days. Chloroquine is indicated with (c). For details of effect extraction and full dosage information see the [appendix. B and C. Random effects meta-analysis of early treatment mortality and hospitalization results. D. Scatter plot of the effects reported in early treatment studies compared with all studies.](#) Early treatment is more effective. **E. Scatter plot showing the most serious outcome in all studies in the context of multiple COVID-19 treatments.** Diamonds show the results of random effects meta-analysis for each treatment. **F. Timeline of results in HCQ treatment studies.** The marked dates indicate the time when efficacy was known with a statistically significant improvement of $\geq 10\%$ from ≥ 3 studies for pooled outcomes, one or more specific outcome, pooled outcomes in RCTs, and one or more specific outcome in RCTs. Efficacy based on RCTs only was delayed by 2.6 months, compared to using all studies. Efficacy based on specific outcomes in RCTs was delayed by 10.9 months, compared to using pooled outcomes in RCTs.

Introduction

We analyze all significant studies concerning the use of HCQ (or CQ) for COVID-19. Search methods, inclusion criteria, effect extraction criteria (more serious outcomes have priority), all individual study data, PRISMA answers, and statistical methods are detailed in Appendix 1. We present random-effects meta-analysis results for all studies, studies within each treatment stage, mortality, hospitalization, cases, viral clearance, after exclusion of studies with critical bias, and for Randomized Controlled Trials (RCTs).

Figure 2 shows stages of possible treatment for COVID-19. **Pre-Exposure Prophylaxis (PrEP)** refers to regularly taking medication before being infected, in order to prevent or minimize infection. In **Post-Exposure Prophylaxis (PEP)**, medication is taken after exposure but before symptoms appear. **Early Treatment** refers to treatment immediately or soon after symptoms appear, while **Late Treatment** refers to more delayed treatment.

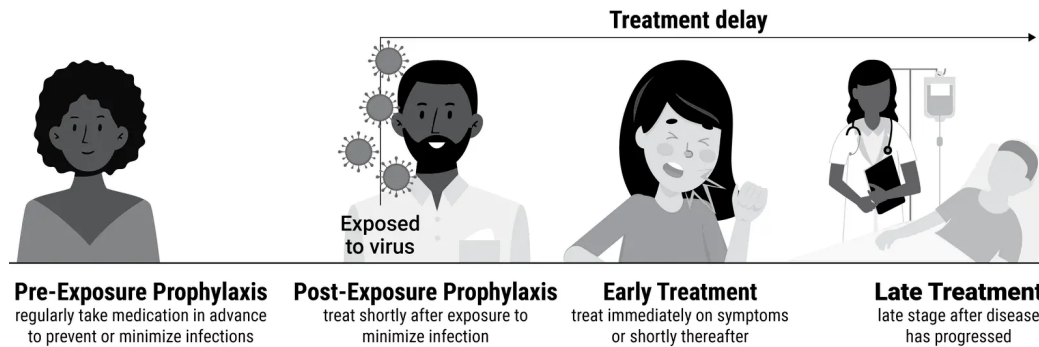


Figure 2. Treatment stages.

Preclinical Research

6 *In Silico* studies support the efficacy of hydroxychloroquine *Baidya, Hussein, Navya, Nouredine, Tarek, Yadav*.

18 *In Vitro* studies support the efficacy of hydroxychloroquine *Alsmadi, Andreani, Clementi, Dang, Delandre, Faísca, Kamga Kapchoup, Liu, Milan Bonotto, Ou, Purwati, Shang, Sheaff, Wang, Wang (B), Wen, Yao, Yuan*.

2 *In Vivo* animal studies support the efficacy of hydroxychloroquine *Shu-Han Lin, Wen*.

5 studies investigate novel formulations of hydroxychloroquine that may be more effective for COVID-19 *Alsmadi, Faísca, Kavanagh, Klimke, Zelenko*.

Preclinical research is an important part of the development of treatments, however results may be very different in clinical trials. Preclinical results are not used in this paper.

Results

Early treatment. 92% of early treatment studies report a positive effect, with an estimated improvement of 62% in random effects meta analysis.

Late treatment. Late treatment studies are mixed, with 68% showing positive effects, and an estimated improvement of 20%. Negative studies typically fall into the following categories: they show evidence of significant unadjusted confounding, including confounding by indication; usage is extremely late; or they use an excessively high dosage.

Pre-Exposure Prophylaxis. 80% of PrEP studies show positive effects, with an estimated improvement of 33%. The majority of negative studies analyze systemic autoimmune disease patients and either do not adjust for the different baseline risk of these patients at all, or do not adjust for the highly variable risk within this group.

Post-Exposure Prophylaxis. 88% of PEP studies report positive effects, with an estimated improvement of 30%.

Table 1 summarizes the results for all stages combined, with different exclusions, and for specific outcomes. Table 2 shows results by treatment stage. Figure 3 plots individual results by treatment stage. Figure 4, 5, 6, 7, and 8 show forest plots for treatment studies with pooled effects, and for studies reporting mortality, hospitalization, case, and viral clearance results.

	<i>Improvement</i>	<i>Studies</i>	<i>Patients</i>	<i>Authors</i>
All studies	26% [22-29%] $p < 0.0001$ ****	409	518,702	8,525
After exclusions	37% [33-41%] $p < 0.0001$ ****	262	305,405	6,329
Randomized Controlled Trials	17% [4-29%] $p = 0.013$ *	59	26,164	3,107
RCTs exc. late treatment	23% [9-36%] $p = 0.0031$ **	26	14,385	621
Mortality	24% [19-28%] $p < 0.0001$ ****	247	375,153	6,234
Hospitalization	16% [6-24%] $p = 0.0015$ **	62	94,005	1,159
Recovery	17% [6-27%] $p = 0.0031$ **	28	8,652	499
Cases	29% [21-36%] $p < 0.0001$ ****	78	154,193	1,054
Viral	20% [10-28%] $p = 0.00025$ ***	47	8,598	601
RCT mortality exc. late	27% [-72-69%] $p = 0.48$	2	3,866	52
RCT hospitalization exc. late	23% [-2-42%] $p = 0.069$	10	7,909	222
RCT cases	19% [6-31%] $p = 0.0049$ **	16	10,789	437

Table 1. Random effects meta-analysis for all stages combined, with different exclusions, and for specific outcomes. Results show the percentage improvement with treatment and the 95% confidence interval. * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ **** $p < 0.0001$.

	Early treatment	Late treatment	Pre-Exposure Prophylaxis	Post-Exposure Prophylaxis
All studies	62% [53-70%] ****	20% [16-25%] ****	33% [25-40%] ****	30% [10-46%] **
After exclusions	63% [54-71%] ****	32% [27-36%] ****	42% [34-50%] ****	30% [10-46%] **
Randomized Controlled Trials	25% [-18-52%]	15% [-4-31%]	24% [3-41%] *	21% [-6-41%]
Mortality	72% [59-81%] ****	21% [16-25%] ****	30% [12-44%] **	46% [-80-84%]
Hospitalization	41% [28-51%] ****	-1% [-17-12%]	10% [-3-21%]	16% [-69-58%]
Recovery	35% [16-50%] **	12% [-1-23%]		
Cases			29% [21-37%] ****	25% [-0-43%]
Viral	35% [16-51%] **	17% [6-27%] **		
RCT mortality	1% [-241-71%]	-3% [-19-11%]		46% [-80-84%]
RCT hospitalization	24% [-5-45%]	-18% [-70-19%]	51% [-199-92%]	16% [-69-58%]
RCT cases			25% [8-39%] **	13% [-14-34%]

Table 2. Random effects meta-analysis results by treatment stage. Results show the percentage improvement with treatment, the 95% confidence interval, and the number of studies for the stage. * $p < 0.05$ ** $p < 0.01$ **** $p < 0.0001$.

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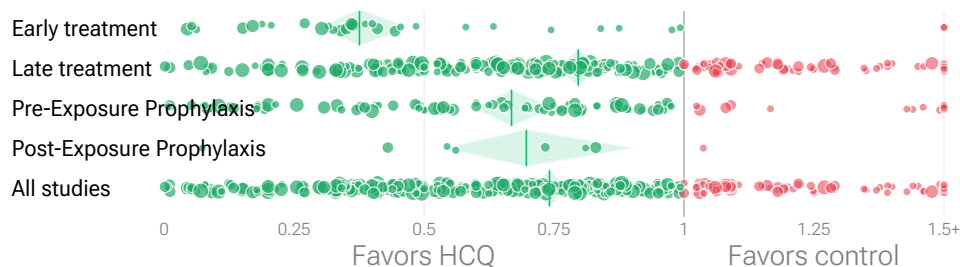
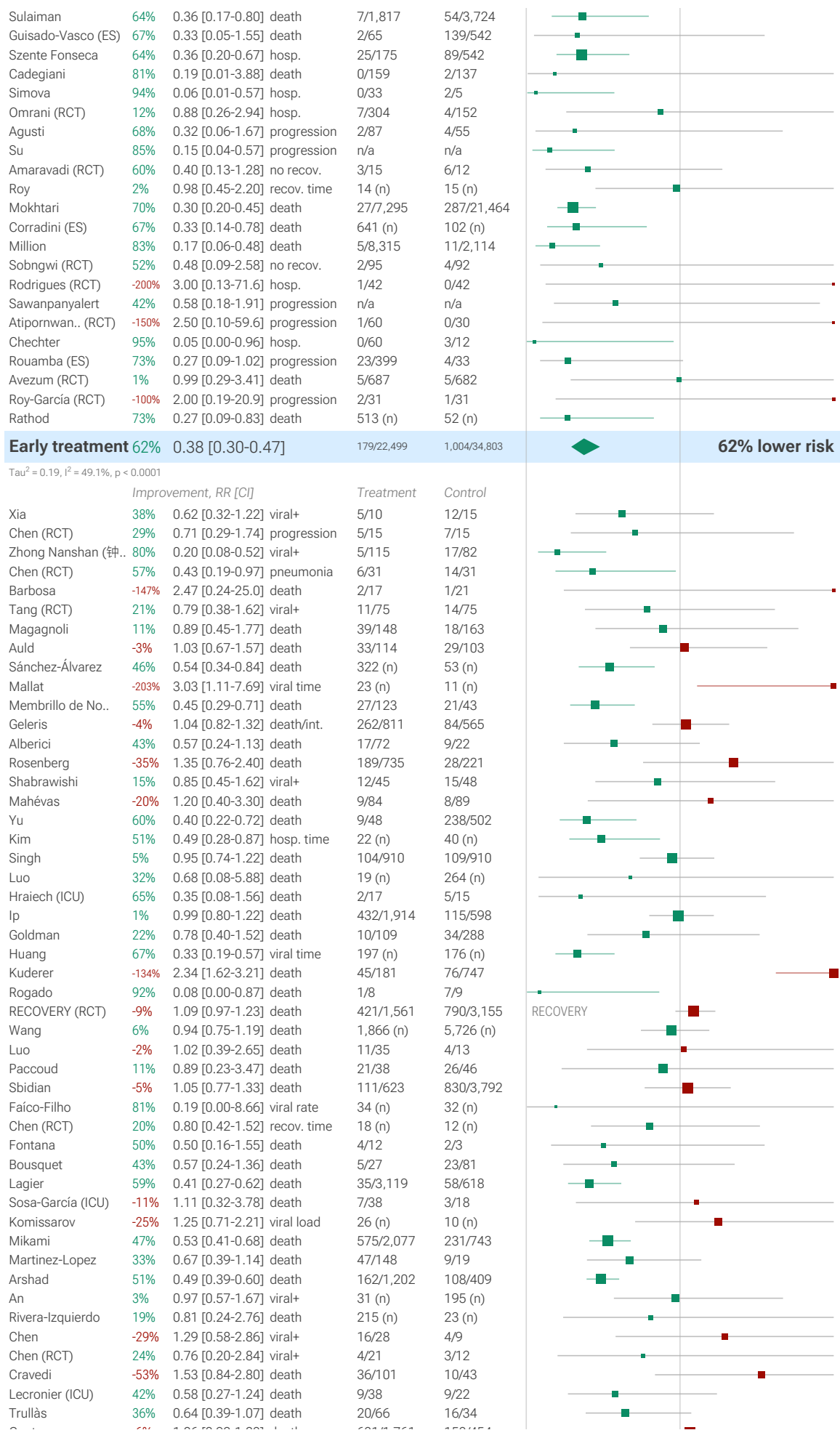


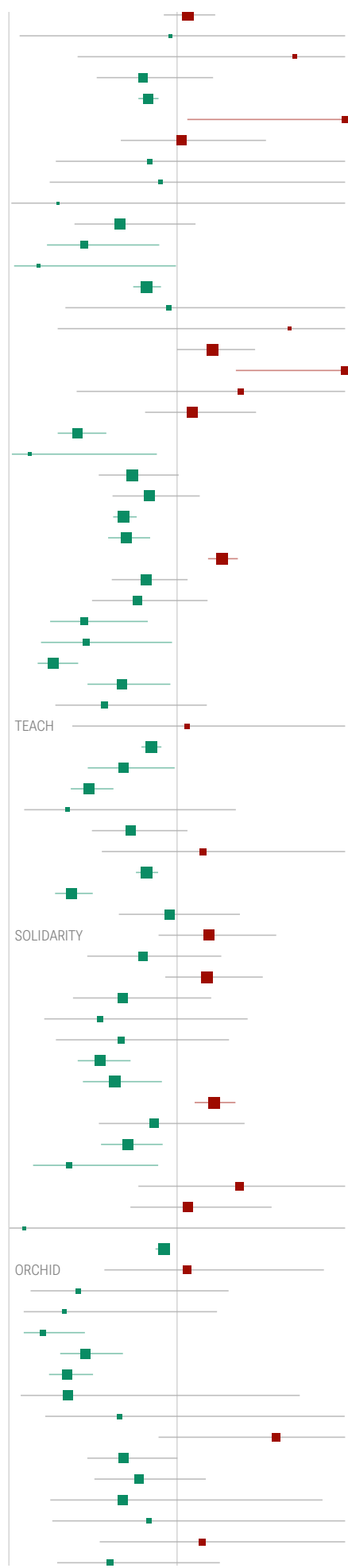
Figure 3. Results by treatment stage.

All HCQ COVID-19 studies

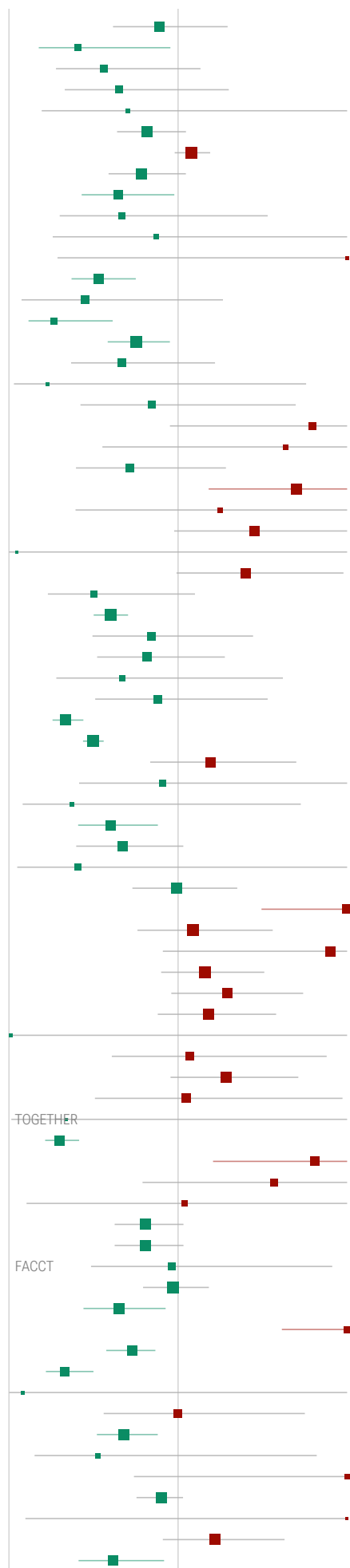
	Improvement, RR [CI]	Treatment	Control	
Gautret	66% 0.34 [0.17-0.68] viral+	6/20	14/16	
Esper	64% 0.36 [0.15-0.87] hosp.	8/412	12/224	
Ashraf	68% 0.32 [0.10-1.10] death	10/77	2/5	
Huang (ES)	59% 0.41 [0.26-0.64] viral time	32 (n)	37 (n)	
Guérin	61% 0.39 [0.02-9.06] death	0/20	1/34	
Derwand	79% 0.21 [0.03-1.47] death	1/141	13/377	
Smith (RCT)	64% 0.36 [0.02-7.70] hosp.	0/7	1/9	
Mitjà (RCT)	16% 0.84 [0.35-2.03] hosp.	8/136	11/157	
Skipper (RCT)	37% 0.63 [0.21-1.91] death/hosp.	5/231	8/234	
Hong	65% 0.35 [0.13-0.72] viral+	42 (n)	48 (n)	
Bernabeu-Wittel	59% 0.41 [0.36-0.95] death	189 (n)	83 (n)	
Yu (ES)	85% 0.15 [0.03-0.74] death	1/73	238/2,604	
Ly	56% 0.44 [0.26-0.75] death	18/116	29/110	
Ip	55% 0.45 [0.11-1.85] death	2/97	44/970	
Heras	96% 0.04 [0.02-0.09] death	8/70	16/30	
Kirenga	26% 0.74 [0.47-1.17] recov. time	29 (n)	27 (n)	



Gupta	-6%	1.06 [0.92-1.23]	death	63/11,761	153/454
Lyngbakken (RCT)	4%	0.96 [0.06-14.6]	death	1/27	1/26
McGrail	-70%	1.70 [0.41-7.07]	death	4/33	3/42
Krishnan	20%	0.80 [0.52-1.21]	death	86/144	6/8
Bernaola	17%	0.83 [0.77-0.89]	death	236/1,498	28/147
Kelly	-143%	2.43 [1.06-5.56]	death	23/82	6/52
Rivera	-2%	1.02 [0.67-1.53]	death	44/179	59/327
Cavalcanti (RCT)	16%	0.84 [0.28-2.53]	death	8/331	5/173
Santos	10%	0.90 [0.24-3.36]	death	8/31	2/7
Novartis (RCT)	71%	0.29 [0.01-6.03]	no disch.	0/7	1/5
D'Arminio Monfo..	34%	0.66 [0.39-1.11]	death	53/197	47/92
Davido	55%	0.45 [0.23-0.89]	int./hosp.	12/80	13/40
Yu	83%	0.17 [0.03-0.99]	progression	1/231	32/1,291
Berenguer	18%	0.82 [0.74-0.90]	death	681/2,618	438/1,377
Kamran	5%	0.95 [0.34-2.69]	progression	11/349	5/151
Kalligeros	-67%	1.67 [0.29-9.36]	death	36 (n)	72 (n)
Salemi	-21%	1.21 [1.00-1.46]	viral time	65 (n)	20 (n)
Pablos	-126%	2.26 [1.35-3.79]	severe case	172 (n)	56 (n)
Roomi	-38%	1.38 [0.40-2.76]	death	13/144	6/32
Peters	-9%	1.09 [0.81-1.47]	death	419/1,596	53/353
Pinato	59%	0.41 [0.29-0.58]	death	30/182	181/446
Dubernet	88%	0.12 [0.02-0.88]	ICU	1/17	9/19
Gonzalez	27%	0.73 [0.53-1.01]	death	1,246/8,476	341/1,168
Pasquini (ICU)	16%	0.84 [0.62-1.14]	death	23/33	15/18
Catteau	32%	0.68 [0.62-0.76]	death	804/4,542	957/3,533
Di Castelnuovo	30%	0.70 [0.59-0.84]	death	386/2,634	90/817
Fried	-27%	1.27 [1.18-1.36]	death	1,048/4,232	1,466/7,489
Albani	18%	0.82 [0.61-1.06]	death	60/211	172/605
Synolaki	24%	0.76 [0.49-1.18]	death	21/98	60/214
Alamdari	55%	0.45 [0.25-0.83]	death	54/427	9/32
Heberto	54%	0.46 [0.19-0.97]	death	139 (n)	115 (n)
Lauriola	74%	0.27 [0.17-0.41]	death	102/297	35/63
Ashinyo	33%	0.67 [0.47-0.96]	hosp. time	61 (n)	61 (n)
Serrano	43%	0.57 [0.28-1.18]	death	6/14	6/8
Ulrich (RCT)	-6%	1.06 [0.38-2.98]	death	7/67	6/61
Shoaibi	15%	0.85 [0.79-0.91]	death	686/5,047	3,923/24,404
Lammers	32%	0.68 [0.47-0.99]	death/ICU	30/189	101/498
Ayerbe	52%	0.48 [0.37-0.62]	death	237/1,857	49/162
Almazrou	65%	0.35 [0.09-1.35]	ventilation	3/95	6/66
Nachega	28%	0.72 [0.49-1.06]	death	69/630	28/96
Ader (RCT)	-15%	1.15 [0.55-2.27]	death	11/150	13/149
Soto-Becerra	18%	0.82 [0.76-0.89]	death	346/692	1,606/2,630
Aparisi	63%	0.37 [0.27-0.50]	death	122/605	27/49
Annie	4%	0.96 [0.65-1.37]	death	48/367	50/367
SOLIDARITY (RCT)	-19%	1.19 [0.89-1.59]	death	104/947	84/906
Guisado-Vasco	20%	0.80 [0.47-1.26]	death	127/558	14/49
Solh	-18%	1.18 [0.93-1.51]	death	131/265	134/378
Ñamendys-S.. (ICU)	32%	0.68 [0.38-1.20]	death	24/54	42/64
Dubee (RCT)	46%	0.54 [0.21-1.42]	death	6/124	11/123
Lano	33%	0.67 [0.28-1.31]	death	56 (n)	66 (n)
Coll	46%	0.54 [0.41-0.72]	death	55/307	108/328
Frontera (PSM)	37%	0.63 [0.44-0.91]	death	121/1,006	424/2,467
Choi	-22%	1.22 [1.10-1.35]	viral time	701 (n)	701 (n)
Tehrani	13%	0.87 [0.54-1.40]	death	16/65	54/190
Niwas	29%	0.71 [0.55-0.91]	recov. time	12 (n)	17 (n)
López	64%	0.36 [0.14-0.89]	progression	5/36	14/36
Salazar	-37%	1.37 [0.77-2.42]	death	12/92	80/811
Rodriguez-Nava	-6%	1.06 [0.72-1.56]	death	22/65	79/248
Maldonado	91%	0.09 [0.00-2.70]	death	1/11	1/1
Núñez-Gil	8%	0.92 [0.87-0.94]	death	200/686	100/268
Self (RCT)	-6%	1.06 [0.57-1.87]	death	25/241	25/236
Rodriguez	59%	0.41 [0.13-1.31]	death	8/39	2/4
Águila-Gordo	67%	0.33 [0.09-1.24]	death	151/346	47/70
Sheshah	80%	0.20 [0.09-0.45]	death	267 (n)	33 (n)
Boari	55%	0.45 [0.30-0.68]	death	41/202	25/56
Budhiraja	65%	0.35 [0.24-0.50]	death	69/834	34/142
Falcone (PSM)	65%	0.35 [0.07-1.73]	death	40/238	30/77
Qin	34%	0.66 [0.22-2.00]	death	3/43	75/706
Burdick	-59%	1.59 [0.89-2.83]	death	142 (n)	148 (n)
van Halem	32%	0.68 [0.47-1.00]	death	34/164	47/155
Rodriguez-Gonzalez	23%	0.77 [0.51-1.17]	death	251/1,148	17/60
Lambermont	32%	0.68 [0.25-1.87]	death	97/225	14/22
Abdulrahman (PSM)	17%	0.83 [0.26-2.69]	death	5/223	6/223
Aboulenain	-15%	1.15 [0.54-2.48]	death	82 (n)	93 (n)
Canoni	40%	0.60 [0.29-1.25]	ventilation	17/40	6/12



Supern	OR	95% CI	Outcome	12/18	57/12
Peng	11%	0.89 [0.62-1.29]	progression	29/453	256/3,567
Modrák	59%	0.41 [0.18-0.95]	death	108 (n)	105 (n)
Ozturk	44%	0.56 [0.28-1.13]	death	165/1,127	6/23
Guglielmetti	35%	0.65 [0.33-1.30]	death	181 (n)	37 (n)
Johnston (RCT)	30%	0.70 [0.19-2.54]	hosp.	5/148	4/83
Alqassieh	18%	0.82 [0.64-1.05]	hosp. time	63 (n)	68 (n)
Rosenthal	-8%	1.08 [0.98-1.19]	death	n/a	n/a
Bielza	22%	0.78 [0.59-1.05]	death	33/91	249/539
Tan	35%	0.65 [0.43-0.98]	hosp. time	8 (n)	277 (n)
Naseem	33%	0.67 [0.30-1.53]	death	77 (n)	1,137 (n)
Orioli	13%	0.87 [0.26-2.94]	death	8/55	3/18
De Luna	-105%	2.05 [0.29-14.6]	death	15/132	1/18
Signes-Costa	47%	0.53 [0.37-0.75]	death	4,854 (n)	993 (n)
Matangila	55%	0.45 [0.07-1.27]	death	25/147	8/13
Cangiano	73%	0.27 [0.12-0.61]	death	5/33	37/65
Taccone (ICU)	25%	0.75 [0.58-0.95]	death	449/1,308	183/439
Chari	33%	0.67 [0.37-1.22]	death	8/29	195/473
Güner	77%	0.23 [0.03-1.76]	ICU	604 (n)	100 (n)
Vernaz (PSM)	15%	0.85 [0.42-1.70]	death	12/93	16/105
Texeira	-79%	1.79 [0.95-3.38]	death	17/65	14/96
Psevdos	-63%	1.63 [0.55-4.84]	death	17/52	3/15
Mahale	29%	0.71 [0.40-1.28]	death	25/102	11/32
Sands	-70%	1.70 [1.18-2.42]	death	101/973	56/696
Lotfy	-25%	1.25 [0.39-3.96]	death	6/99	5/103
Sarfaraz	-45%	1.45 [0.98-2.15]	death	40/94	27/92
Yegerov	95%	0.0 [0.00-5e+186]	death	0/23	20/1,049
Li	-40%	1.40 [0.99-1.98]	viral time	18 (n)	19 (n)
Li	50%	0.50 [0.23-1.10]	no disch.	14 (n)	14 (n)
Di Castelnuovo	40%	0.60 [0.50-0.70]	death	3,270 (n)	1,000 (n)
Roig	16%	0.84 [0.49-1.44]	death	33/67	7/12
Ubaldo (ICU)	18%	0.82 [0.52-1.28]	death	17/25	5/6
Ouedraogo	33%	0.67 [0.28-1.62]	death	397 (n)	59 (n)
Hernandez-C.. (RCT)	12%	0.88 [0.51-1.53]	death	106 (n)	108 (n)
Purwati (RCT)	66%	0.34 [0.26-0.44]	viral+	38/121	111/119
Lora-Tamayo	50%	0.50 [0.44-0.56]	death	7,192 (n)	1,361 (n)
Awad	-19%	1.19 [0.84-1.70]	death	56/188	37/148
Lamback	9%	0.91 [0.41-2.00]	death	11/101	11/92
Beltran Gon.. (RCT)	63%	0.37 [0.08-1.73]	death	2/33	6/37
Rubio-Sánchez	40%	0.60 [0.41-0.88]	severe case	51/161	19/36
Salvador	33%	0.67 [0.40-1.03]	death	28/121	58/124
Martin-Vice.. (ICU)	59%	0.41 [0.05-3.39]	death	37/91	1/1
Stewart	1%	0.99 [0.73-1.35]	death	66/578	188/1,243
Stewart	-130%	2.30 [1.49-3.54]	death	32/108	33/256
Stewart	-9%	1.09 [0.76-1.56]	death	212/1,157	203/1,101
Stewart	-90%	1.90 [0.91-4.10]	death	46/208	47/1,334
Stewart	-16%	1.16 [0.90-1.51]	death	428/1,711	123/688
Stewart	-29%	1.29 [0.96-1.74]	ventilation	48/305	95/1,302
Stewart	-18%	1.18 [0.88-1.58]	death	90/429	141/737
Barry	99%	0.0 [0.00-1e+05]	death	0/6	91/599
Alghamdi	-7%	1.07 [0.61-1.88]	death	44/568	15/207
Mulhem	-28%	1.28 [0.96-1.71]	death	435/2,496	81/723
Gadhiya	-5%	1.05 [0.51-1.97]	death	22/55	33/216
Reis (RCT)	66%	0.34 [0.01-8.30]	death	0/214	1/227
Corradini	70%	0.30 [0.21-0.41]	death	1,439 (n)	274 (n)
Mohandas	-81%	1.81 [1.21-2.72]	death	27/384	115/2,961
Réa-Neto (RCT)	-57%	1.57 [0.79-3.13]	death	16/53	10/52
Kokturk	-4%	1.04 [0.10-7.64]	death	62/1,382	5/118
Aghajani	19%	0.81 [0.62-1.03]	death	553 (n)	438 (n)
Haji Aghajani	19%	0.81 [0.62-1.03]	death	553 (n)	438 (n)
Bosaeed (RCT)	4%	0.96 [0.49-1.91]	death	14/125	15/129
Çiyiltepe (ICU)	3%	0.97 [0.79-1.18]	death	69/95	39/52
De Rosa	35%	0.65 [0.44-0.93]	death	118/731	80/280
Sammartino (PSM)	-240%	3.40 [1.61-7.40]	death	137 (n)	191 (n)
Smith	27%	0.73 [0.58-0.87]	death	19/37	182/218
Ramírez-García	67%	0.33 [0.22-0.50]	death	48/350	22/53
Sivapalan (RCT)	92%	0.08 [0.00-11.7]	death	1/61	2/56
Byakika-Ki.. (RCT)	0%	1.00 [0.56-1.75]	recov. time	36 (n)	29 (n)
Lagier	32%	0.68 [0.52-0.88]	death	93/1,270	146/841
Singh (RCT)	48%	0.53 [0.15-1.82]	death	3/20	6/21
Saib (PSM)	-125%	2.25 [0.74-6.85]	death/int.	9/52	4/52
Turrini	10%	0.90 [0.75-1.03]	death	103/160	33/45
Schwartz (RCT)	-133%	2.33 [0.10-56.1]	ICU	1/111	0/37
Gerlovin	-22%	1.22 [0.91-1.63]	death	90/429	141/770
Taieb	39%	0.61 [0.41-0.92]	no disch.	674 (n)	252 (n)

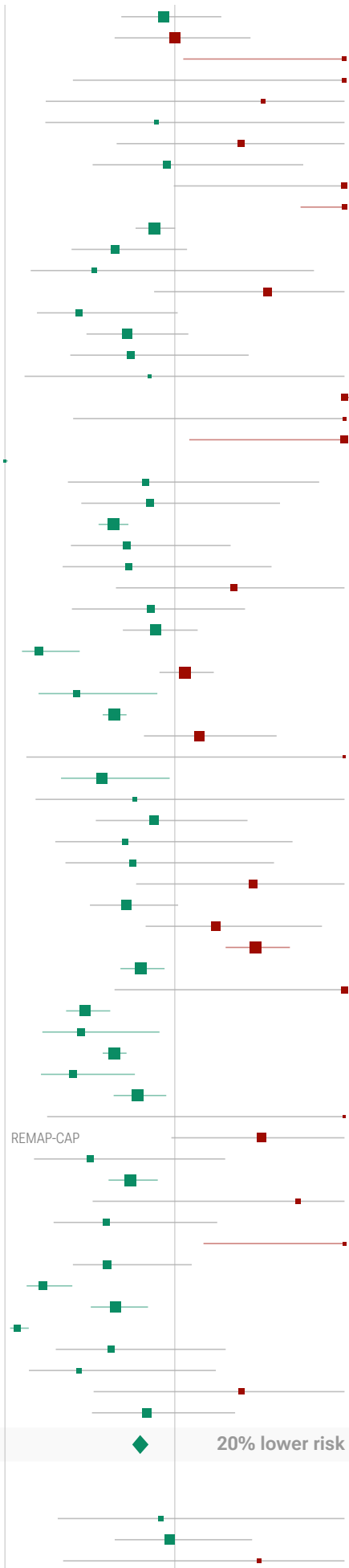


Jacobs	7%	0.93 [0.69-1.27]	death	24/46	86/154
Roger (ICU)	0%	1.00 [0.65-1.45]	death	53/289	120/677
Tamura	-299%	3.99 [1.05-15.2]	death	25 (n)	163 (n)
Barrat-Due (RCT)	-120%	2.20 [0.40-10.8]	death	4/45	2/48
Alhamlan	-52%	1.52 [0.24-5.23]	death	n/a	n/a
Barra	11%	0.89 [0.24-3.35]	death	2/18	81/650
Alghamdi (ICU)	-39%	1.39 [0.66-2.95]	death	29/128	7/43
Karruli (ICU)	5%	0.95 [0.52-1.76]	death	20/28	3/4
Alotaibi	-134%	2.33 [0.99-5.49]	death	193 (n)	244 (n)
Çivriz Bozdağ	-399%	4.99 [1.74-14.3]	death	35 (n)	140 (n)
Uygen	12%	0.88 [0.77-1.00]	viral time	15 (n)	25 (n)
Menardi	35%	0.65 [0.39-1.07]	death	32/200	19/77
Panda (RCT)	48%	0.53 [0.15-1.82]	death	3/20	6/21
Babalola (RCT)	-55%	1.55 [0.88-2.72]	no disch.	17/30	11/30
Atipornwan.. (RCT)	56%	0.44 [0.19-1.02]	death	7/100	16/100
Guglielmetti	28%	0.72 [0.48-1.08]	death	474 (n)	126 (n)
Sarhan (RCT)	26%	0.74 [0.38-1.44]	death	12/56	15/52
Cortez	15%	0.85 [0.12-6.27]	death	1/25	12/255
Schmidt (PSM)	-333%	4.33 [2.07-9.04]	death	70 (n)	407 (n)
Calderón	-215%	3.15 [0.40-24.7]	death	5/27	1/17
Ferreira	-151%	2.51 [1.09-4.43]	death	17/111	11/81
AbdelGhaffar	100%	0.00 [0.00-0.02]	death	0/238	900/3,474
Tu	17%	0.83 [0.37-1.85]	death	6/37	28/143
Alwafi	15%	0.85 [0.45-1.62]	viral+	12/45	15/48
Lavilla Ollerros	36%	0.64 [0.55-0.73]	death	2,285/12,772	774/2,149
Omma	28%	0.72 [0.39-1.33]	death	17/213	20/180
Fernández-Cruz	27%	0.73 [0.34-1.57]	death	23/63	4/8
Albanghali	-35%	1.35 [0.65-2.77]	death	20/466	11/345
Beaumont	14%	0.86 [0.39-1.41]	death/int.	7/38	88/258
Hall (ICU)	11%	0.89 [0.69-1.14]	death	31/56	280/449
Rouamba	80%	0.20 [0.10-0.44]	death	20/336	24/73
Soto	-6%	1.06 [0.91-1.23]	death	292/590	362/828
Tsanovska (PSM)	58%	0.42 [0.20-0.90]	death	8/70	19/70
Azaña Gómez	36%	0.64 [0.58-0.72]	death	500/1,378	238/421
Salehi (ICU)	-14%	1.14 [0.82-1.60]	death	53/86	21/39
Uyaroğlu (PSM)	-200%	3.00 [0.13-71.6]	death	1/42	0/42
Ebongue	43%	0.57 [0.33-0.97]	death	93/522	36/58
AlQahtani (RCT)	24%	0.76 [0.18-3.25]	ICU	3/51	4/52
Hafez	12%	0.88 [0.53-1.43]	viral+	40 (n)	1,446 (n)
Bassets-Bosch	29%	0.71 [0.30-1.69]	viral time	5 (n)	5 (n)
Hong (PSM)	25%	0.75 [0.36-1.58]	no recov.	15 (n)	15 (n)
Silva	-46%	1.46 [0.77-2.21]	death	21 (n)	374 (n)
Osawa	29%	0.71 [0.50-1.02]	death	25/71	71/144
Malundo	-24%	1.24 [0.83-1.87]	death	20/90	201/1,125
Lyashchenko	-48%	1.48 [1.30-1.68]	death	389/1,419	341/1,837
Bowen	20%	0.80 [0.68-0.94]	death	1,317 (n)	3,314 (n)
Babayigit	-112%	2.12 [0.65-5.71]	ventilation	63/1,378	6/94
Núñez-Gil (PSM)	53%	0.47 [0.36-0.62]	death	581 (n)	581 (n)
Go	55%	0.45 [0.22-0.91]	death	n/a	n/a
Gómez	36%	0.64 [0.58-0.72]	death	500/1,378	238/421
Assad	60%	0.40 [0.21-0.77]	death	9/72	68/219
Bubenek-Tur.. (ICU)	22%	0.78 [0.64-0.95]	death	n/a	n/a
Alosaimi (PSM)	-400%	5.00 [0.25-101]	death	2/37	0/37
Higgins (RCT)	-51%	1.51 [0.98-2.29]	death	16/41	107/311
Alshamrani (PSM)	50%	0.50 [0.17-1.30]	death	6/161	50/653
Delgado	26%	0.74 [0.61-0.90]	death	1,239 (n)	8,399 (n)
Spivak (RCT)	-73%	1.73 [0.52-5.78]	hosp.	7/152	4/150
Aweimer	40%	0.60 [0.29-1.25]	death	4/9	104/140
Ho	-890%	9.90 [1.17-65.6]	progression	4/91	1/234
Krishnan	40%	0.60 [0.40-1.10]	death	case control	
Said	78%	0.22 [0.13-0.40]	death	14/435	58/405
AlQadheeb (ICU)	35%	0.65 [0.51-0.84]	death	37/92	466/756
Yilgwan	93%	0.07 [0.03-0.14]	death	1,039 (n)	2,423 (n)
de Gonzalo-.. (ICU)	38%	0.62 [0.30-1.30]	death	6/32	138/459
Cárdenas-Jaén	56%	0.44 [0.14-1.24]	severe case	3/42	126/787
Shamsi	-39%	1.39 [0.52-3.71]	death	4/23	20/160
Afşin	17%	0.83 [0.51-1.36]	death	15/36	22/44

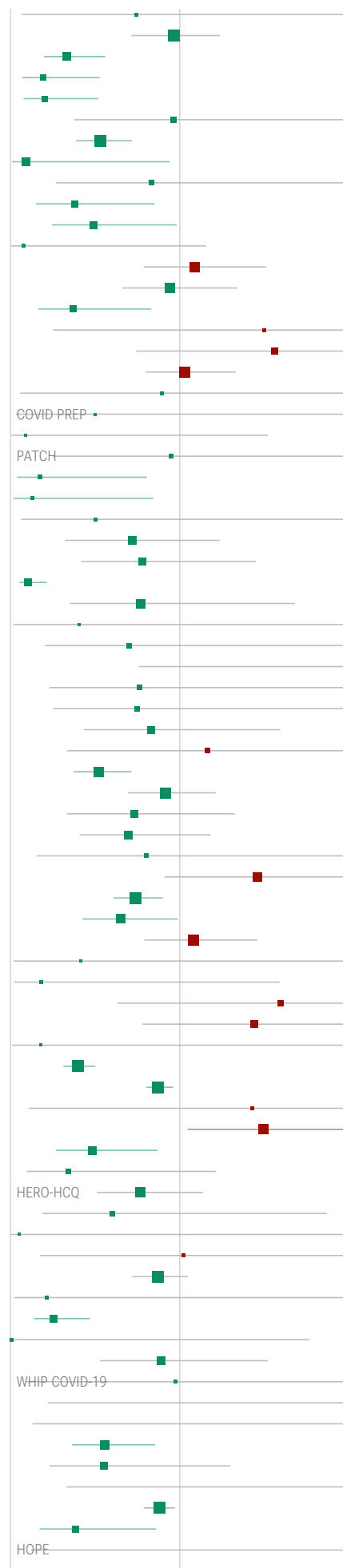
Late treatment 20% 0.80 [0.75-0.84] 19,890/135,416 22,903/142,309

Tau² = 0.11, I² = 84.9%, p < 0.0001

	Improvement, RR [CI]	Treatment	Control
Gendelman	8% 0.92 [0.31-2.72] cases	3/36	1,314/14,484
Konig	3% 0.97 [0.65-1.46] hosp.	16/29	29/51
Cassione	-50% 1.50 [0.34-6.53] cases	10/127	2/38



Macias	26%	0.74 [0.07-8.18]	hosp.	1/290	2/432
Gianfrancesco	3%	0.97 [0.71-1.24]	hosp.	58/130	219/470
Chatterjee	67%	0.33 [0.20-0.56]	cases	12/68	206/387
Bhattacharya	81%	0.19 [0.07-0.53]	cases	4/54	20/52
Huang	80%	0.20 [0.08-0.52]	hosp.	8 (n)	1,247 (n)
Gendebien	4%	0.96 [0.38-2.46]	cases	12/152	6/73
Ferreira	47%	0.53 [0.39-0.72]	cases	population-based cohort	
Zhong	91%	0.09 [0.01-0.94]	cases	7/16	20/27
Desbois	17%	0.83 [0.27-2.58]	cases	3/27	23/172
Kadnur	62%	0.38 [0.15-0.85]	cases	10/258	15/100
Khurana	51%	0.49 [0.24-0.98]	cases	6/22	88/159
Santos	92%	0.08 [0.00-1.16]	death	0/7	10/31
Singer	-9%	1.09 [0.79-1.51]	cases	55/10,700	104/22,058
Salvarani	6%	0.94 [0.66-1.34]	cases	population-based cohort	
Ferri	63%	0.37 [0.16-0.83]	cases	9/994	16/647
de la Iglesia	-50%	1.50 [0.25-8.95]	hosp.	3/687	2/688
Laplana	-56%	1.56 [0.74-3.28]	cases	17/319	11/319
Rentsch	-3%	1.03 [0.80-1.33]	death	population-based cohort	
Grau-Pujol (RCT)	11%	0.89 [0.06-14.2]	cases	1/142	1/127
Rajasingham (RCT)	50%	0.50 [0.03-7.97]	hosp.	1/989	1/494
Gentry	91%	0.09 [0.00-1.52]	death	0/10,703	7/21,406
Abella (RCT)	5%	0.95 [0.25-3.63]	cases	4/64	4/61
Yadav	82%	0.18 [0.04-0.81]	hosp.	2/279	9/221
Goenka	87%	0.13 [0.02-0.85]	IgG+	1/77	115/885
Arleo	50%	0.50 [0.06-4.02]	death	1/20	5/50
Behera	28%	0.72 [0.32-1.24]	cases	7/19	179/353
Datta	22%	0.78 [0.42-1.45]	cases	16/146	19/135
Mathai	90%	0.10 [0.05-0.21]	cases	10/491	22/113
Revollo (PSM)	23%	0.77 [0.35-1.68]	cases	16/69	65/418
Jung	59%	0.41 [0.02-9.97]	death	0/649	1/1,417
Gönenli	30%	0.70 [0.20-2.46]	progression	3/148	12/416
Huh	-251%	3.51 [0.76-16.2]	progression	5/8	873/2,797
Cordtz	24%	0.76 [0.23-2.52]	hosp.	population-based cohort	
Rangel	25%	0.75 [0.25-2.24]	death	4/50	11/103
Khoubnasabjafari	17%	0.83 [0.44-1.59]	cases	34/1,436	12/422
Trefond	-17%	1.17 [0.33-3.54]	death	4/68	12/183
Strangfeld	48%	0.52 [0.37-0.71]	death	27/426	124/739
Fitzgerald	9%	0.91 [0.69-1.21]	cases	65/1,072	200/3,594
Mahto	27%	0.73 [0.33-1.33]	IgG+	9/89	84/600
Bae (PSM)	30%	0.70 [0.41-1.18]	cases	16/743	91/2,698
Pham	20%	0.80 [0.15-2.79]	death	2/14	5/28
Vivanco-Hidalgo	-46%	1.46 [0.91-2.34]	hosp.	40/6,746	50/13,492
Dev	26%	0.74 [0.61-0.90]	cases	260 (n)	499 (n)
Seet (RCT)	35%	0.65 [0.43-0.99]	symp. case	29/432	64/619
Alegiani	-8%	1.08 [0.79-1.46]	death	case control	
Alzahrani	59%	0.41 [0.02-9.55]	death	0/14	1/33
Rojas-Serrano (RCT)	82%	0.18 [0.02-1.59]	symp. case	1/62	6/65
Syed (RCT)	-60%	1.60 [0.63-4.04]	symp. case	10/48	6/46
Kamstrup	-44%	1.44 [0.78-2.65]	hosp.	population-based cohort	
Korkmaz	82%	0.18 [0.01-3.72]	death	0/385	2/299
Badyal	60%	0.40 [0.31-0.50]	cases	247/617	611/1,473
Shaw (PSM)	13%	0.87 [0.80-0.96]	cases	45 (n)	99 (n)
Küçükakkaş	-43%	1.43 [0.11-19.2]	ICU	1/7	1/10
Bhatt	-49%	1.49 [1.05-2.13]	cases	167/731	30/196
McCullough	52%	0.48 [0.27-0.87]	cases	13/101	32/120
Patil	66%	0.34 [0.10-1.22]	death	5,266 (n)	3,946 (n)
Naggie (RCT)	24%	0.76 [0.51-1.14]	symp. case	41/683	53/676
Cordtz	40%	0.60 [0.19-1.87]	hosp.	1,170 (n)	1,363 (n)
Agarwal	95%	0.05 [0.00-3401]	hosp.	0/29	17/455
Guillaume	-2%	1.02 [0.17-6.07]	hosp.	2/181	3/278
Fung	13%	0.87 [0.72-1.05]	death	population-based cohort	
Belmont	79%	0.21 [0.02-2.25]	symp. case	1/56	2/24
Samajdar	75%	0.25 [0.14-0.47]	cases	12/129	29/81
Ahmed	99%	0.01 [0.00-1.77]	cases	case control	
Rao	11%	0.89 [0.53-1.52]	cases	16/273	67/1,021
McKinnon (RCT)	2%	0.98 [0.09-10.7]	symp. case	2/365	1/178
Juneja	-142%	2.42 [0.22-26.6]	severe case	2/996	1/1,204
Erden	-150%	2.50 [0.13-48.0]	death	1/6	0/3
Ugarte-Gil	44%	0.56 [0.36-0.85]	severe case	665 (n)	230 (n)
Opdam	45%	0.55 [0.23-1.30]	hosp.	case control	
Oztas	-215%	3.15 [0.33-30.1]	hosp.	3/317	1/333
MacFadden	12%	0.88 [0.79-0.97]	cases	n/a	n/a
Satti	61%	0.39 [0.17-0.86]	cases	10/63	7/17
Tirupakuzhi.. (RCT)	-196%	2.96 [0.12-72.3]	progression	1/211	0/203
Resha	92%	0.18 [0.02-1.86]	symp. case	1/50	2/21



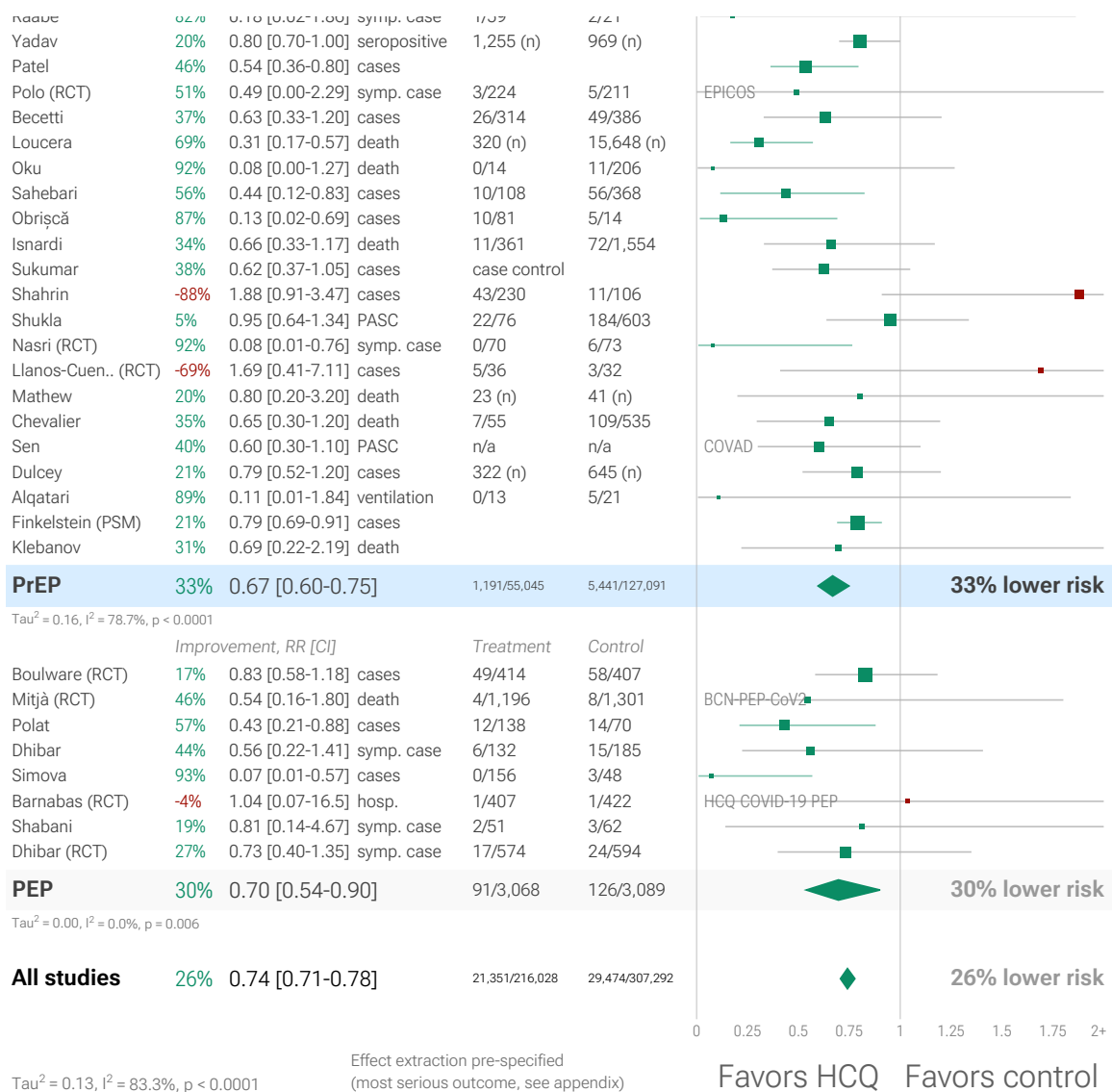
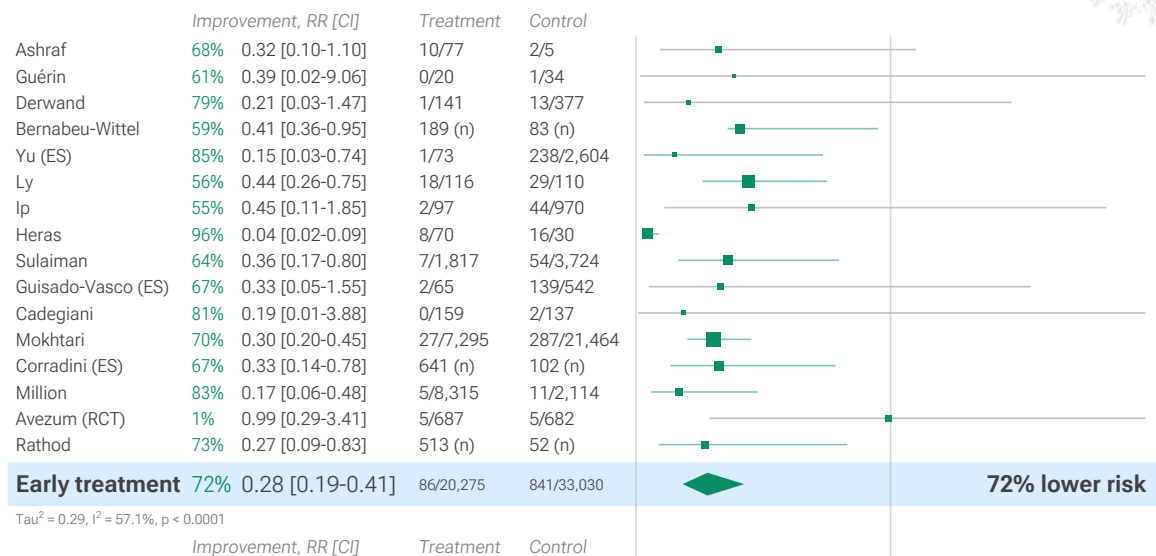


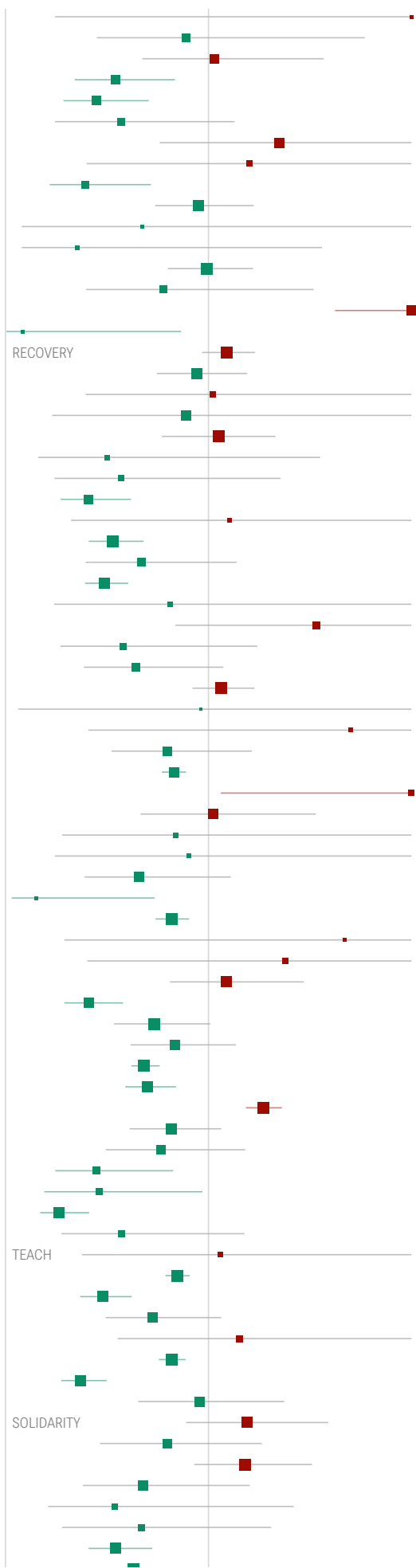
Figure 4. Random effects meta-analysis. This plot shows pooled effects, analysis for individual outcomes is below, and more details on pooled effects can be found in the heterogeneity section. Effect extraction is pre-specified, using the most serious outcome reported, see the [appendix](#) for details. (ES) indicates the early treatment subset of a study.

All 247 HCQ COVID-19 mortality results

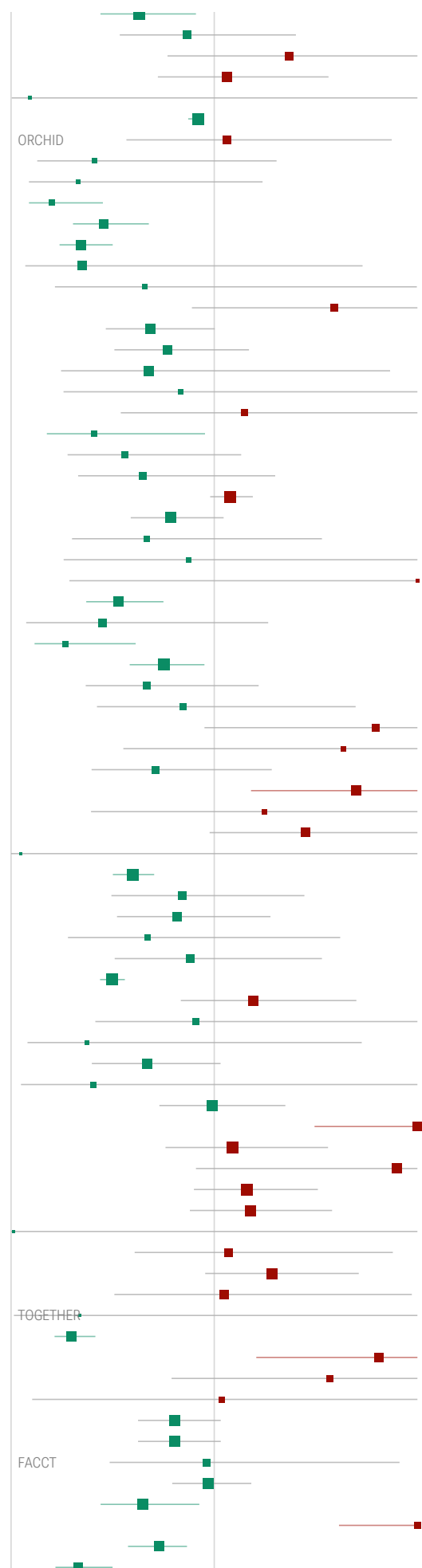
c19hcq.org Sep 2023

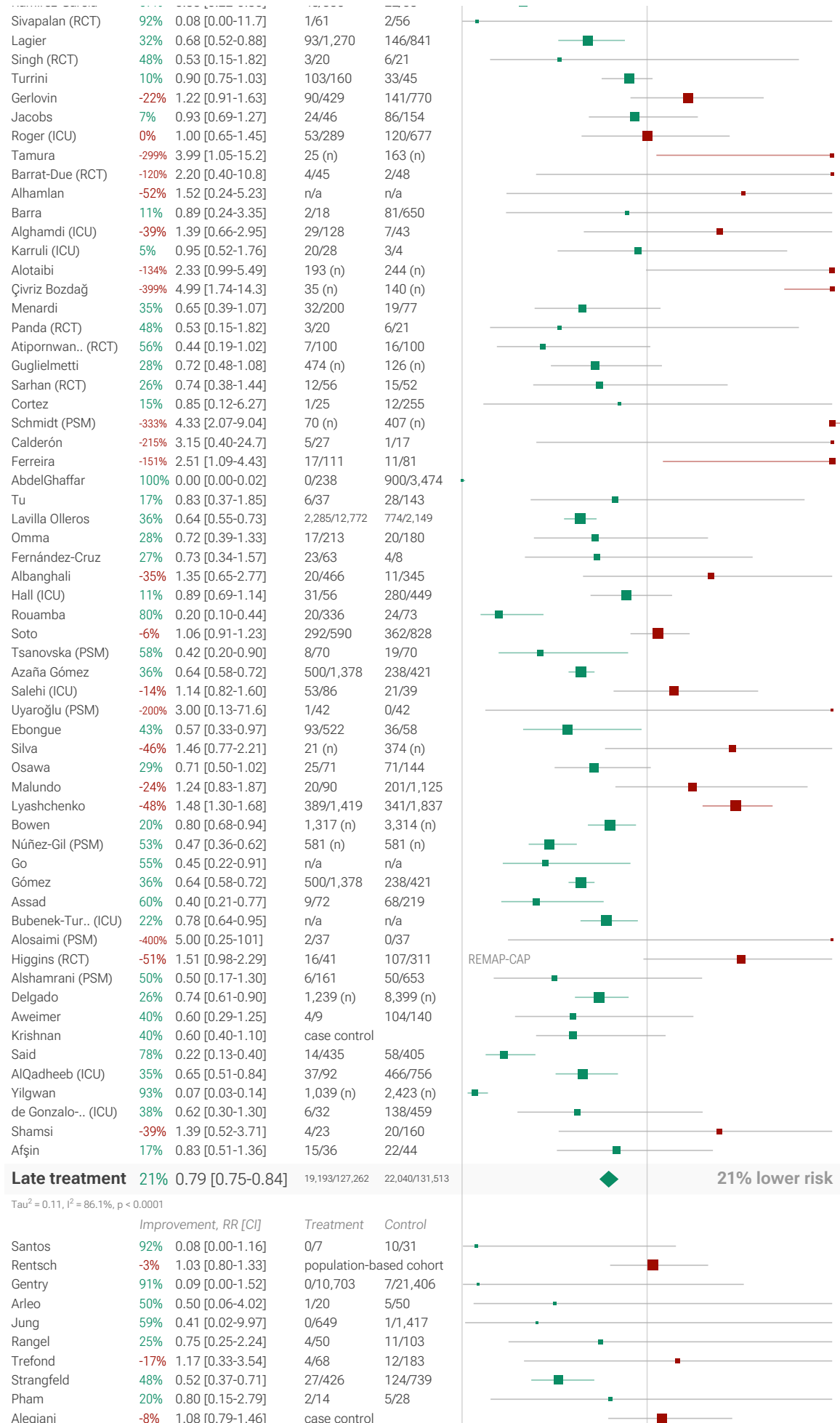


Barbosa	-147%	2.47 [0.24-25.0]	2/17	1/21
Magagnoli	11%	0.89 [0.45-1.77]	39/148	18/163
Auld	-3%	1.03 [0.67-1.57]	33/114	29/103
Sánchez-Álvarez	46%	0.54 [0.34-0.84]	322 (n)	53 (n)
Membrillo de No..	55%	0.45 [0.29-0.71]	27/123	21/43
Alberici	43%	0.57 [0.24-1.13]	17/72	9/22
Rosenberg	-35%	1.35 [0.76-2.40]	189/735	28/221
Mahévas	-20%	1.20 [0.40-3.30]	9/84	8/89
Yu	60%	0.40 [0.22-0.72]	9/48	238/502
Singh	5%	0.95 [0.74-1.22]	104/910	109/910
Luo	32%	0.68 [0.08-5.88]	19 (n)	264 (n)
Hraiech (ICU)	65%	0.35 [0.08-1.56]	2/17	5/15
Ip	1%	0.99 [0.80-1.22]	432/1,914	115/598
Goldman	22%	0.78 [0.40-1.52]	10/109	34/288
Kuderer	-134%	2.34 [1.62-3.21]	45/181	76/747
Rogado	92%	0.08 [0.00-0.87]	1/8	7/9
RECOVERY (RCT)	-9%	1.09 [0.97-1.23]	421/1,561	790/3,155
Wang	6%	0.94 [0.75-1.19]	1,866 (n)	5,726 (n)
Luo	-2%	1.02 [0.39-2.65]	11/35	4/13
Paccoud	11%	0.89 [0.23-3.47]	21/38	26/46
Sbidian	-5%	1.05 [0.77-1.33]	111/623	830/3,792
Fontana	50%	0.50 [0.16-1.55]	4/12	2/3
Bousquet	43%	0.57 [0.24-1.36]	5/27	23/81
Lagier	59%	0.41 [0.27-0.62]	35/3,119	58/618
Sosa-García (ICU)	-11%	1.11 [0.32-3.78]	7/38	3/18
Mikami	47%	0.53 [0.41-0.68]	575/2,077	231/743
Martínez-López	33%	0.67 [0.39-1.14]	47/148	9/19
Arshad	51%	0.49 [0.39-0.60]	162/1,202	108/409
Rivera-Izquierdo	19%	0.81 [0.24-2.76]	215 (n)	23 (n)
Cravedi	-53%	1.53 [0.84-2.80]	36/101	10/43
Lecronier (ICU)	42%	0.58 [0.27-1.24]	9/38	9/22
Trullàs	36%	0.64 [0.39-1.07]	20/66	16/34
Gupta	-6%	1.06 [0.92-1.23]	631/1,761	153/454
Lyngbakken (RCT)	4%	0.96 [0.06-14.6]	1/27	1/26
McGrail	-70%	1.70 [0.41-7.07]	4/33	3/42
Krishnan	20%	0.80 [0.52-1.21]	86/144	6/8
Bernaola	17%	0.83 [0.77-0.89]	236/1,498	28/147
Kelly	-143%	2.43 [1.06-5.56]	23/82	6/52
Rivera	-2%	1.02 [0.67-1.53]	44/179	59/327
Cavalcanti (RCT)	16%	0.84 [0.28-2.53]	8/331	5/173
Santos	10%	0.90 [0.24-3.36]	8/31	2/7
D'Arminio Monfo..	34%	0.66 [0.39-1.11]	53/197	47/92
Yu	85%	0.15 [0.03-0.74]	1/73	238/2,604
Berenguer	18%	0.82 [0.74-0.90]	681/2,618	438/1,377
Kalligeros	-67%	1.67 [0.29-9.36]	36 (n)	72 (n)
Roomi	-38%	1.38 [0.40-2.76]	13/144	6/32
Peters	-9%	1.09 [0.81-1.47]	419/1,596	53/353
Pinato	59%	0.41 [0.29-0.58]	30/182	181/446
Gonzalez	27%	0.73 [0.53-1.01]	1,246/8,476	341/1,168
Pasquini (ICU)	16%	0.84 [0.62-1.14]	23/33	15/18
Catteau	32%	0.68 [0.62-0.76]	804/4,542	957/3,533
Di Castelnuovo	30%	0.70 [0.59-0.84]	386/2,634	90/817
Fried	-27%	1.27 [1.18-1.36]	1,048/4,232	1,466/7,489
Albani	18%	0.82 [0.61-1.06]	60/211	172/605
Synolaki	24%	0.76 [0.49-1.18]	21/98	60/214
Alamdari	55%	0.45 [0.25-0.83]	54/427	9/32
Heberto	54%	0.46 [0.19-0.97]	139 (n)	115 (n)
Lauriola	74%	0.27 [0.17-0.41]	102/297	35/63
Serrano	43%	0.57 [0.28-1.18]	6/14	6/8
Ulrich (RCT)	-6%	1.06 [0.38-2.98]	7/67	6/61
Shoaibi	15%	0.85 [0.79-0.91]	686/5,047	3,923/24,404
Ayerbe	52%	0.48 [0.37-0.62]	237/1,857	49/162
Nachega	28%	0.72 [0.49-1.06]	69/630	28/96
Ader (RCT)	-15%	1.15 [0.55-2.27]	11/150	13/149
Soto-Becerra	18%	0.82 [0.76-0.89]	346/692	1,606/2,630
Aparisi	63%	0.37 [0.27-0.50]	122/605	27/49
Annie	4%	0.96 [0.65-1.37]	48/367	50/367
SOLIDARITY (RCT)	-19%	1.19 [0.89-1.59]	104/947	84/906
Guisado-Vasco	20%	0.80 [0.47-1.26]	127/558	14/49
Solh	-18%	1.18 [0.93-1.51]	131/265	134/378
Ñamendys-S.. (ICU)	32%	0.68 [0.38-1.20]	24/54	42/64
Dubee (RCT)	46%	0.54 [0.21-1.42]	6/124	11/123
Lano	33%	0.67 [0.28-1.31]	56 (n)	66 (n)
Coll	46%	0.54 [0.41-0.72]	55/307	108/328
Fraser (RCT)	27%	0.68 [0.44-0.93]	101/306	101/306



Frontera (PSM)	37%	0.63 [0.44-0.91]	12/1,006	424/2,467
Tehrani	13%	0.87 [0.54-1.40]	16/65	54/190
Salazar	-37%	1.37 [0.77-2.42]	12/92	80/811
Rodriguez-Nava	-6%	1.06 [0.72-1.56]	22/65	79/248
Maldonado	91%	0.09 [0.00-2.70]	1/11	1/1
Núñez-Gil	8%	0.92 [0.87-0.94]	200/686	100/268
Self (RCT)	-6%	1.06 [0.57-1.87]	25/241	25/236
Rodriguez	59%	0.41 [0.13-1.31]	8/39	2/4
Águila-Gordo	67%	0.33 [0.09-1.24]	151/346	47/70
Sheshah	80%	0.20 [0.09-0.45]	267 (n)	33 (n)
Boari	55%	0.45 [0.30-0.68]	41/202	25/56
Budhiraja	65%	0.35 [0.24-0.50]	69/834	34/142
Falcone (PSM)	65%	0.35 [0.07-1.73]	40/238	30/77
Qin	34%	0.66 [0.22-2.00]	3/43	75/706
Burdick	-59%	1.59 [0.89-2.83]	142 (n)	148 (n)
van Halem	32%	0.68 [0.47-1.00]	34/164	47/155
Rodriguez-Gonzalez	23%	0.77 [0.51-1.17]	251/1,148	17/60
Lambermont	32%	0.68 [0.25-1.87]	97/225	14/22
Abdulrahman (PSM)	17%	0.83 [0.26-2.69]	5/223	6/223
Aboulénain	-15%	1.15 [0.54-2.48]	82 (n)	93 (n)
Modrák	59%	0.41 [0.18-0.95]	108 (n)	105 (n)
Ozturk	44%	0.56 [0.28-1.13]	165/1,127	6/23
Guglielmetti	35%	0.65 [0.33-1.30]	181 (n)	37 (n)
Rosenthal	-8%	1.08 [0.98-1.19]	n/a	n/a
Bielza	22%	0.78 [0.59-1.05]	33/91	249/539
Naseem	33%	0.67 [0.30-1.53]	77 (n)	1,137 (n)
Orioli	13%	0.87 [0.26-2.94]	8/55	3/18
De Luna	-105%	2.05 [0.29-14.6]	15/132	1/18
Signes-Costa	47%	0.53 [0.37-0.75]	4,854 (n)	993 (n)
Matangila	55%	0.45 [0.07-1.27]	25/147	8/13
Cangiano	73%	0.27 [0.12-0.61]	5/33	37/65
Taccone (ICU)	25%	0.75 [0.58-0.95]	449/1,308	183/439
Chari	33%	0.67 [0.37-1.22]	8/29	195/473
Vernaz (PSM)	15%	0.85 [0.42-1.70]	12/93	16/105
Texeira	-79%	1.79 [0.95-3.38]	17/65	14/96
Pseudos	-63%	1.63 [0.55-4.84]	17/52	3/15
Mahale	29%	0.71 [0.40-1.28]	25/102	11/32
Sands	-70%	1.70 [1.18-2.42]	101/973	56/696
Lotfy	-25%	1.25 [0.39-3.96]	6/99	5/103
Sarfaraz	-45%	1.45 [0.98-2.15]	40/94	27/92
Yegerov	95%	0.0 [0.00-5e+186]	0/23	20/1,049
Di Castelnuovo	40%	0.60 [0.50-0.70]	3,270 (n)	1,000 (n)
Roig	16%	0.84 [0.49-1.44]	33/67	7/12
Ubaldo (ICU)	18%	0.82 [0.52-1.28]	17/25	5/6
Ouedraogo	33%	0.67 [0.28-1.62]	397 (n)	59 (n)
Hernandez-C.. (RCT)	12%	0.88 [0.51-1.53]	106 (n)	108 (n)
Lora-Tamayo	50%	0.50 [0.44-0.56]	7,192 (n)	1,361 (n)
Awad	-19%	1.19 [0.84-1.70]	56/188	37/148
Lamback	9%	0.91 [0.41-2.00]	11/101	11/92
Beltran Gon.. (RCT)	63%	0.37 [0.08-1.73]	2/33	6/37
Salvador	33%	0.67 [0.40-1.03]	28/121	58/124
Martin-Vice.. (ICU)	59%	0.41 [0.05-3.39]	37/91	1/1
Stewart	1%	0.99 [0.73-1.35]	66/578	188/1,243
Stewart	-130%	2.30 [1.49-3.54]	32/108	33/256
Stewart	-9%	1.09 [0.76-1.56]	212/1,157	203/1,101
Stewart	-90%	1.90 [0.91-4.10]	46/208	47/1,334
Stewart	-16%	1.16 [0.90-1.51]	428/1,711	123/688
Stewart	-18%	1.18 [0.88-1.58]	90/429	141/737
Barry	99%	0.0 [0.00-1e+05]	0/6	91/599
Alghamdi	-7%	1.07 [0.61-1.88]	44/568	15/207
Mulhem	-28%	1.28 [0.96-1.71]	435/2,496	81/723
Gadhiya	-5%	1.05 [0.51-1.97]	22/55	33/216
Reis (RCT)	66%	0.34 [0.01-8.30]	0/214	1/227
Corradini	70%	0.30 [0.21-0.41]	1,439 (n)	274 (n)
Mohandas	-81%	1.81 [1.21-2.72]	27/384	115/2,961
Réa-Neto (RCT)	-57%	1.57 [0.79-3.13]	16/53	10/52
Kokturk	-4%	1.04 [0.10-7.64]	62/1,382	5/118
Aghajani	19%	0.81 [0.62-1.03]	553 (n)	438 (n)
Haji Aghajani	19%	0.81 [0.62-1.03]	553 (n)	438 (n)
Bosaeed (RCT)	4%	0.96 [0.49-1.91]	14/125	15/129
Çiyiltepe (ICU)	3%	0.97 [0.79-1.18]	69/95	39/52
De Rosa	35%	0.65 [0.44-0.93]	118/731	80/280
Sammartino (PSM)	-240%	3.40 [1.61-7.40]	137 (n)	191 (n)
Smith	27%	0.73 [0.58-0.87]	19/37	182/218
Ramírez-García	67%	0.33 [0.22-0.50]	48/350	22/53





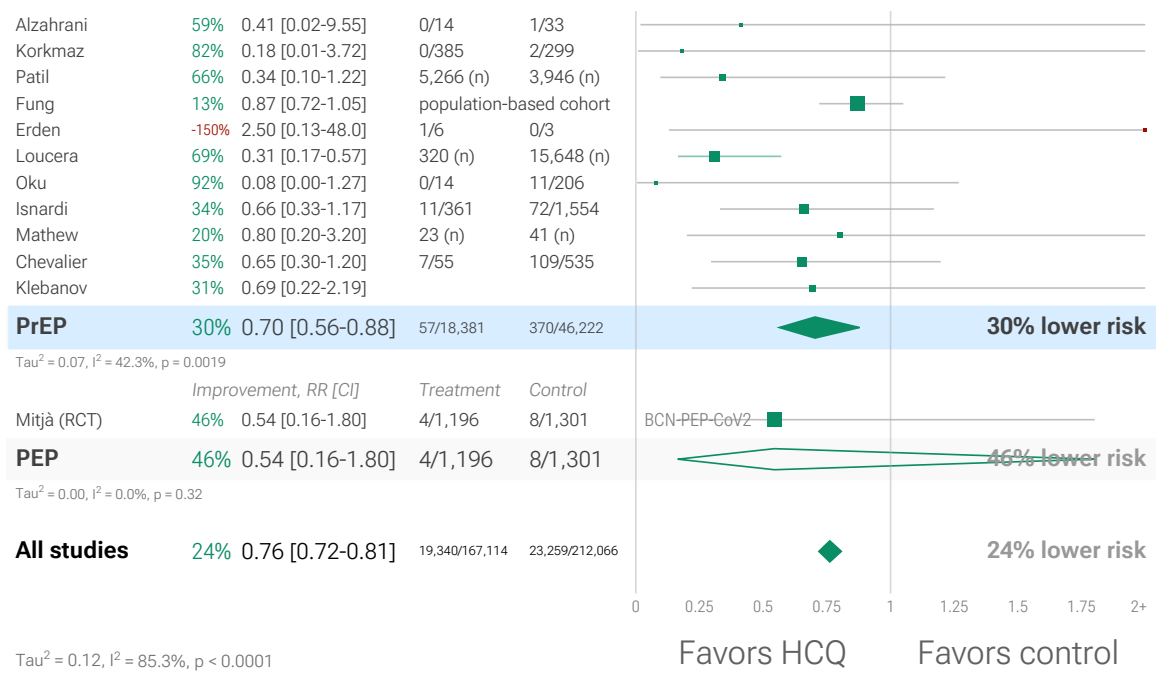
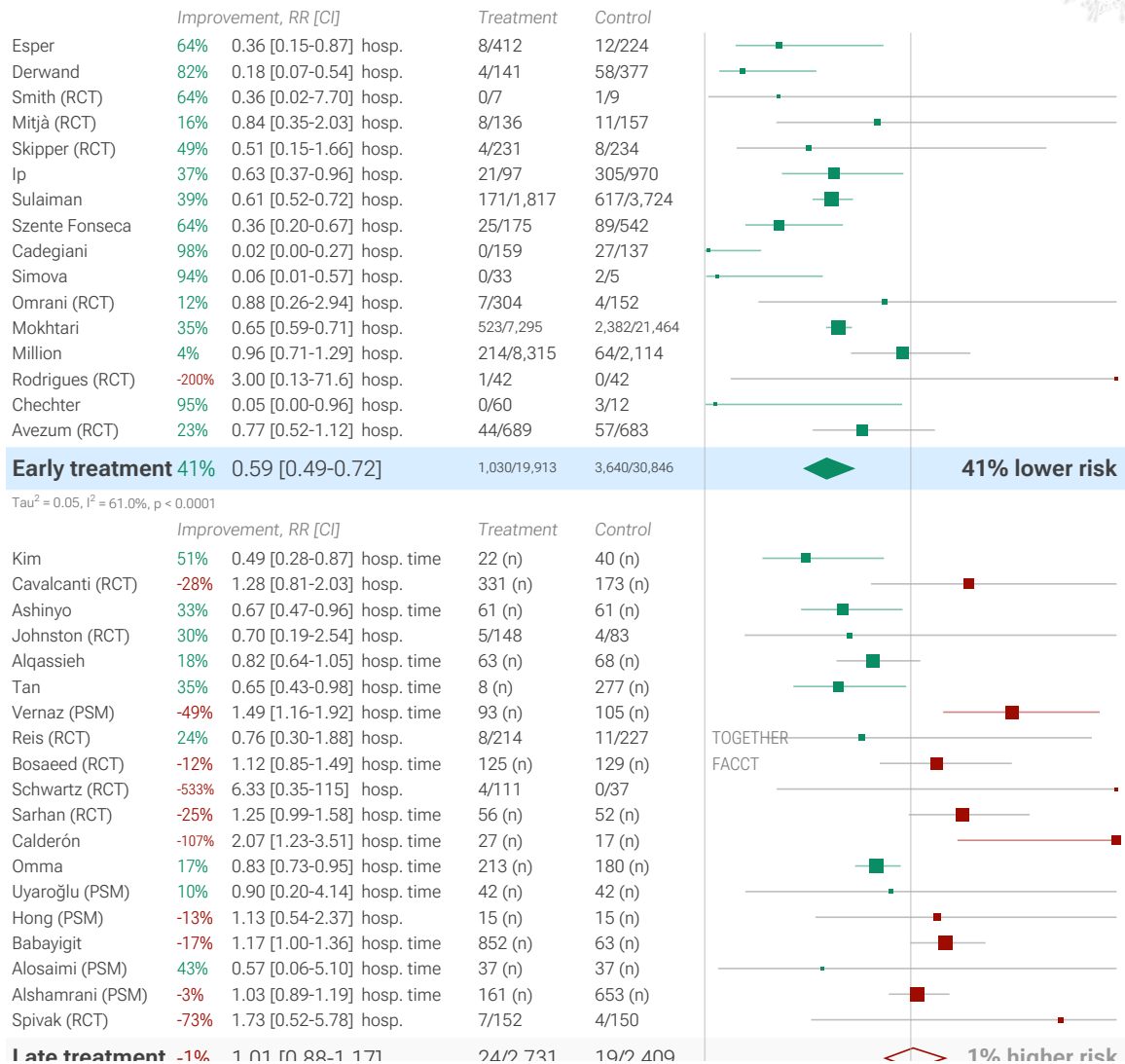


Figure 5. Random effects meta-analysis for mortality results only. (ES) indicates the early treatment subset of a study.

All 62 HCQ COVID-19 hospitalization results

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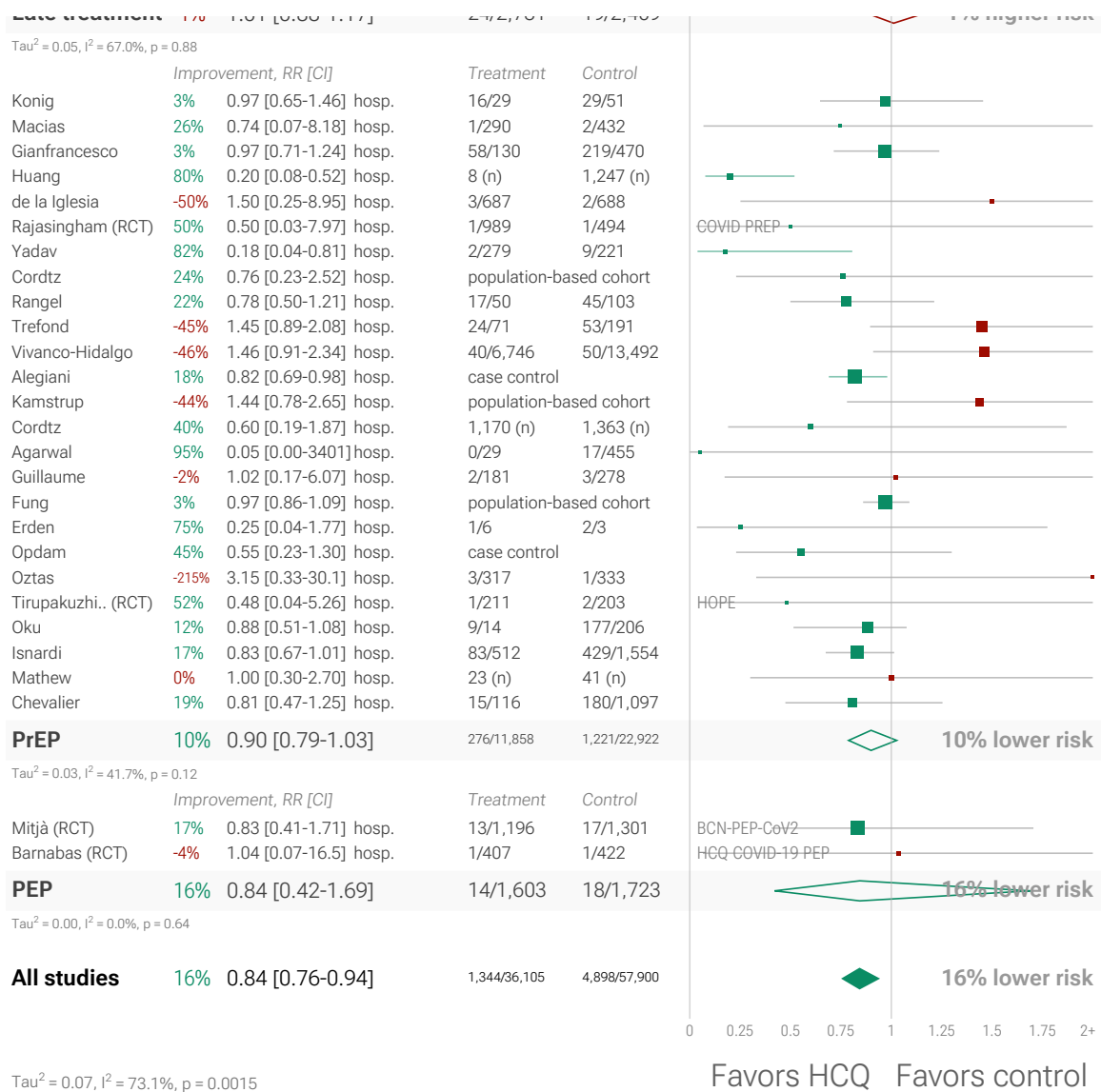


Figure 6. Random effects meta-analysis for hospitalization results only.

All 78 HCQ COVID-19 case results

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Figure 7. Random effects meta-analysis for case results only.

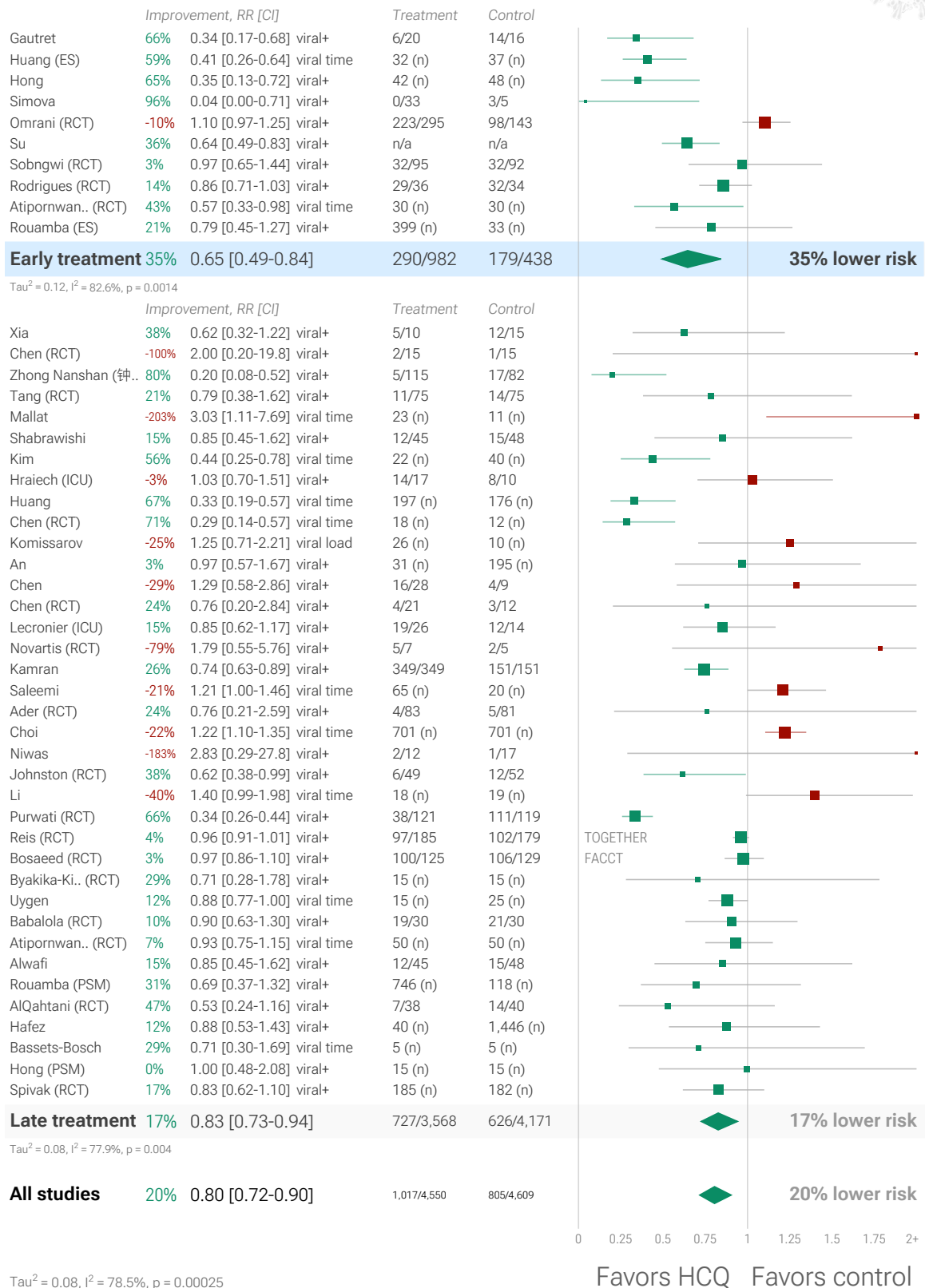


Figure 8. Random effects meta-analysis for viral clearance results only.

Randomized Controlled Trials (RCTs)

Results restricted to RCTs are shown in Figure 9 and Figure 10, showing 17% [4-29%] improvement for all RCTs, and 23% [9-36%] improvement when excluding late treatment studies.

RCTs have many potential biases. Bias in clinical research may be defined as something that tends to make conclusions differ systematically from the truth. RCTs help to make study groups more similar and can provide a higher level of evidence, however they are subject to many biases [Jadad](#), and analysis of double-blind RCTs has identified extreme levels of bias [Gøtzsche](#). For COVID-19, the overhead may delay treatment, dramatically compromising efficacy; they may encourage monotherapy for simplicity at the cost of efficacy which may rely on combined or synergistic effects; the participants that sign up may not reflect real world usage or the population that benefits most in terms of age, comorbidities, severity of illness, or other factors; standard of care may be compromised and unable to evolve quickly based on emerging research for new diseases; errors may be made in randomization and medication delivery; and investigators may have hidden agendas or vested interests influencing design, operation, analysis, and the potential for fraud. All of these biases have been observed with COVID-19 RCTs. There is no guarantee that a specific RCT provides a higher level of evidence.

RCTs for novel acute diseases requiring rapid treatment. High quality RCTs for novel acute diseases are more challenging, with increased ethical issues due to the urgency of treatment, increased risk due to enrollment delays, and more difficult design with a rapidly evolving evidence base. For COVID-19, the most common site of initial infection is the upper respiratory tract. Immediate treatment is likely to be most successful and may prevent or slow progression to other parts of the body. For a non-prophylaxis RCT, it makes sense to provide treatment in advance and instruct patients to use it immediately on symptoms, just as some governments have done by providing medication kits in advance. Unfortunately, no RCTs have been done in this way. Every treatment RCT to date involves delayed treatment. Among the 56 treatments we have analyzed, 64% of RCTs involve very late treatment 5+ days after onset. No non-prophylaxis COVID-19 RCTs match the potential real-world use of early treatments (they may more accurately represent results for treatments that require visiting a medical facility, e.g., those requiring intravenous administration).

RCT bias for widely available treatments. RCTs have a bias against finding an effect for interventions that are widely available — patients that believe they need the intervention are more likely to decline participation and take the intervention. RCTs for hydroxychloroquine are more likely to enroll low-risk participants that do not need treatment to recover, making the results less applicable to clinical practice. This bias is likely to be greater for widely known treatments, and may be greater when the risk of a serious outcome is overstated. This bias does not apply to the typical pharmaceutical trial of a new drug that is otherwise unavailable.

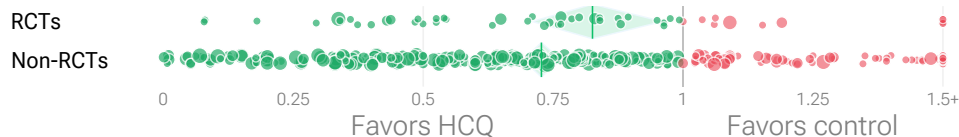
Non-RCT studies have been shown to be reliable. Evidence shows that non-RCT trials can also provide reliable results. [Concato](#) find that well-designed observational studies do not systematically overestimate the magnitude of the effects of treatment compared to RCTs. [Anglemyer](#) summarized reviews comparing RCTs to observational studies and found little evidence for significant differences in effect estimates. [Lee](#) shows that only 14% of the guidelines of the Infectious Diseases Society of America were based on RCTs. Evaluation of studies relies on an understanding of the study and potential biases. Limitations in an RCT can outweigh the benefits, for example excessive dosages, excessive treatment delays, or Internet survey bias could have a greater effect on results. Ethical issues may also prevent running RCTs for known effective treatments. For more on issues with RCTs see [Deaton, Nichol](#).

Using all studies identifies efficacy 5.7+ months faster for COVID-19. Currently, 38 of the treatments we analyze show statistically significant efficacy or harm, defined as $\geq 10\%$ decreased risk or $> 0\%$ increased risk from ≥ 3 studies. Of the 38 treatments with statistically significant efficacy/harm, 24 have been confirmed in RCTs, with a mean delay of 5.7 months. For the 14 unconfirmed treatments, 4 have zero RCTs to date. The point estimates for the remaining 10 are all consistent with the overall results (benefit or harm), with 8 showing $> 20\%$. The only treatments showing $> 10\%$ efficacy for all studies, but $< 10\%$ for RCTs are sotrovimab and aspirin.

Summary. We need to evaluate each trial on its own merits. RCTs for a given medication and disease may be more reliable, however they may also be less reliable. For off-patent medications, very high conflict of interest trials may be more likely to be RCTs, and more likely to be large trials that dominate meta analyses.

Efficacy in COVID-19 HCQ studies (pooled effects)

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A

All 59 HCQ COVID-19 RCTs

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	Improvement, RR [CI]	Treatment	Control
Kim (RCT)	not reported, >3 years late	65 (total)	
Butler (RCT)	not reported, >3 years late	400 (est. total)	
Smith (RCT)	64% 0.36 [0.02-7.70] hosp.	0/7	1/9
Mitjà (RCT)	16% 0.84 [0.35-2.03] hosp.	8/136	11/157
Skipper (RCT)	37% 0.63 [0.21-1.91] death/hosp.	5/231	8/234
Sarwar (RCT)	not reported, >3 years late	137 (total)	
Sow (RCT)	not reported, >2.5 years late	231 (total)	
Omran (RCT)	12% 0.88 [0.26-2.94] hosp.	7/304	4/152
Akram (RCT)	not reported, >2.5 years late	550 (total)	
Okasha (RCT)	not reported, >2.5 years late	100 (est. total)	
Gül (RCT)	not reported, >2.5 years late	1,120 (total)	
Amaravadi (RCT)	60% 0.40 [0.13-1.28] no recov.	3/15	6/12
Kara (RCT)	not reported, >2 years late	1,008 (total)	
Sobngwi (RCT)	52% 0.48 [0.09-2.58] no recov.	2/95	4/92
Rodrigues (RCT)	-200% 3.00 [0.13-71.6] hosp.	1/42	0/42
Atipornwan... (RCT)	-150% 2.50 [0.10-59.6] progression	1/60	0/30
Aston (RCT)	not reported, >1.5 years late	1,550 (est. total)	
Pineda (RCT)	not reported, >1.5 years late	132 (est. total)	
Avezum (RCT)	1% 0.99 [0.29-3.41] death	5/687	5/682
Roy-García (RCT)	-100% 2.00 [0.19-20.9] progression	2/31	1/31
Genton (RCT)	not reported, >8 months late	800 (est. total)	

Early treatment 25% 0.75 [0.48-1.18] 34/1,608 40/1,441

Tau² = 0.00, I² = 0.0%, p = 0.22

	Improvement, RR [CI]	Treatment	Control
Chen (RCT)	29% 0.71 [0.29-1.74] progression	5/15	7/15
Chen (RCT)	57% 0.43 [0.19-0.97] pneumonia	6/31	14/31
Tang (RCT)	21% 0.79 [0.38-1.62] viral+	11/75	14/75
RECOVERY (RCT)	-9% 1.09 [0.97-1.23] death	421/1,561	790/3,155
Chen (RCT)	20% 0.80 [0.42-1.52] recov. time	18 (n)	12 (n)
Farooq (RCT)	not reported, >3 years late	75 (est. total)	
Chen (RCT)	24% 0.76 [0.20-2.84] viral+	4/21	3/12
Lyngholmen (RCT)	4% 0.96 [0.06-14.6] death	1/27	1/26
Cavalcanti (RCT)	16% 0.84 [0.28-2.53] death	8/331	5/173
Novartis (RCT)	71% 0.29 [0.01-6.03] no disch.	0/7	1/5
Mežnar (RCT)	not reported, >3 years late	90 (est. total)	
El-Sherbiny (RCT)	not reported, >3 years late	40 (est. total)	
Ulrich (RCT)	-6% 1.06 [0.38-2.98] death	7/67	6/61
Ader (RCT)	-15% 1.15 [0.55-2.27] death	11/150	13/149
SOLIDARITY (RCT)	-19% 1.19 [0.89-1.59] death	104/947	84/906
Dubee (RCT)	46% 0.54 [0.21-1.42] death	6/124	11/123
Self (RCT)	-6% 1.06 [0.57-1.87] death	25/241	25/236
WellStar (RCT)	not reported, >2.5 years late	700 (est. total)	
Johnston (RCT)	30% 0.70 [0.19-2.54] hosp.	5/148	4/83
Levi (RCT)	not reported, >2.5 years late	250 (est. total)	
Hernandez-C... (RCT)	12% 0.88 [0.51-1.53] death	106 (n)	108 (n)
Purwati (RCT)	66% 0.34 [0.26-0.44] viral+	38/121	111/119
Beltran Gon... (RCT)	63% 0.37 [0.08-1.73] death	2/33	6/37
Mordmüller (RCT)	not reported, >2.5 years late	30 (total)	
Reis (RCT)	66% 0.34 [0.01-8.30] death	0/214	1/227
Réa-Neto (RCT)	-57% 1.57 [0.79-3.13] death	16/53	10/52
Bosaeed (RCT)	4% 0.96 [0.49-1.91] death	14/125	15/129
Sivapalan (RCT)	92% 0.08 [0.00-11.7] death	1/61	2/56
Byakika-Ki... (RCT)	0% 1.00 [0.56-1.75] recov. time	36 (n)	29 (n)
Singh (RCT)	48% 0.53 [0.15-1.82] death	3/20	6/21
Schwartz (RCT)	-133% 2.33 [0.10-56.1] ICU	1/111	0/37
Barrat-Due (RCT)	-120% 2.20 [0.40-10.8] death	4/45	2/48
Panda (RCT)	48% 0.53 [0.15-1.82] death	3/20	6/21
Babalola (RCT)	-55% 1.55 [0.88-2.72] no disch.	17/30	11/30
Atipornwan... (RCT)	56% 0.44 [0.19-1.02] death	7/100	16/100
Sarhan (RCT)	26% 0.74 [0.38-1.44] death	12/56	15/52
AlQahtani (RCT)	24% 0.76 [0.18-3.25] ICU	3/51	4/52

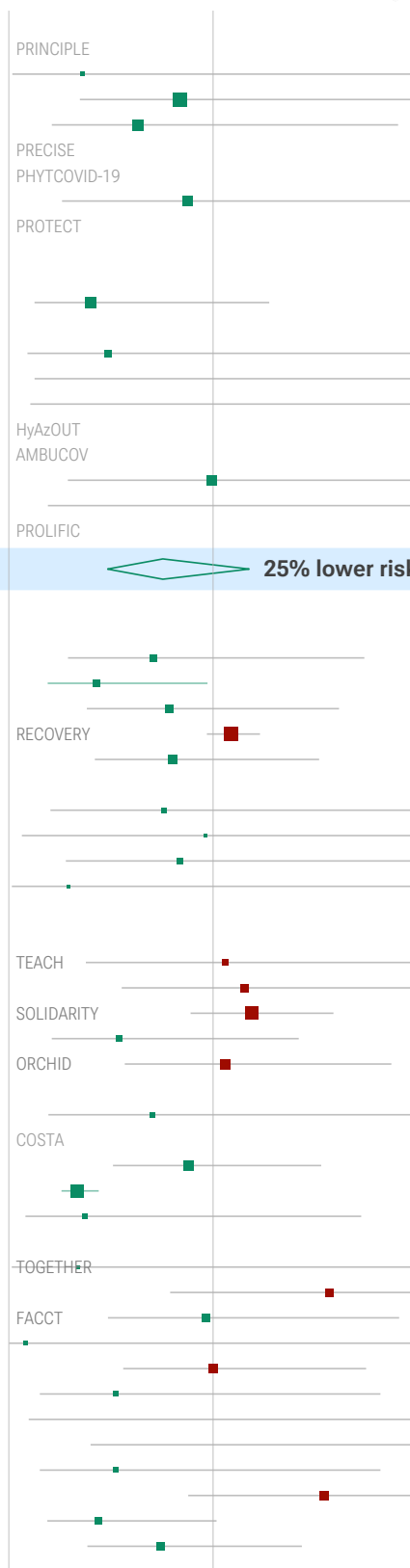
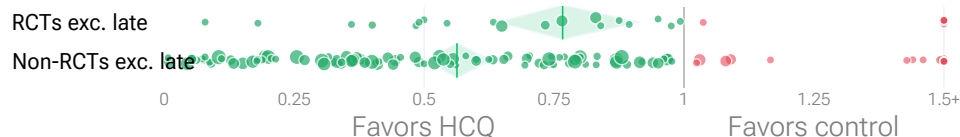




Figure 9. Randomized Controlled Trials. Effect extraction is pre-specified, using the most serious outcome reported, see the [appendix](#) for details. **A.** Scatter plot of all effects comparing RCTs to non-RCTs. **B.** Meta analysis of RCTs.

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Figure 10. RCTs excluding late treatment. Effect extraction is pre-specified, using the most serious outcome reported, see the [appendix](#) for details. **A.** Scatter plot of all effects comparing RCTs to non-RCTs. **B.** Meta analysis of RCTs excluding late treatment.

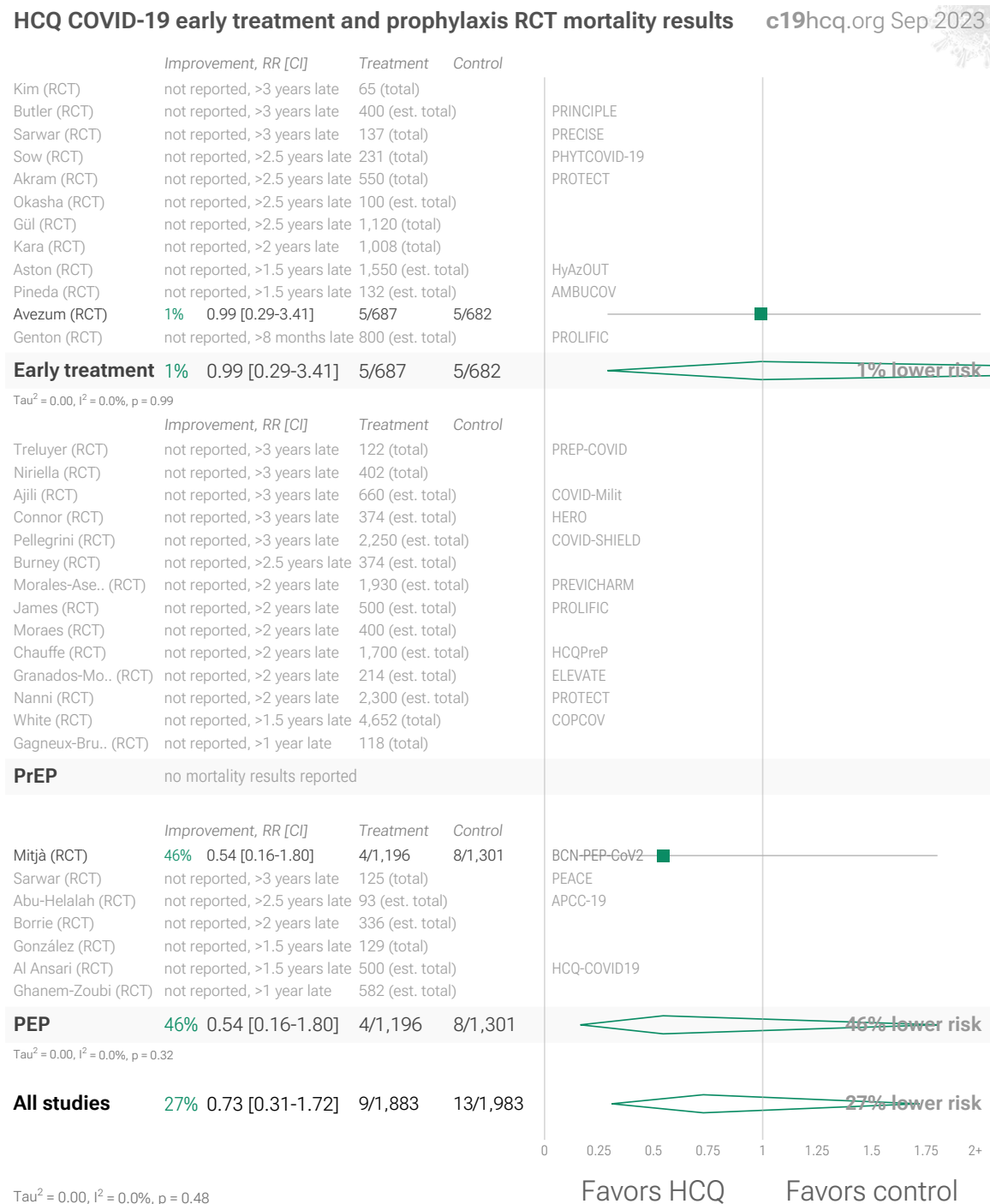


Figure 11. Random effects meta-analysis for RCT mortality results excluding late treatment.



Figure 12. Random effects meta-analysis for RCT hospitalization results excluding late treatment.

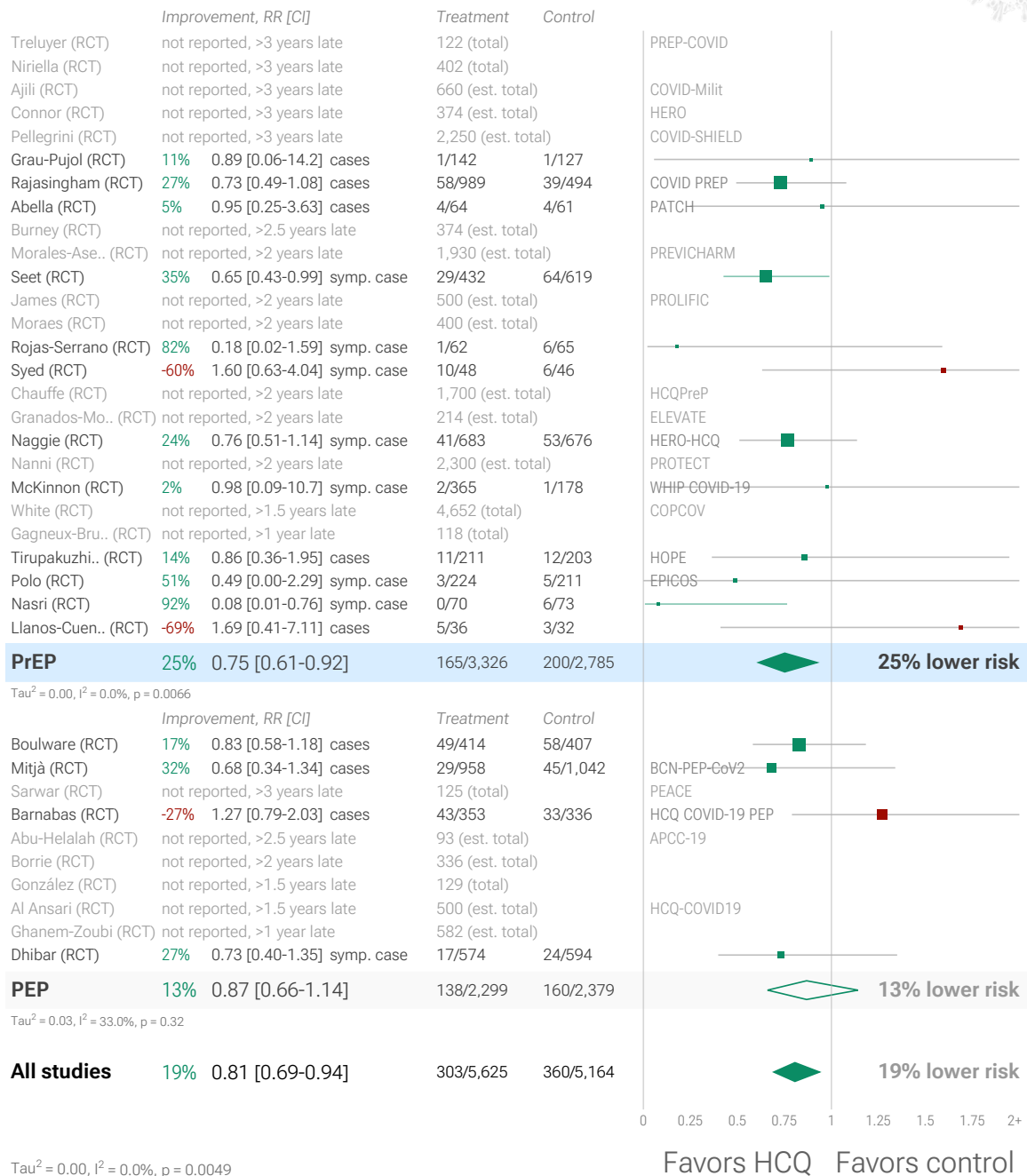


Figure 13. Random effects meta-analysis for RCT case results.

Exclusions

Many meta-analyses for HCQ have been written, most of which have become obsolete due to the continuing stream of more recent studies. More recent analyses with positive conclusions include *IHU Marseille* which considers significant bias from an understanding of each trial, and *García-Albéniz*, *Ladapo*, *Prodromos* which focus on early or prophylactic use studies.

Meta analyses reporting negative conclusions focus on late treatment studies, tend to disregard treatment delay, tend to follow formulaic evaluations which overlook major issues with various studies, and end up with weighting disproportionate to a reasoned analysis of each study's contribution. For example, *Axfors* assigns 87% weight to a single trial, the RECOVERY trial *RECOVERY*, thereby producing the same result. However, the RECOVERY trial may

be the most biased of the studies they included, due to the excessive dosage used, close to the level shown to be very dangerous in *Borba* (OR 2.8), and with extremely sick late stage patients (60% requiring oxygen, 17% ventilation/ECMO, and a very high mortality rate in both arms). There is little reason to suggest that the results from this trial are applicable to more typical dosages or to earlier treatment (10/22: the second version of this study released 10/22 assigns 74% to RECOVERY and 15% to SOLIDARITY *SOLIDARITY*, which is the only other trial using a similar excessive dosage).

We include all studies in the main analysis, however there are major issues with several studies that could significantly alter the results. Here, we present an analysis excluding studies with significant issues, including indication of significant unadjusted group differences or confounding by indication, extremely late stage usage >14 days post symptoms or >50% on oxygen at baseline, very minimal detail provided, excessive dosages which have been shown to be dangerous, significant issues with adjustments that could reasonably make substantial differences, and reliance on PCR which may be inaccurate and less indicative of severity than symptoms. The aim here is not to exclude studies on technicalities, but to exclude studies that clearly have major issues that may significantly change the outcome. We welcome feedback on improvements or corrections to this. The studies excluded are as follows, and the resulting forest plot is shown in Figure 14.

Aboulenain, substantial unadjusted confounding by indication possible.

Ader, very late stage, >50% on oxygen/ventilation at baseline.

Afşin, unadjusted results with no group details.

Alamdari, substantial unadjusted confounding by indication likely.

Albanghali, unadjusted results with no group details; substantial unadjusted confounding by indication likely.

Albani, substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Alghamdi, unadjusted results with no group details; very late stage, ICU patients.

Alghamdi (B), confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Alhamlan, substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Alqatari, unadjusted results with no group details.

Alwafi, excessive unadjusted differences between groups.

Annie, confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Aparisi, unadjusted results with no group details.

Assad, unadjusted results with no group details; confounding by time possible, propensity to use HCQ changed significantly during the study period.

Awad, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Azaña Gómez, unadjusted results with no group details.

Barbosa, excessive unadjusted differences between groups.

Barra, unadjusted results with no group details.

Bielza, unadjusted results with no group details.

Boari, unadjusted results with no group details.

Bosaeed, very late stage, >50% on oxygen/ventilation at baseline.

Budhiraja, excessive unadjusted differences between groups.

Cassione, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Chari, unadjusted results with no group details.

Chechter, unadjusted results with no group details.

Choi, excessive unadjusted differences between groups.

Coll, unadjusted results with no group details.

Cortez, unadjusted results with no group details.

Cravedi, substantial unadjusted confounding by indication likely.

Cárdenas-Jaén, unadjusted for baseline differences with no group details.

de Gonzalo-Calvo, unadjusted results with no group details.

de la Iglesia, not fully adjusting for the different baseline risk of systemic autoimmune patients.

De Luna, unadjusted results with no group details; substantial unadjusted confounding by indication likely.

Erden, unadjusted results with no group details.

Fernández-Cruz, unadjusted results with no group details.

Fitzgerald, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Fried, excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.

Fung, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Gadhiya, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Gautret, excessive unadjusted differences between groups; results only for PCR status which may be significantly different to symptoms.

Geleris, significant issues found with adjustments.

Gendebien, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Gendelman, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Gianfrancesco, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Goldman, unadjusted results with no group details.

Guillaume, statistical analysis shows significant mismatch with prior research, potential overfitting.

Gupta, very late stage, >50% on oxygen/ventilation at baseline.

Gómez, unadjusted results with no group details.

Hall, unadjusted results with no group details.

Ho, excessive unadjusted differences between groups.

Hraiech, very late stage, ICU patients.

Huang, significant unadjusted confounding possible.

Huh, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Izoulet, excessive unadjusted differences between groups.

Jacobs, unadjusted results with no group details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Juneja, excessive unadjusted differences between groups.

Kamran, excessive unadjusted differences between groups.

Kamstrup, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Karruli, unadjusted results with no group details.

Kelly, substantial unadjusted confounding by indication likely.

Konig, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Krishnan, unadjusted results with no group details.

Kuderer, substantial unadjusted confounding by indication likely.

Küçükakkaş, minimal details of groups provided.

Lamback, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Laplana, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Lecronier, very late stage, >50% on oxygen/ventilation at baseline.

Lotfy, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Luo, substantial unadjusted confounding by indication likely.

Lyashchenko, substantial unadjusted confounding by indication likely.

Macias, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Mahale, unadjusted results with no group details.

Mahto, unadjusted results with no group details.

Maldonado, treatment or control group size extremely small.

Malundo, unadjusted results with no group details.

Martin-Vicente, unadjusted results with no group details; treatment or control group size extremely small.

Martinez-Lopez, unadjusted results with no group details.

McGrail, excessive unadjusted differences between groups.

Menardi, excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.

Mitchell, excessive unadjusted differences between groups.

Mohandas, substantial unadjusted confounding by indication likely; unadjusted results with no group details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Mulhem, substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Niwas, excessive unadjusted differences between groups.

Oztas, not adjusting for the different baseline risk of systemic autoimmune patients; excessive unadjusted differences between groups.

Pasquini, unadjusted results with no group details.

Patel, unadjusted results with no group details.

Peters, excessive unadjusted differences between groups.

Pseudos, unadjusted results with no group details; no treatment details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Qin, unadjusted results with no group details.

Ramírez-García, excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.

Rangel, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Rao, unadjusted results with minimal group details.

RECOVERY, excessive dosage in late stage patients, results do not apply to typical dosages.

Rentsch, not fully adjusting for the baseline risk differences within systemic autoimmune patients; medication adherence unknown and may significantly change results.

Rodriguez, unadjusted results with no group details.

Rodriguez-Nava, substantial unadjusted confounding by indication likely; excessive unadjusted differences between groups; unadjusted results with no group details.

Roger, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Roig, unadjusted results with no group details.

Roomi, substantial unadjusted confounding by indication likely.

Rosenthal, confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Roy, no serious outcomes reported and fast recovery in treatment and control groups, there is little room for a treatment to improve results.

Rubio-Sánchez, unadjusted results with no group details.

Saib, substantial unadjusted confounding by indication likely.

Said, unadjusted results with no group details.

Salazar, substantial unadjusted confounding by indication likely; unadjusted results with no group details.

Saleemi, substantial unadjusted confounding by indication likely.

Salehi, unadjusted results with no group details.

Salvarani, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Samajdar, minimal details provided; unadjusted results with no group details; results may be significantly affected by survey bias.

Sammartino, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Sands, includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons; substantial unadjusted confounding by indication likely.

Santos, unadjusted results with no group details.

Santos, unadjusted results with no group details.

Sarfaraz, substantial unadjusted confounding by indication likely; significant unadjusted confounding possible; unadjusted results with no group details.

Sarhan, very late stage, >50% on oxygen/ventilation at baseline; significant unadjusted differences between groups.

Satti, unadjusted results with no group details.

Sbidian, significant issues found with adjustments.

Schmidt, confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Shamsi, unadjusted results with no group details.

Shoaibi, unadjusted results with no group details.

Singer, not fully adjusting for the baseline risk differences within systemic autoimmune patients.

Singh, confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Smith, immortal time bias may significantly affect results.

Solh, very late stage, >50% on oxygen/ventilation at baseline; substantial unadjusted confounding by indication likely.

SOLIDARITY, excessive dosage in late stage patients, results do not apply to typical dosages; very late stage, >50% on oxygen/ventilation at baseline.

Sosa-García, very late stage, >50% on oxygen/ventilation at baseline; substantial unadjusted confounding by indication likely.

Soto, unadjusted results with no group details; substantial unadjusted confounding by indication likely; substantial confounding by time possible due to significant changes in SOC and treatment propensity near the start of the pandemic.

Soto-Becerra, substantial unadjusted confounding by indication likely; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart, substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (B), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (C), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (D), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (E), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (F), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Stewart (G), substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.

Tamura, substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Tehrani, substantial unadjusted confounding by indication likely; unadjusted results with no group details.

Texeira, unadjusted results with no group details; no treatment details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Trefond, not fully adjusting for the different baseline risk of systemic autoimmune patients; significant unadjusted confounding possible; excessive unadjusted differences between groups.

Tu, unadjusted results with no group details.

Ubaldo, substantial unadjusted confounding by indication likely; very late stage, ICU patients; unadjusted results with no group details.

Ulrich, very late stage, >50% on oxygen/ventilation at baseline.

Vernaz, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.

Vivanco-Hidalgo, not fully adjusting for the different baseline risk of systemic autoimmune patients.

Wang (C), confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.

Xia, minimal details provided.

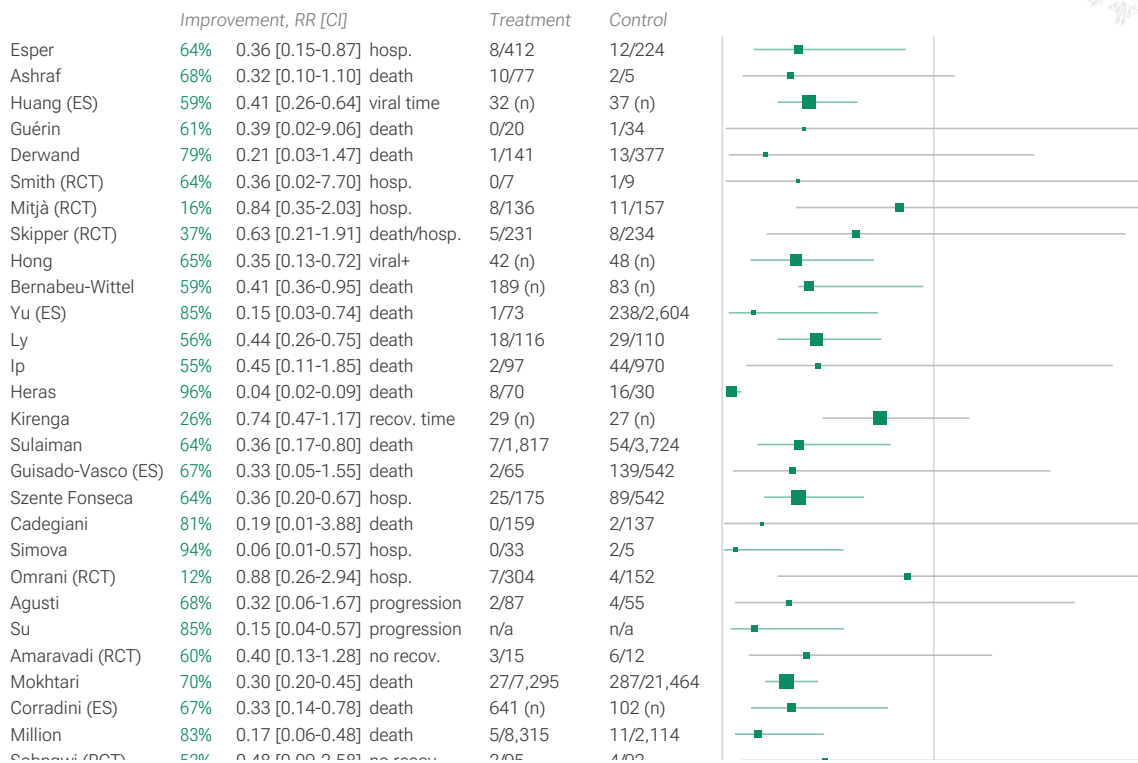
Yegerov, unadjusted results with no group details.

Çivriiz Bozdağ, substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.

Çiyiltepe, treatment group only includes patients where treatment failed resulting in ICU admission.

HCQ COVID-19 studies after exclusions

c19hcq.org Sep 2023

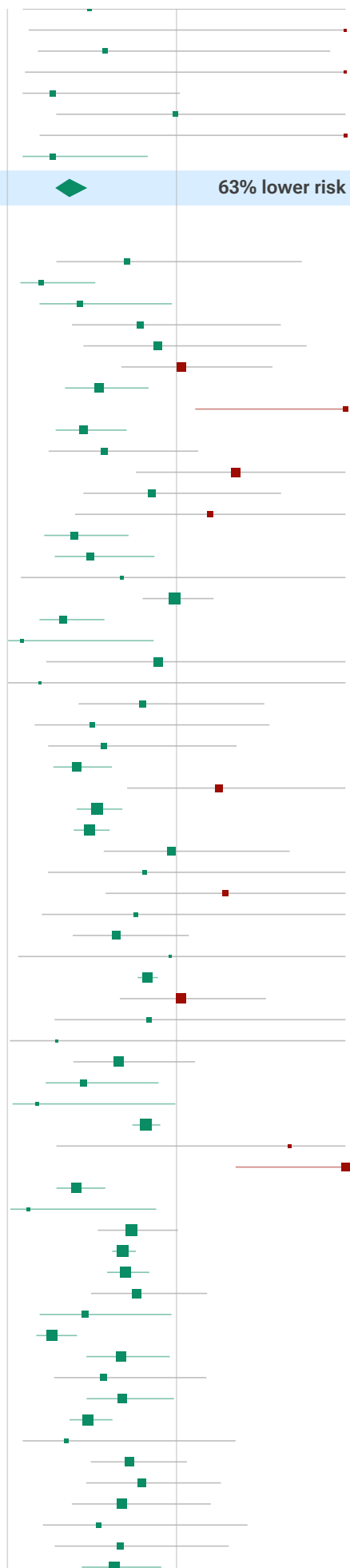


Soungwi (RCT)	32%	0.46 [0.09-2.36]	no recov.	2/93	4/92
Rodrigues (RCT)	-200%	3.00 [0.13-71.6]	hosp.	1/42	0/42
Sawanpanyalert	42%	0.58 [0.18-1.91]	progression	n/a	n/a
Atipornwan.. (RCT)	-150%	2.50 [0.10-59.6]	progression	1/60	0/30
Rouamba (ES)	73%	0.27 [0.09-1.02]	progression	23/399	4/33
Avezum (RCT)	1%	0.99 [0.29-3.41]	death	5/687	5/682
Roy-García (RCT)	-100%	2.00 [0.19-20.9]	progression	2/31	1/31
Rathod	73%	0.27 [0.09-0.83]	death	513 (n)	52 (n)

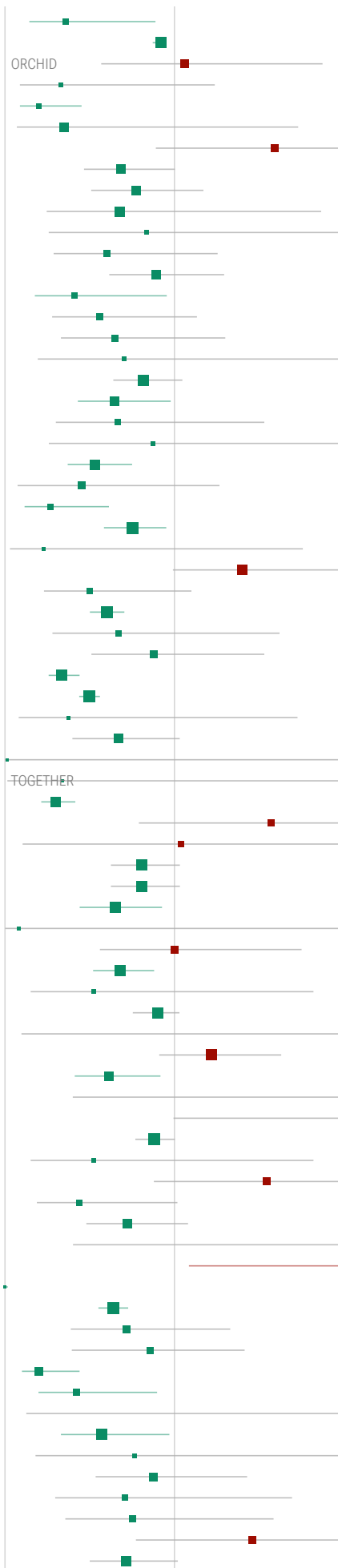
Early treatment 63% 0.37 [0.29-0.46] 173/22,405 987/34,760

Tau² = 0.18, I² = 47.9%, p < 0.0001

		Improvement, RR [CI]		Treatment	Control
Chen (RCT)	29%	0.71 [0.29-1.74]	progression	5/15	7/15
Zhong Nanshan (钟..)	80%	0.20 [0.08-0.52]	viral+	5/115	17/82
Chen (RCT)	57%	0.43 [0.19-0.97]	pneumonia	6/31	14/31
Tang (RCT)	21%	0.79 [0.38-1.62]	viral+	11/75	14/75
Magagnoli	11%	0.89 [0.45-1.77]	death	39/148	18/163
Auld	-3%	1.03 [0.67-1.57]	death	33/114	29/103
Sánchez-Álvarez	46%	0.54 [0.34-0.84]	death	322 (n)	53 (n)
Mallat	-203%	3.03 [1.11-7.69]	viral time	23 (n)	11 (n)
Membrillo de No..	55%	0.45 [0.29-0.71]	death	27/123	21/43
Alberici	43%	0.57 [0.24-1.13]	death	17/72	9/22
Rosenberg	-35%	1.35 [0.76-2.40]	death	189/735	28/221
Shabrawishi	15%	0.85 [0.45-1.62]	viral+	12/45	15/48
Mahévas	-20%	1.20 [0.40-3.30]	death	9/84	8/89
Yu	60%	0.40 [0.22-0.72]	death	9/48	238/502
Kim	51%	0.49 [0.28-0.87]	hosp. time	22 (n)	40 (n)
Luo	32%	0.68 [0.08-5.88]	death	19 (n)	264 (n)
Ip	1%	0.99 [0.80-1.22]	death	432/1,914	115/598
Huang	67%	0.33 [0.19-0.57]	viral time	197 (n)	176 (n)
Rogado	92%	0.08 [0.00-0.87]	death	1/8	7/9
Paccoud	11%	0.89 [0.23-3.47]	death	21/38	26/46
Faico-Filho	81%	0.19 [0.00-8.66]	viral rate	34 (n)	32 (n)
Chen (RCT)	20%	0.80 [0.42-1.52]	recov. time	18 (n)	12 (n)
Fontana	50%	0.50 [0.16-1.55]	death	4/12	2/3
Bousquet	43%	0.57 [0.24-1.36]	death	5/27	23/81
Lagier	59%	0.41 [0.27-0.62]	death	35/3,119	58/618
Komissarov	-25%	1.25 [0.71-2.21]	viral load	26 (n)	10 (n)
Mikami	47%	0.53 [0.41-0.68]	death	575/2,077	231/743
Arshad	51%	0.49 [0.39-0.60]	death	162/1,202	108/409
An	3%	0.97 [0.57-1.67]	viral+	31 (n)	195 (n)
Rivera-Izquierdo	19%	0.81 [0.24-2.76]	death	215 (n)	23 (n)
Chen	-29%	1.29 [0.58-2.86]	viral+	16/28	4/9
Chen (RCT)	24%	0.76 [0.20-2.84]	viral+	4/21	3/12
Trullàs	36%	0.64 [0.39-1.07]	death	20/66	16/34
Lyngbakken (RCT)	4%	0.96 [0.06-14.6]	death	1/27	1/26
Bernaola	17%	0.83 [0.77-0.89]	death	236/1,498	28/147
Rivera	-2%	1.02 [0.67-1.53]	death	44/179	59/327
Cavalcanti (RCT)	16%	0.84 [0.28-2.53]	death	8/331	5/173
Novartis (RCT)	71%	0.29 [0.01-6.03]	no disch.	0/7	1/5
D'Arminio Monfo..	34%	0.66 [0.39-1.11]	death	53/197	47/92
Davido	55%	0.45 [0.23-0.89]	int./hosp.	12/80	13/40
Yu	83%	0.17 [0.03-0.99]	progression	1/231	32/1,291
Berenguer	18%	0.82 [0.74-0.90]	death	681/2,618	438/1,377
Kalligeros	-67%	1.67 [0.29-9.36]	death	36 (n)	72 (n)
Pablos	-126%	2.26 [1.35-3.79]	severe case	172 (n)	56 (n)
Pinato	59%	0.41 [0.29-0.58]	death	30/182	181/446
Dubernet	88%	0.12 [0.02-0.88]	ICU	1/17	9/19
Gonzalez	27%	0.73 [0.53-1.01]	death	1,246/8,476	341/1,168
Catteau	32%	0.68 [0.62-0.76]	death	804/4,542	957/3,533
Di Castelnuovo	30%	0.70 [0.59-0.84]	death	386/2,634	90/817
Synolaki	24%	0.76 [0.49-1.18]	death	21/98	60/214
Heberto	54%	0.46 [0.19-0.97]	death	139 (n)	115 (n)
Lauriola	74%	0.27 [0.17-0.41]	death	102/297	35/63
Ashinyo	33%	0.67 [0.47-0.96]	hosp. time	61 (n)	61 (n)
Serrano	43%	0.57 [0.28-1.18]	death	6/14	6/8
Lammers	32%	0.68 [0.47-0.99]	death/ICU	30/189	101/498
Ayerbe	52%	0.48 [0.37-0.62]	death	237/1,857	49/162
Almazrou	65%	0.35 [0.09-1.35]	ventilation	3/95	6/66
Nachega	28%	0.72 [0.49-1.06]	death	69/630	28/96
Guisado-Vasco	20%	0.80 [0.47-1.26]	death	127/558	14/49
Ñamendys-S.. (ICU)	32%	0.68 [0.38-1.20]	death	24/54	42/64
Dubee (RCT)	46%	0.54 [0.21-1.42]	death	6/124	11/123
Lano	33%	0.67 [0.28-1.31]	death	56 (n)	66 (n)
Frontera (PSM)	37%	0.63 [0.44-0.91]	death	121/1,006	424/2,467



López	64%	0.36 [0.14-0.89]	progression	5/36	14/36
Núñez-Gil	8%	0.92 [0.87-0.94]	death	200/686	100/268
Self (RCT)	-6%	1.06 [0.57-1.87]	death	25/241	25/236
Águila-Gordo	67%	0.33 [0.09-1.24]	death	151/346	47/70
Sheshah	80%	0.20 [0.09-0.45]	death	267 (n)	33 (n)
Falcone (PSM)	65%	0.35 [0.07-1.73]	death	40/238	30/77
Burdick	-59%	1.59 [0.89-2.83]	death	142 (n)	148 (n)
van Halem	32%	0.68 [0.47-1.00]	death	34/164	47/155
Rodriguez-Gonzalez	23%	0.77 [0.51-1.17]	death	251/1,148	17/60
Lambermont	32%	0.68 [0.25-1.87]	death	97/225	14/22
Abdulrahman (PSM)	17%	0.83 [0.26-2.69]	death	5/223	6/223
Capsoni	40%	0.60 [0.29-1.25]	ventilation	12/40	6/12
Peng	11%	0.89 [0.62-1.29]	progression	29/453	256/3,567
Modrák	59%	0.41 [0.18-0.95]	death	108 (n)	105 (n)
Ozturk	44%	0.56 [0.28-1.13]	death	165/1,127	6/23
Guglielmetti	35%	0.65 [0.33-1.30]	death	181 (n)	37 (n)
Johnston (RCT)	30%	0.70 [0.19-2.54]	hosp.	5/148	4/83
Alqassieh	18%	0.82 [0.64-1.05]	hosp. time	63 (n)	68 (n)
Tan	35%	0.65 [0.43-0.98]	hosp. time	8 (n)	277 (n)
Naseem	33%	0.67 [0.30-1.53]	death	77 (n)	1,137 (n)
Orioli	13%	0.87 [0.26-2.94]	death	8/55	3/18
Signes-Costa	47%	0.53 [0.37-0.75]	death	4,854 (n)	993 (n)
Matangila	55%	0.45 [0.07-1.27]	death	25/147	8/13
Cangiano	73%	0.27 [0.12-0.61]	death	5/33	37/65
Taccone (ICU)	25%	0.75 [0.58-0.95]	death	449/1,308	183/439
Güner	77%	0.23 [0.03-1.76]	ICU	604 (n)	100 (n)
Li	-40%	1.40 [0.99-1.98]	viral time	18 (n)	19 (n)
Li	50%	0.50 [0.23-1.10]	no disch.	14 (n)	14 (n)
Di Castelnuovo	40%	0.60 [0.50-0.70]	death	3,270 (n)	1,000 (n)
Ouedraogo	33%	0.67 [0.28-1.62]	death	397 (n)	59 (n)
Hernandez-C.. (RCT)	12%	0.88 [0.51-1.53]	death	106 (n)	108 (n)
Purwati (RCT)	66%	0.34 [0.26-0.44]	viral+	38/121	111/119
Lora-Tamayo	50%	0.50 [0.44-0.56]	death	7,192 (n)	1,361 (n)
Beltran Gon.. (RCT)	63%	0.37 [0.08-1.73]	death	2/33	6/37
Salvador	33%	0.67 [0.40-1.03]	death	28/121	58/124
Barry	99%	0.0 [0.00-1e+05]	death	0/6	91/599
Reis (RCT)	66%	0.34 [0.01-8.30]	death	0/214	1/227
Corradini	70%	0.30 [0.21-0.41]	death	1,439 (n)	274 (n)
Réa-Neto (RCT)	-57%	1.57 [0.79-3.13]	death	16/53	10/52
Kokturk	-4%	1.04 [0.10-7.64]	death	62/1,382	5/118
Aghajani	19%	0.81 [0.62-1.03]	death	553 (n)	438 (n)
Haji Aghajani	19%	0.81 [0.62-1.03]	death	553 (n)	438 (n)
De Rosa	35%	0.65 [0.44-0.93]	death	118/731	80/280
Sivapalan (RCT)	92%	0.08 [0.00-11.7]	death	1/61	2/56
Byakika-Ki.. (RCT)	0%	1.00 [0.56-1.75]	recov. time	36 (n)	29 (n)
Lagier	32%	0.68 [0.52-0.88]	death	93/1,270	146/841
Singh (RCT)	48%	0.53 [0.15-1.82]	death	3/20	6/21
Turrini	10%	0.90 [0.75-1.03]	death	103/160	33/45
Schwartz (RCT)	-133%	2.33 [0.10-56.1]	ICU	1/111	0/37
Gerlovin	-22%	1.22 [0.91-1.63]	death	90/429	141/770
Taieb	39%	0.61 [0.41-0.92]	no disch.	674 (n)	252 (n)
Barrat-Due (RCT)	-120%	2.20 [0.40-10.8]	death	4/45	2/48
Alotaibi	-134%	2.33 [0.99-5.49]	death	193 (n)	244 (n)
Uygen	12%	0.88 [0.77-1.00]	viral time	15 (n)	25 (n)
Panda (RCT)	48%	0.53 [0.15-1.82]	death	3/20	6/21
Babalola (RCT)	-55%	1.55 [0.88-2.72]	no disch.	17/30	11/30
Atipornwan.. (RCT)	56%	0.44 [0.19-1.02]	death	7/100	16/100
Guglielmetti	28%	0.72 [0.48-1.08]	death	474 (n)	126 (n)
Calderón	-215%	3.15 [0.40-24.7]	death	5/27	1/17
Ferreira	-151%	2.51 [1.09-4.43]	death	17/111	11/81
AbdelGhaffar	100%	0.00 [0.00-0.02]	death	0/238	900/3,474
Lavilla Olleros	36%	0.64 [0.55-0.73]	death	2,285/12,772	774/2,149
Omma	28%	0.72 [0.39-1.33]	death	17/213	20/180
Beaumont	14%	0.86 [0.39-1.41]	death/int.	7/38	88/258
Rouamba	80%	0.20 [0.10-0.44]	death	20/336	24/73
Tsanovska (PSM)	58%	0.42 [0.20-0.90]	death	8/70	19/70
Uyaroğlu (PSM)	-200%	3.00 [0.13-71.6]	death	1/42	0/42
Ebongue	43%	0.57 [0.33-0.97]	death	93/522	36/58
AlQahtani (RCT)	24%	0.76 [0.18-3.25]	ICU	3/51	4/52
Hafez	12%	0.88 [0.53-1.43]	viral+	40 (n)	1,446 (n)
Bassets-Bosch	29%	0.71 [0.30-1.69]	viral time	5 (n)	5 (n)
Hong (PSM)	25%	0.75 [0.36-1.58]	no recov.	15 (n)	15 (n)
Silva	-46%	1.46 [0.77-2.21]	death	21 (n)	374 (n)
Osawa	29%	0.71 [0.50-1.02]	death	25/71	71/144



Bowen	20%	0.80 [0.68-0.94]	death	1,317 (n)	3,314 (n)
Babayigit	-112%	2.12 [0.65-5.71]	ventilation	63/1,378	6/94
Núñez-Gil (PSM)	53%	0.47 [0.36-0.62]	death	581 (n)	581 (n)
Go	55%	0.45 [0.22-0.91]	death	n/a	n/a
Bubenek-Tur.. (ICU)	22%	0.78 [0.64-0.95]	death	n/a	n/a
Alosaimi (PSM)	-400%	5.00 [0.25-101]	death	2/37	0/37
Higgins (RCT)	-51%	1.51 [0.98-2.29]	death	16/41	107/311
Alshamrani (PSM)	50%	0.50 [0.17-1.30]	death	6/161	50/653
Delgado	26%	0.74 [0.61-0.90]	death	1,239 (n)	8,399 (n)
Spivak (RCT)	-73%	1.73 [0.52-5.78]	hosp.	7/152	4/150
Aweimer	40%	0.60 [0.29-1.25]	death	4/9	104/140
Krishnan	40%	0.60 [0.40-1.10]	death	case control	
AlQadheeb (ICU)	35%	0.65 [0.51-0.84]	death	37/92	466/756
Yilgwan	93%	0.07 [0.03-0.14]	death	1,039 (n)	2,423 (n)

Late treatment 32% 0.68 [0.64-0.73] 10,594/90,810 8,202/59,886

Tau² = 0.08, I² = 75.9%, p < 0.0001

		Improvement, RR [CI]		Treatment	Control
Chatterjee	67%	0.33 [0.20-0.56]	cases	12/68	206/387
Bhattacharya	81%	0.19 [0.07-0.53]	cases	4/54	20/52
Ferreira	47%	0.53 [0.39-0.72]	cases	population-based cohort	
Zhong	91%	0.09 [0.01-0.94]	cases	7/16	20/27
Desbois	17%	0.83 [0.27-2.58]	cases	3/27	23/172
Kadnur	62%	0.38 [0.15-0.85]	cases	10/258	15/100
Khurana	51%	0.49 [0.24-0.98]	cases	6/22	88/159
Ferri	63%	0.37 [0.16-0.83]	cases	9/994	16/647
Grau-Pujol (RCT)	11%	0.89 [0.06-14.2]	cases	1/142	1/127
Rajasingham (RCT)	50%	0.50 [0.03-7.97]	hosp.	1/989	1/494
Gentry	91%	0.09 [0.00-1.52]	death	0/10,703	7/21,406
Abella (RCT)	5%	0.95 [0.25-3.63]	cases	4/64	4/61
Yadav	82%	0.18 [0.04-0.81]	hosp.	2/279	9/221
Goenka	87%	0.13 [0.02-0.85]	IgG+	1/77	115/885
Arleo	50%	0.50 [0.06-4.02]	death	1/20	5/50
Behera	28%	0.72 [0.32-1.24]	cases	7/19	179/353
Datta	22%	0.78 [0.42-1.45]	cases	16/146	19/135
Mathai	90%	0.10 [0.05-0.21]	cases	10/491	22/113
Revollo (PSM)	23%	0.77 [0.35-1.68]	cases	16/69	65/418
Jung	59%	0.41 [0.02-9.97]	death	0/649	1/1,417
Gönenli	30%	0.70 [0.20-2.46]	progression	3/148	12/416
Cordtz	24%	0.76 [0.23-2.52]	hosp.	population-based cohort	
Khoubnasabjafari	17%	0.83 [0.44-1.59]	cases	34/1,436	12/422
Strangfeld	48%	0.52 [0.37-0.71]	death	27/426	124/739
Bae (PSM)	30%	0.70 [0.41-1.18]	cases	16/743	91/2,698
Pham	20%	0.80 [0.15-2.79]	death	2/14	5/28
Dev	26%	0.74 [0.61-0.90]	cases	260 (n)	499 (n)
Seet (RCT)	35%	0.65 [0.43-0.99]	symp. case	29/432	64/619
Alegiani	-8%	1.08 [0.79-1.46]	death	case control	
Alzahrani	59%	0.41 [0.02-9.55]	death	0/14	1/33
Rojas-Serrano (RCT)	82%	0.18 [0.02-1.59]	symp. case	1/62	6/65
Syed (RCT)	-60%	1.60 [0.63-4.04]	symp. case	10/48	6/46
Korkmaz	82%	0.18 [0.01-3.72]	death	0/385	2/299
Badyal	60%	0.40 [0.31-0.50]	cases	247/617	611/1,473
Shaw (PSM)	13%	0.87 [0.80-0.96]	cases	45 (n)	99 (n)
Bhatt	-49%	1.49 [1.05-2.13]	cases	167/731	30/196
McCullough	52%	0.48 [0.27-0.87]	cases	13/101	32/120
Patil	66%	0.34 [0.10-1.22]	death	5,266 (n)	3,946 (n)
Naggie (RCT)	24%	0.76 [0.51-1.14]	symp. case	41/683	53/676
Cordtz	40%	0.60 [0.19-1.87]	hosp.	1,170 (n)	1,363 (n)
Agarwal	95%	0.05 [0.00-3401]	hosp.	0/29	17/455
Belmont	79%	0.21 [0.02-2.25]	symp. case	1/56	2/24
Ahmed	99%	0.01 [0.00-1.77]	cases	case control	
McKinnon (RCT)	2%	0.98 [0.09-10.7]	symp. case	2/365	1/178
Ugarte-Gil	44%	0.56 [0.36-0.85]	severe case	665 (n)	230 (n)
Opdam	45%	0.55 [0.23-1.30]	hosp.	case control	
MacFadden	12%	0.88 [0.79-0.97]	cases	n/a	n/a
Tirupakuzhi.. (RCT)	-196%	2.96 [0.12-72.3]	progression	1/211	0/203
Raabe	82%	0.18 [0.02-1.86]	symp. case	1/59	2/21
Yadav	20%	0.80 [0.70-1.00]	seropositive	1,255 (n)	969 (n)
Polo (RCT)	51%	0.49 [0.00-2.29]	symp. case	3/224	5/211
Becetti	37%	0.63 [0.33-1.20]	cases	26/314	49/386
Loucera	69%	0.31 [0.17-0.57]	death	320 (n)	15,648 (n)
Oku	92%	0.08 [0.00-1.27]	death	0/14	11/206
Sahebari	56%	0.44 [0.12-0.83]	cases	10/108	56/368
Obrîșcă	87%	0.13 [0.02-0.69]	cases	10/81	5/14

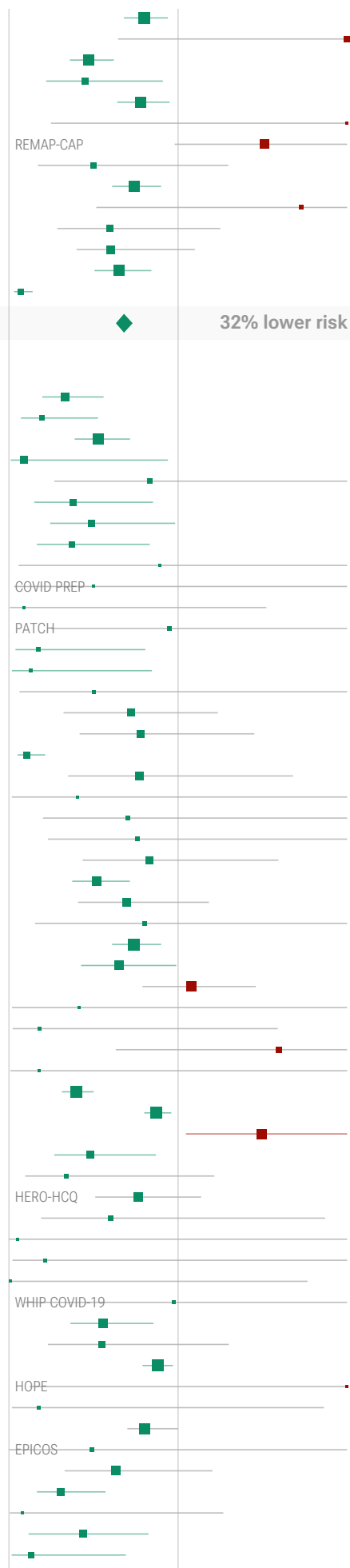




Figure 14. Random effects meta-analysis excluding studies with significant issues. Effect extraction is pre-specified, using the most serious outcome reported, see the [appendix](#) for details. (ES) indicates the early treatment subset of a study.

Heterogeneity

Heterogeneity in COVID-19 studies arises from many factors including:

Treatment delay. The time between infection or the onset of symptoms and treatment may critically affect how well a treatment works. For example an antiviral may be very effective when used early but may not be effective in late stage disease, and may even be harmful. Oseltamivir, for example, is generally only considered effective for influenza when used within 0-36 or 0-48 hours *McLean, Treanor*. Baloxavir studies for influenza also show that treatment delay is critical — *Ikematsu* report an 86% reduction in cases for post-exposure prophylaxis, *Hayden* show a 33 hour reduction in the time to alleviation of symptoms for treatment within 24 hours and a reduction of 13 hours for treatment within 24-48 hours, and *Kumar* report only 2.5 hours improvement for inpatient treatment.

<i>Treatment delay</i>	<i>Result</i>
Post exposure prophylaxis	86% fewer cases <i>Ikematsu</i>
<24 hours	-33 hours symptoms <i>Hayden</i>
24-48 hours	-13 hours symptoms <i>Hayden</i>
Inpatients	-2.5 hours to improvement <i>Kumar</i>

Table 3. Studies of baloxavir for influenza show that early treatment is more effective.

Figure 15 shows a mixed-effects meta-regression of efficacy as a function of treatment delay in HCQ COVID-19 studies, showing that efficacy declines rapidly with treatment delay. Early treatment is critical for COVID-19.

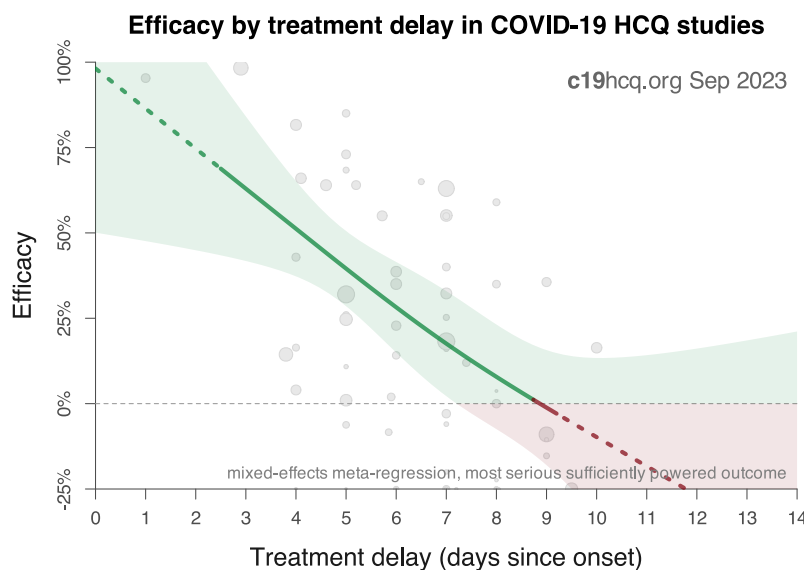


Figure 15. Early treatment is more effective. Meta-regression showing efficacy as a function of treatment delay in COVID-19 HCQ studies.

Patient demographics. Details of the patient population including age and comorbidities may critically affect how well a treatment works. For example, many COVID-19 studies with relatively young low-comorbidity patients show all patients recovering quickly with or without treatment. In such cases, there is little room for an effective treatment to improve results (as in *López-Medina*).

Effect measured. Efficacy may differ significantly depending on the effect measured, for example a treatment may be very effective at reducing mortality, but less effective at minimizing cases or hospitalization. Or a treatment may have no effect on viral clearance while still being effective at reducing mortality.

Variants. There are many different variants of SARS-CoV-2 and efficacy may depend critically on the distribution of variants encountered by the patients in a study. For example, the Gamma variant shows significantly different characteristics *Faria, Karita, Nonaka, Zavascki*. Different mechanisms of action may be more or less effective depending on variants, for example the viral entry process for the omicron variant has moved towards TMPRSS2-independent fusion, suggesting that TMPRSS2 inhibitors may be less effective *Peacock, Willett*.

Regimen. Effectiveness may depend strongly on the dosage and treatment regimen.

Other treatments. The use of other treatments may significantly affect outcomes, including anything from supplements, other medications, or other kinds of treatment such as prone positioning.

Medication quality. The quality of medications may vary significantly between manufacturers and production batches, which may significantly affect efficacy and safety. *Williams* analyze ivermectin from 11 different sources, showing highly variable antiparasitic efficacy across different manufacturers. *Xu* analyze a treatment from two different manufacturers, showing 9 different impurities, with significantly different concentrations for each manufacturer.

Pooled outcome analysis. We present both pooled analyses and specific outcome analyses. Notably, pooled analysis often results in earlier detection of efficacy as shown in Figure 16. For many COVID-19 treatments, a reduction in mortality logically follows from a reduction in hospitalization, which follows from a reduction in symptomatic cases, etc. An antiviral tested with a low-risk population may report zero mortality in both arms, however a reduction in severity and improved viral clearance may translate into lower mortality among a high-risk population, and including these results in pooled analysis allows faster detection of efficacy. Trials with high-risk patients may also be restricted due to ethical concerns for treatments that are known or expected to be effective.

Pooled analysis enables using more of the available information. While there is much more information available, for example dose-response relationships, the advantage of the method used here is simplicity and transparency. Note that pooled analysis could hide efficacy, for example a treatment that is beneficial for late stage patients but has no effect on viral replication or early stage disease could show no efficacy in pooled analysis if most studies only examine viral clearance. While we present pooled results, we also present individual outcome analyses, which may be more informative for specific use cases.

Pooled outcomes identify efficacy faster. Currently, 38 of the treatments we analyze show statistically significant efficacy or harm, defined as $\geq 10\%$ decreased risk or $>0\%$ increased risk from ≥ 3 studies. 91% of treatments showing statistically significant efficacy/harm with pooled effects have been confirmed with one or more specific outcomes, with a mean delay of 3.3 months. When restricting to RCTs only, 57% of treatments showing statistically significant efficacy/harm with pooled effects have been confirmed with one or more specific outcomes, with a mean delay of 3.9 months.

Time when COVID-19 studies showed efficacy

c19early.org Sep 2023

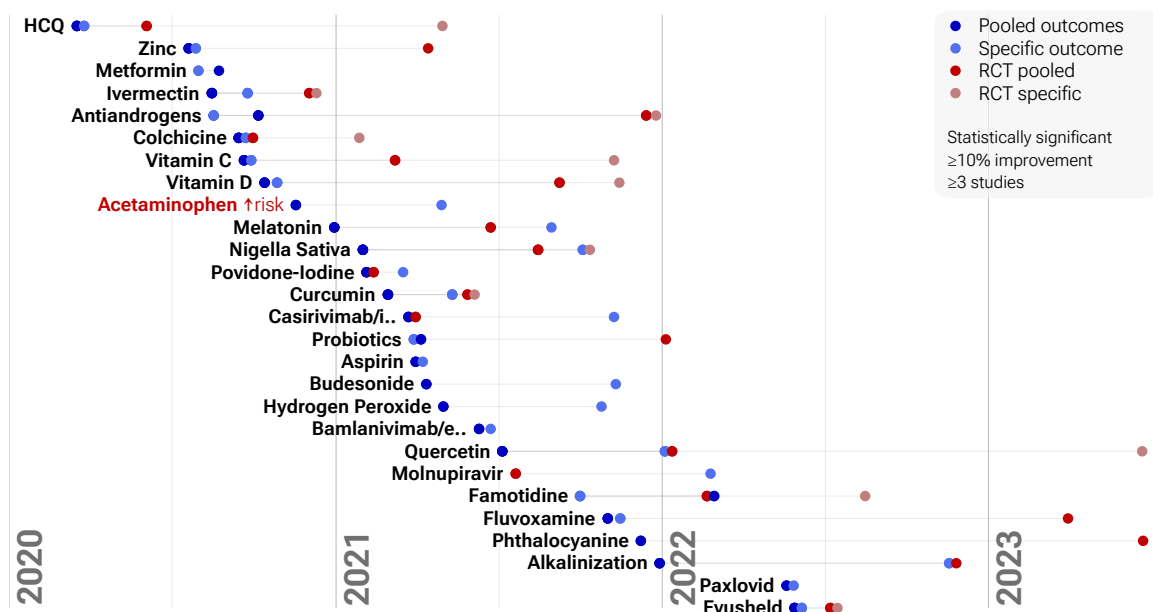


Figure 16. The time when studies showed that treatments were effective, defined as statistically significant improvement of $\geq 10\%$ from ≥ 3 studies. Pooled results typically show efficacy earlier than specific outcome results. Results from all studies often shows efficacy much earlier than when restricting to RCTs. Results reflect conditions as used in trials to date, these depend on the population treated, treatment delay, and treatment regimen.

Meta analysis. The distribution of studies will alter the outcome of a meta analysis. Consider a simplified example where everything is equal except for the treatment delay, and effectiveness decreases to zero or below with increasing delay. If there are many studies using very late treatment, the outcome may be negative, even though early treatment is very effective. This may have a greater effect than pooling different outcomes such as mortality and hospitalization. For example a treatment may have 50% efficacy for mortality but only 40% for hospitalization when used within 48 hours. However efficacy could be 0% when used late.

All meta analyses combine heterogeneous studies, varying in population, variants, and potentially all factors above, and therefore may obscure efficacy by including studies where treatment is less effective. Generally, we expect the estimated effect size from meta analysis to be less than that for the optimal case. Looking at all studies is valuable for providing an overview of all research, important to avoid cherry-picking, and informative when a positive result is found despite combining less-optimal situations. However, the resulting estimate does not apply to specific cases such as early treatment in high-risk populations. While we present results for all studies, we also present treatment time and individual outcome analyses, which may be more informative for specific use cases.

HCQ studies vary widely in all the factors above. We find a significant effect based on treatment delay. Early treatment shows consistently positive results, while late treatment results are very mixed. Closer analysis may identify factors related to efficacy among this group, for example treatment may be more effective in certain populations, or more fine-grained analysis of treatment delay may identify a point after which treatment is ineffective.

Discussion

Publication bias. Publication of clinical trials is often biased based on conflicts of interest. One way to examine potential bias is to compare prospective and retrospective studies. Prospective trials that involve significant effort are more likely to be published regardless of the result, while retrospective studies are more likely to exhibit bias. For example, researchers may perform preliminary analysis with minimal effort and the results may influence their decision to continue. Retrospective studies also provide more opportunities for the specifics of data extraction and adjustments to influence results.

For HCQ, 77.6% of prospective studies report positive effects, compared to 72.3% of retrospective studies, suggesting a bias toward publishing negative results. Prospective studies show 32% [23-40%] improvement in meta analysis, compared to 25% [21-29%] for retrospective studies. Figure 17 shows a scatter plot of results for prospective and retrospective studies.

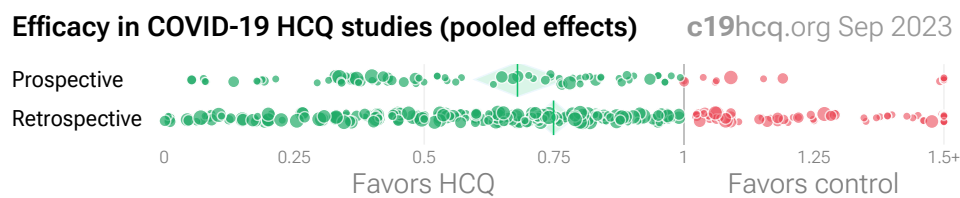


Figure 17. Prospective vs. retrospective studies. The diamonds show the results of random effects meta-analysis.

Figure 18 shows the results by region of the world, for all regions that have > 5 studies. Studies from North America are 2.4 times more likely to report negative results than studies from the rest of the world combined, 47.8% vs. 20.1%, two-tailed z test -5.25, $p = 0.0000001518$. *Berry* performed an independent analysis which also showed bias toward negative results for US-based research.

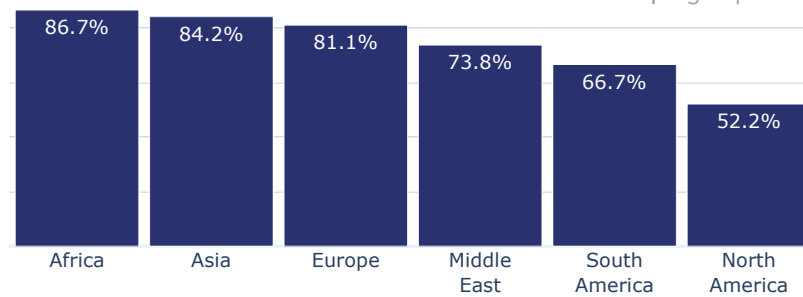


Figure 18. Percentage of studies reporting positive effects by region.

The lack of bias towards positive results is not surprising. Both negative and positive results are very important given the use of HCQ for COVID-19 around the world, evidence of which can be found in the studies analyzed here, government protocols, and news reports, e.g., *AFP, AfricaFeeds, Africanews, Afrik.com, Al Arabia, Al-bab, Anadolu Agency, Anadolu Agency (B), Archyde, Barron's, Barron's (B), BBC, Belayneh, A., Bianet, CBS News, Challenge, Dr. Goldin, Efecto Cocuyo, Expats.cz, Face 2 Face Africa, Filipova, France 24, France 24 (B), Franceinfo, Global Times, Government of China, Government of India, Government of Venezuela, GulfInsider, Le Nouvel Afrik, LifeSiteNews, Medical World Nigeria, Medical Xpress, Medical Xpress (B), Middle East Eye, Ministerstva Zdravotnictví, Ministry of Health of Ukraine, Ministry of Health of Ukraine (B), Morocco World News, Mosaïque Guinée, Nigeria News World, NPR News, Oneindia, Pan African Medical Journal, Parola, Pilot News, PledgeTimes, Pleno.News, Q Costa Rica, Rath, Russian Government, Russian Government (B), Teller Report, The Africa Report, The Australian, The BL, The East African, The Guardian, The Indian Express, The Moscow Times, The North Africa Post, The Tico Times, Ukrinform, Vanguard, Voice of America.*

HCQ treatment became highly politicized and widely restricted. In many cases, physicians recommending treatment based on clinical evidence lost employment, licenses, and careers. There is a strong bias towards publishing negative results, with negative RCTs receiving priority handling at top journals, and scientists reporting difficulty publishing positive results *Boulware, Meeus, Meneguesso, Meeus*, for example, report that their paper with 4,000 patients reporting favourable outcomes for HCQ+AZ was rejected without peer review from the editors of four different journals.

News organizations show a similar bias. Although 298 studies show positive results, The New York Times, for example, has only written articles for studies that claim HCQ is not effective *The New York Times, The New York Times (B), The New York Times (C)*. As of September 10, 2020, The New York Times still claims that there is clear evidence that HCQ is not effective for COVID-19 *The New York Times (D)*. As of October 9, 2020, the United States National Institutes of Health recommends against HCQ for both hospitalized and non-hospitalized patients *United States National Institutes of Health*.

Over 50% of early treatment and prophylaxis RCTs have not reported results. 38 HCQ RCTs have not reported their results, with results missing for 52% of early treatment RCTs and 56% of prophylaxis RCTs, compared to 18% for late treatment RCTs. This is consistent with the higher prevalence of positive studies for early treatment and prophylaxis, and bias against publishing positive results.

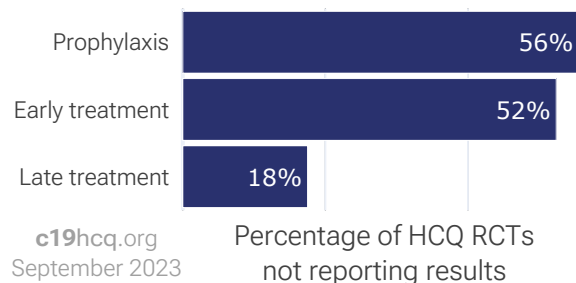


Figure 19. Many RCTs have not reported their results, mostly those for early treatment and prophylaxis.

The RCTs with missing results are shown in the RCT [forest plots](#), and do not include 65 RCTs that report terminating prior to enrolling 30 patients. The missing trials report a total of 25,149 patients, with 13 trials having actual enrollment of 8,689, and the remainder only reporting estimated numbers. Most trials are known to have started enrollment, while several may have been terminated early. A few trials may have been terminated before enrollment started. This analysis is based on the US [clinicaltrials.gov](#) registry. There may be additional missing RCTs not registered in the US.

Unpublished results are unethical. Future patients are deprived of the ability to make informed decisions. Moreover, RCT participants make a potentially lethal sacrifice for the good of humanity. For existing medications with known efficacy and safety data, patients forego the best treatment choice based on current data. For COVID-19, they know that they may die, depending on their random assignment.

The reasons for lack of publication differ, and may be out of control of the authors. Some RCTs were submitted for publication, but have been caught in journal politicization (authors should release preprints in this case). Others may be held due to decisions of associated organizations, or decisions of only a subset of authors. Most missing RCTs have associations with organizations and/or physicians that restricted HCQ — publication would highlight their liability. Note that in many cases, trials may have been started prior to the extreme politicization.

Physician case series results. Table 4 shows the reported results of physicians that use early treatments for COVID-19, compared to the results for a non-treating physician (this physician reportedly prescribed early treatment for themselves, but not for patients [medicospelavidacovid19.com.br](#)). The treatments used vary between physicians. Almost all report using ivermectin and/or HCQ, and most use additional treatments in combination. These results are subject to selection and ascertainment bias and more accurate analysis requires details of the patient populations and followup, however results are consistently better across many teams, and consistent with the extensive controlled trial evidence that shows a significant reduction in risk with many early treatments, and improved results with the use of multiple treatments in combination.

LATE TREATMENT						
Physician / Team	Location	Patients	Hospitalization		Mortality	
Dr. David Uip (*)	Brazil	2,200	38.6% (850)	Ref.	2.5% (54)	Ref.
EARLY TREATMENT - 39 physicians/teams						
Physician / Team	Location	Patients	Hospitalization	Improvement	Mortality	Improvement
Dr. Roberto Alfonso Accinelli 0/360 deaths for treatment within 3 days	Peru	1,265			0.6% (7)	77.5%
Dr. Mohammed Tarek Alam patients up to 84 years old	Bangladesh	100			0.0% (0)	100.0%
Dr. Oluwagbenga Alonge	Nigeria	310			0.0% (0)	100.0%
Dr. Raja Bhattacharya	India	148			1.4% (2)	44.9%

up to 88yo, 81% comorbidities						
Dr. Flavio Cadegiani	Brazil	3,450	0.1% (4)	99.7%	0.0% (0)	100.0%
Dr. Alessandro Capucci	Italy	350	4.6% (16)	88.2%		
Dr. Shankara Chetty	South Africa	8,000			0.0% (0)	100.0%
Dr. Deborah Chisholm	USA	100			0.0% (0)	100.0%
Dr. Ryan Cole	USA	400	0.0% (0)	100.0%	0.0% (0)	100.0%
Dr. Marco Cosentino vs. 3-3.8% mortality during period; earlier treatment better	Italy	392	6.4% (25)	83.5%	0.3% (1)	89.6%
Dr. Jeff Davis	USA	6,000			0.0% (0)	100.0%
Dr. Dhanajay	India	500			0.0% (0)	100.0%
Dr. Bryan Tyson & Dr. George Fareed	USA	20,000	0.0% (6)	99.9%	0.0% (4)	99.2%
Dr. Raphael Furtado	Brazil	170	0.6% (1)	98.5%	0.0% (0)	100.0%
Dr. Heather Gessling	USA	1,500			0.1% (1)	97.3%
Dr. Ellen Guimarães	Brazil	500	1.6% (8)	95.9%	0.4% (2)	83.7%
Dr. Syed Haider	USA	4,000	0.1% (5)	99.7%	0.0% (0)	100.0%
Dr. Mark Hancock	USA	24			0.0% (0)	100.0%
Dr. Sabine Hazan	USA	1,000			0.0% (0)	100.0%
Dr. Mollie James	USA	3,500	1.1% (40)	97.0%	0.0% (1)	98.8%
Dr. Roberta Lacerda	Brazil	550	1.5% (8)	96.2%	0.4% (2)	85.2%
Dr. Katarina Lindley	USA	100	5.0% (5)	87.1%	0.0% (0)	100.0%
Dr. Ben Marble	USA	150,000			0.0% (4)	99.9%
Dr. Edimilson Migowski	Brazil	2,000	0.3% (7)	99.1%	0.1% (2)	95.9%
Dr. Abdulrahman Mohana	Saudi Arabia	2,733			0.0% (0)	100.0%
Dr. Carlos Nigro	Brazil	5,000	0.9% (45)	97.7%	0.5% (23)	81.3%
Dr. Benoit Ochs	Luxembourg	800			0.0% (0)	100.0%
Dr. Ortore	Italy	240	1.2% (3)	96.8%	0.0% (0)	100.0%
Dr. Valerio Pascua one death for a patient presenting on the 5th day in need of supplemental oxygen	Honduras	415	6.3% (26)	83.8%	0.2% (1)	90.2%
Dr. Sebastian Pop	Romania	300			0.0% (0)	100.0%
Dr. Brian Proctor	USA	869	2.3% (20)	94.0%	0.2% (2)	90.6%
Dr. Anastacio Queiroz	Brazil	700			0.0% (0)	100.0%
Dr. Didier Raoult	France	8,315	2.6% (214)	93.3%	0.1% (5)	97.6%
Dr. Karin Ried up to 99yo, 73% comorbidities, av. age 63	Turkey	237			0.4% (1)	82.8%
Dr. Roman Rozenywaig patients up to 86 years old	Canada	80			0.0% (0)	100.0%
Dr. Vipul Shah	India	8,000			0.1% (5)	97.5%
Dr. Silvestre Sobrinho	Brazil	116	8.6% (10)	77.7%	0.0% (0)	100.0%

Dr. Unknown	Brazil	957	1.7% (16)	95.7%	0.2% (2)	91.5%
Dr. Vladimir Zelenko	USA	2,200	0.5% (12)	98.6%	0.1% (2)	96.3%
Mean improvement with early treatment protocols		237,521	Hospitalization	94.1%	Mortality	94.7%

Table 4. Physician results with early treatment protocols compared to no early treatment. (*) Dr. Uip reportedly prescribed early treatment for himself, but not for patients medicospelavidacovid19.com.br.

Funnel plot analysis. Funnel plots have traditionally been used for analyzing publication bias. This is invalid for COVID-19 acute treatment trials — the underlying assumptions are invalid, which we can demonstrate with a simple example. Consider a set of hypothetical perfect trials with no bias. Figure 20 plot A shows a funnel plot for a simulation of 80 perfect trials, with random group sizes, and each patient's outcome randomly sampled (10% control event probability, and a 30% effect size for treatment). Analysis shows no asymmetry ($p > 0.05$). In plot B, we add a single typical variation in COVID-19 treatment trials — treatment delay. Consider that efficacy varies from 90% for treatment within 24 hours, reducing to 10% when treatment is delayed 3 days. In plot B, each trial's treatment delay is randomly selected. Analysis now shows highly significant asymmetry, $p < 0.0001$, with six variants of Egger's test all showing $p < 0.05$ *Egger, Harbord, Macaskill, Moreno, Peters (B), Rothstein, Rücker, Stanley*. Note that these tests fail even though treatment delay is uniformly distributed. In reality treatment delay is more complex — each trial has a different distribution of delays across patients, and the distribution across trials may be biased (e.g., late treatment trials may be more common). Similarly, many other variations in trials may produce asymmetry, including dose, administration, duration of treatment, differences in SOC, comorbidities, age, variants, and bias in design, implementation, analysis, and reporting.

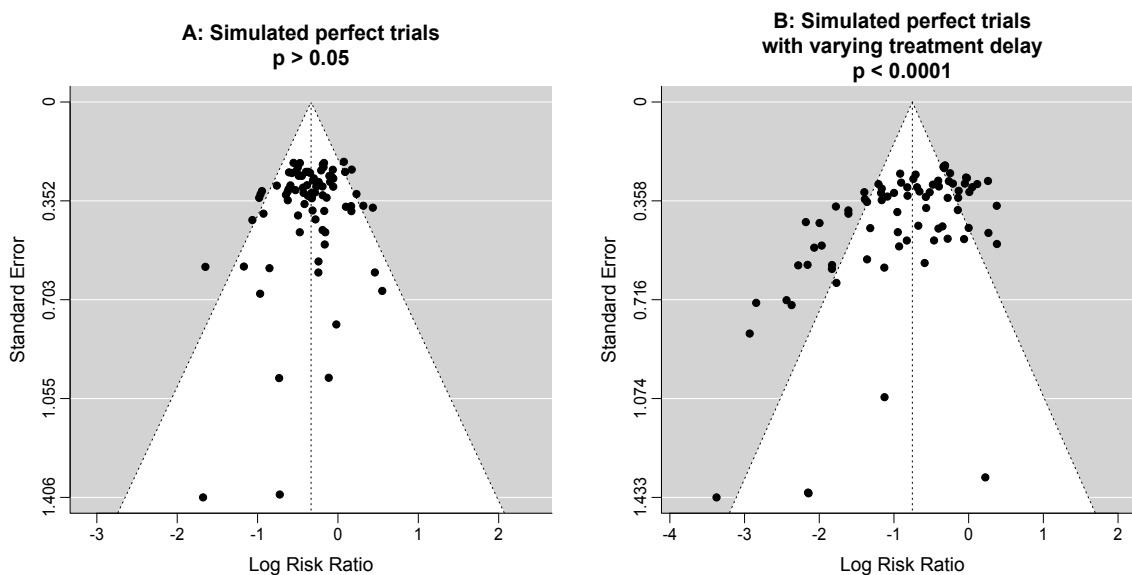


Figure 20. Example funnel plot analysis for simulated perfect trials.

Limitations. Summary statistics from meta analysis necessarily lose information. As with all meta analyses, studies are [heterogeneous](#), with differences in treatment delay, treatment regimen, patient demographics, variants, conflicts of interest, standard of care, and [other factors](#). We provide analyses by specific outcomes and by treatment delay, and we aim to identify key characteristics in the forest plots and summaries. Results should be viewed in the context of study characteristics.

Some analyses classify treatment based on early or late administration, as done here, while others distinguish between mild, moderate, and severe cases. Viral load does not indicate degree of symptoms — for example patients may have a high viral load while being asymptomatic. With regard to treatments that have antiviral properties, timing of treatment is critical — late administration may be less helpful regardless of severity.

Details of treatment delay per patient is often not available. For example, a study may treat 90% of patients relatively early, but the events driving the outcome may come from 10% of patients treated very late. Our 5 day cutoff for early treatment may be too conservative, [5 days may be too late in many cases](#).

Comparison across treatments is confounded by differences in the studies performed, for example dose, variants, and conflicts of interest. Trials affiliated with special interests may use designs better suited to the preferred outcome.

In some cases, the most serious outcome has very few events, resulting in lower confidence results being used in pooled analysis, however the method is simpler and more transparent. This is less critical as the number of studies increases. Restriction to outcomes with sufficient power may be beneficial in pooled analysis and improve accuracy when there are few studies, however we maintain our pre-specified method to avoid any retrospective changes.

Studies show that combinations of treatments can be highly synergistic and may result in many times greater efficacy than individual treatments alone [Alsaïdi, Andreani, Biancatelli, De Forni, Gasmi, Jeffreys, Jitobaom, Jitobaom \(B\), Ostrov, Thairu](#). Therefore standard of care may be critical and benefits may diminish or disappear if standard of care does not include certain treatments.

This real-time analysis is constantly updated based on submissions. Accuracy benefits from widespread review and submission of updates and corrections from reviewers. Less popular treatments may receive fewer reviews.

No treatment, vaccine, or intervention is 100% available and effective for all current and future variants. Efficacy may vary significantly with different variants and within different populations. All treatments have potential side effects. Propensity to experience side effects may be predicted in advance by qualified physicians. We do not provide medical advice. Before taking any medication, consult a qualified physician who can compare all options, provide personalized advice, and provide details of risks and benefits based on individual medical history and situations.

Treatment details. We focus here on the question of whether HCQ is effective or not for COVID-19. Studies vary significantly in terms of treatment delay, treatment regimen, patients characteristics, and (for the pooled effects analysis) outcomes, as reflected in the high degree of heterogeneity. However, early treatment consistently shows benefits. 92% of early treatment studies report a positive effect, with an estimated improvement of 62% ($p < 0.0001$).

Negative Analyses

Generally, it is easy to choose inclusion criteria and assign biased risk evaluations in order to produce any desired outcome in a meta analysis.

COVID-19 treatment studies have many sources of heterogeneity which affect the results, including treatment delay (time from infection or the onset of symptoms), patient population (age, comorbidities), the effect measured and details of the measurement, distribution of SARS-CoV-2 variants, dosage/regimen, and other treatments (anything from supplements, other medications, or other kinds of treatment like prone positioning).

If a treatment is effective early, there is no reason to expect it will also work late. Antivirals are typically only considered effective when used within a short timeframe, for example 0-36 or 0-48 hours for oseltamivir, with longer delays not being effective [McLean, Treanor](#). For HCQ, the overwhelming majority of trials involve treatment not only after 48 hours but after 5 days - results from these trials are not relevant to earlier usage.

Authors desiring to produce a negative outcome for HCQ need only focus on late treatment studies. For example, [Axfors](#) assigns 89% weight to the RECOVERY and SOLIDARITY trials, producing the same negative result. These trials used excessively high non-patient-customized dosage in very sick late stage patients, dosages comparable

to those known to be harmful in that context [Borba](#). The results are not generalizable to typical dosage or treatment of earlier stage hospitalized patients, and certainly not applicable to early treatment, i.e., at first glance we can see that this meta analysis is of no relevance to early treatment.

This paper also does not appear to have been done very carefully. For example, authors include [Borba](#) which is assigned 97% weight for CQ. This study has no control group, comparing two different dosages of CQ, which is clear from the abstract of the study.

[Axfors](#) approximate early treatment with outpatient use, where they list 5 trials. This is misleading because authors ignore all outcomes other than mortality, and only one of the 5 trials has mortality events, so in reality only one trial is included. Table 1 shows the 5 trials, only one with mortality. The text says something different: "among the five studies on outpatients, there were three deaths, two occurring in the one trial of 491 relatively young patients with few comorbidities and one occurring in a small trial with 27 patients". We do not know what the missing 27 patient trial is, none of the 5 outpatient trials in Table 1 show 27 patients. There is an outpatient trial with 27 patients [Amaravadi](#), however that trial reports no mortality. It does appear in the meta analysis, but is reported as being an inpatient trial with zero mortality (in reality it was a remotely conducted trial of patients quarantined at home). The supplementary appendix has another different version for outpatient trials, with only 4 trials in Table S3 and Figure S2B (only one with mortality).

Therefore, of the 38 early treatment trials, authors have included data from only one, which contains only 1 death in each of the treatment and control groups. If we read the actual study [Skipper](#), we find that the death in the treatment group was a non-hospitalized patient, suggesting that the death was not caused by COVID-19, or at a minimum the patient did not receive standard care and the comparison here is therefore not valid.

Conclusion

Direct clinical measurement shows that HCQ reaches therapeutic concentrations in COVID-19 patients [Ruiz](#), and analysis of lung cells from COVID-19 patients shows inhibition in early target cell types [Chaudhary](#).

Analysis of 409 controlled clinical studies shows that HCQ reduces risk for COVID-19. Treatment is more effective when used early. Meta analysis using the most serious outcome reported shows 62% [53-70%] lower risk for the 38 [early treatment](#) studies. Results are similar for higher quality studies and peer-reviewed studies. Restricting to the 10 early treatment [RCTs](#) shows 25% [-18-52%] lower risk, the 16 [mortality results](#) shows 72% [59-81%] lower mortality, and the 16 [hospitalization results](#) show 41% [28-51%] lower risk. Very late stage treatment is not effective and may be harmful, especially when using excessive dosages.

Most HCQ studies are inconsistent with the logical use of antivirals, with the majority of studies using late treatment. This makes it easy to generate meta analyses showing poor efficacy by including large late treatment studies [Axfors](#), although the results are not relevant for recommended usage.

HCQ was the first treatment confirmed effective [c19early.org](#), however alternatives may offer advantages. Lung pharmacokinetics show high inter-individual variability [Ruiz](#); dosage is relatively challenging, with cholesterol dependence [Yuan](#), delayed attainment of therapeutic concentrations, and a relatively narrow range of regimens showing efficacy while limiting side effects; and ~2.5% [Million](#) of patients may have contraindications. Longer-term use of endosomal acidification modifiers for prophylaxis raises concern for potential off-target effects, including disruption of cellular processes, impaired lysosomal function, reduced immune response [Kowatsch](#), and altered cellular signaling. Fake tablets are common in some locations [Tchounga](#). Usage of oral tablets may be less relevant for the now typical lower severity cases, when infection does not spread far. Direct nasopharyngeal/oropharyngeal administration may be more appropriate, as it is whenever infection can be stopped at the source in the upper respiratory tract before further progression.

Revisions

This paper is data driven, all graphs and numbers are dynamically generated. Please submit updates and corrections at <https://c19hcq.org/meta.html>.

9/23: We updated *Sobngwi* to the journal version.

8/29: We added *Shamsi*.

8/22: We added details of RCTs where the results have not been reported.

8/16: We added *Afşin*.

8/10: We added *Klebanov*.

7/24: We updated the conclusions.

6/30: We added *Finkelstein*.

6/26: We added *Krishnan (B)*, *Rathod (B)*, *Rubio-Sánchez*.

6/24: We added *McCullough*.

6/20: We added *Cárdenas-Jaén*.

6/20: We added *de Gonzalo-Calvo*.

6/18: We added a forest plot for [RCT case results](#).

6/9: We added *Dulcey*.

5/23: We added *Said*.

5/16: We added *Yilgwan*.

5/14: We added *AlQadheeb*.

4/27: We added *Sen*.

4/8: We added *Chevalier, Ho*.

4/5: We added *Aweimer*.

3/2: We added *Spivak*.

3/1: We added *Llanos-Cuentas, Mathew*.

2/21: We added *Delgado*.

2/17: We added *Alshamrani*.

2/1: We added *Nasri*.

1/25: We corrected *Polo* which had a duplicate entry.

1/9: We added *Dhibar*.

12/31: We added *Higgins, Shukla*.

12/22: We added *Alosaimi*.

12/20: We updated the discussion of heterogeneity and RCTs.

12/8: We added *Shahrin*.

11/28: We added *Assad*.

11/18: We added *Bubenek-Turconi*.

11/17: We added *Sukumar*.

11/11: We added *Fernández-Cruz*.

10/26: We added *Isnardi*.

10/16: We added *Gómez*.

9/28: We added *Obrișcă*.

9/27: We added *Go*.

9/22: We added *Núñez-Gil*.

9/19: We added *Babayigit*.

9/15: We added *Pablos*.

9/14: We added *Santos*.

9/13: We added *Sahebari*.

9/8: We added *Osawa*.

9/7: We added *Oku*.

8/29: We added *Lyashchenko, Yadav (B)*.

8/26: We added *Bowen, Tirupakuzhi Vijayaraghavan*.

8/20: We corrected an error where *Self* was listed twice.

8/18: We added *Loucera*.

8/14: We added *Becetti*.

8/10: We added *Strangfeld*.

8/6: We added *Polo*.

7/16: We added *Malundo, Patel*.

7/4: We added *Raabe*.

6/5: We added *Tu*.

6/1: We added *Satti*.

5/21: We added *Shaw*.

5/21: We added *Silva*.

5/11: We added *Niwas*.

5/9: We added *Uyaroğlu*.

5/6: We added *Hong*.

5/3: We updated *Kadnur* to the journal version.

5/2: We added *MacFadden*.

4/17: We added a section on preclinical research.

4/16: We added *Roy-García*.

4/13: We added *Rosenthal*.

4/9: We added *Hafez*.

3/31: We added *Avezum*.

3/26: We added *Salehi*.

3/26: We added *Oztaş*.

3/26: We added *Schmidt*.

3/25: We added *AlQahtani*.

3/23: We added *Opdam*.

3/21: We added *Arabi*.

3/19: We added *Ebongue*.

3/10: We added *Azaña Gómez*.

3/8: We added *Cortez*.

3/6: We added *Khoubnasabjafari*.

3/5: We added *Tsanovska*.

3/4: We added *Soto (B)*.

3/3: We added *Lavilla Olleros*.

3/3: We updated *Beltran Gonzalez* to the journal version.

3/1: We added *Alwafi*.

2/26: We added *Rouamba*.

2/22: We updated *Ader* with the new results released 2/21/2022.

2/23: We added *Omma*.

2/22: We added *Tamura (B)*.

2/21: We added *Cordtz, Ugarte-Gil*.

2/20: We added *Mahale*.

2/16: We added *Mahto*.

2/14: We added *Beaumont*.

2/7: We added *Karruli*.

2/6: We added *Belmont*.

2/5: We added *Erden*.

2/4: We added *Albanghali*.

1/30: We added *Haji Aghajani*.

1/24: We added *Corradini*.

1/21: We added *AbdelGhaffar*.

1/14: We added *Juneja*.

1/13: We added *Atipornwanich*. We added identification for combined treatment, comparison with other treatments, and use of CQ in Figure 1.

1/10/2022: We updated *Syed* to the journal version.

12/23: We added *McKinnon*.

12/14: We noted that the majority of the PrEP studies reporting negative effects are studies where all or most patients were autoimmune disorder patients *Crawford*.

12/12: We added *Rao*.

12/11: We added *Calderón*.

12/5: We added *Ferreira*.

12/4: We added *Ahmed*.

12/4: We updated *Grau-Pujol* to the journal version.

11/18: We added *Samajdar*.

11/7: We added *Chechter*.

11/3: We added *Guglielmetti (B), Sarhan*.

10/19: We added a summary plot for all results.

10/12: We added *Menardi*.

10/10: We added *Luo (B)*.

10/4: We added *Fung*.

10/4: We added *Babalola*.

9/29: We corrected a display error causing some points to be missing in Figure 3.

9/27: We added *Uygen*, and updated *Million (B)* to the journal version.

9/19: We added *Alotaibi, Çivriz Bozdağ*.

9/17: We added *Çiyiltepe*.

9/15: We added *Agarwal*.

9/14: We added *Sawanpanyalert*.

9/14: We added *Mulhem*.

9/12: We added *Küçükakkaş*.

9/9: We added *Alhamlan*.

9/7: Discussion updates.

8/28: We added *Patil*.

8/27: We added *Rodrigues*.

8/25: We added *Naggie*.

8/21: We added *Gadhiya*.

8/20: We corrected the event counts in *Berenguer*.

8/17: We added *De Luna*.

8/16: We added *Turrini*.

8/12: We added *Shabani*.

8/10: We added *Rogado*.

8/8: We added *Di Castelnuevo*.

8/7: We added *Datta, Kadnur*.

8/6: We added *Yadav (C)*.

8/5: We added *Bhatt*.

8/4: We added *Alghamdi*.

8/3: We added *Barra*.

7/30: We updated *Bosaeed* to the journal version, and added *Sobngwi*.

7/19: We added analysis restricted to hospitalization results.

7/15: We added *Jacobs*.

7/14: We added *Roger*.

7/13: We added *Barrat-Due*.

7/11: We added *Krishnan*.

7/8: We updated *Cadegiani* to the journal version.

7/2: We added *Taieb*.

6/22: We added *Schwartz*.

6/21: We added *Ramírez-García*.

6/16: We added *Saib*.

6/12: We added *Sivapalan*.

6/8: We added *Burdick, Singh (B)*.

6/7: We added *Badyal*.

6/6: We added *Lagier*.

6/4: We added *Byakika-Kibwika, Korkmaz*.

6/2: We added *Kamstrup, Smith*.

5/28: We added *Million (B)*.

5/17: We added *Syed*.

5/16: We added *Rojas-Serrano*. We corrected the group sizes for *Skipper*, and we excluded hospitalizations that were reported as not being related to COVID-19.

5/15: We added *Sammartino*.

5/14: We added more discussion of heterogeneity.

5/12: We added *De Rosa*.

5/10: We added additional information in the abstract.

5/8: We added *Réa-Neto*.

5/7: We added *Kokturk*.

5/3: We added an explanation of how some meta analyses produce negative results.

5/4: We added *Aghajani*.

5/1: We added *Bosaeed*.

4/29: We added *Mohandas*.

4/23: We added *Reis*.

4/20: We added *Alegiani, Alzahrani*.

4/14: We added *Seet*.

4/9: We updated *Dubee* to the journal version.

4/6: We added *Mokhtari*.

4/4: We updated *Mitjà* for 11 control hospitalizations. There is conflicting data, table S2 lists 12 control hospitalizations, while table 2 shows 11. A previous version of this paper also showed some values corresponding to 12 control hospitalizations in the abstract and table 2.

4/2: We added *Salvarani*.

4/1: We added *Alghamdi (B)*.

3/29: We added *Barry*.

3/28: We added *Stewart*.

3/27: We added *Hraiech*, and we corrected an error in effect extraction for *Self*.

3/24: We added *Dev*.

3/13: We added *Roy*.

3/9: We added *Vivanco-Hidalgo*.

3/8: We added *Martin-Vicente*.

3/7: We added *Salvador*.

3/5: We added *Lotfy*.

3/3: We added *Pasquini*.

3/2: We added *Pham*.

2/28: We added *Rodriguez*.

2/26: We added *Amaravadi*.

2/23: We added *Beltran Gonzalez*.

2/25: We added *Bae*.

2/20: We added *Lamback*.

2/18: We added *Awad*.

2/17: We added *Purwati (B)*.

2/16: We added *Albani*.

2/15: We added *Lora-Tamayo*.

2/10: We added *Roig, Ubaldo*.

2/9: We added *Ouedraogo*.

2/7: We added *Johnston*.

2/6: We added *Fitzgerald*.

2/5: We added *Hernandez-Cardenas*.

2/2: We added *Bernabeu-Wittel*.

2/1: We added *Trefond*.

1/24: We added *Desbois, Psevdos*. We moved the analysis with exclusions and mortality analysis to the main text.

1/21: We added *Li*.

1/16: We added the effect measured for each study in the forest plots.

1/15: We updated *Ip* to the published version.

1/12: We added *Li (B)*.

1/11: We added *Rangel*.

1/9: We added *Texeira, Yegerov*.

1/7: We added direct links to the study details in the chronological plots.

1/6: We added direct links to the study details in the forest plots.

1/5: We added *Sarfaraz*.

1/4: We added *Vernaz*.

1/3: We added dosage information for early treatment studies.

1/2: We added the number of patients to the forest plots.

1/1/2021: We added *Sands*.

12/31: We added additional details about the studies in the appendix.

12/29: We added *Güner, Salazar*.

12/28: We added *Auld, Cordtz (B)*.

12/27: We added the total number of authors and patients.

12/25: We added *Chari*.

12/24: We added *Su*.

12/23: We added *Cangiano*.

12/22: We added *Taccone*.

12/21: We added *Matangila*.

12/20: We added *Gönenli, Huh*.

12/17: We added *Signes-Costa*.

12/16: We added *Alqassieh, Naseem, Orioli, Sosa-García, Tan*.

12/15: We added *Kalligeros, López*.

12/14: We added *Rivera-Izquierdo, Rodriguez-Nava*.

12/13: We added *Bielza*.

12/11: We added *Jung*.

12/9: We added *Agusti, Guglielmetti (B)*.

12/8: We added *Barnabas*.

12/7: We added *Maldonado*.

12/4: We added *Modrák, Ozturk, Peng*.

12/2: We added *Rodriguez-Gonzalez*.

12/1: We added *Capsoni*.

11/30: We added *Abdulrahman*.

11/28: We added *Lambermont*.

11/27: We added *van Halem*.

11/25: We added *Qin*, and we added analysis restricted to mortality results.

11/24: We added *Boari*.

11/23: We added *Revollo*.

11/20: We added *Omrani*.

11/19: We added *Falcone*.

11/18: We added *Budhiraja*.

11/14: We added *Sheshah*.

11/13: We added *Núñez-Gil (B)*, *Águila-Gordo*.

11/12: We added *Simova*, *Simova (B)*.

11/10: We added *Mathai*.

11/9: We added *Self*.

11/8: We added *Dhibar (B)*.

11/4: We added *Behera*, *Cadegiani*.

11/1: We added *Trullàs*.

10/31: We added *Frontera*, *Szente Fonseca*, *Tehrani*.

10/30: We added *Berenguer*, *Faico-Filho*.

10/28: We added *Arleo*, *Choi*.

10/26: We added *Coll*, *Goenka*, *Synolaki*.

10/23: We added *Komissarov*, *Lano*. The second version of the preprint for *Komissarov* includes a comparison with the control group (not reported in the first version). We updated *Lyngbakken* to use the mortality result in the recent journal version of the paper (not reported in the preprint).

10/22: We added *Anglemyer*, *Ñamendys-Silva*. We updated the discussion of *Axfors* for the second version of this study. We added a table summarizing RCT results.

10/21: We added studies *Dubee*, *Martinez-Lopez*, *Solh*. We received a report that the United States National Institutes of Health is recommending against HCQ for hospitalized and non-hospitalized patients as of October 9, and we added a reference.

10/20/2020: Initial revision.

The extreme politicization of HCQ means we must evaluate the data directly.

With 409 controlled studies, 59 RCTs, and extensive supporting evidence, few people have the time and experience to analyze all or most of the evidence. We can reduce the volume by disregarding late treatment studies, however that still leaves 139 studies.

One quick way to confirm efficacy is via prophylaxis RCTs. In the US [HERO-HCQ RCT](#), [authors note](#) that combining the US HERO-HCQ and COVID PREP RCTs shows statistically significant efficacy for prophylaxis: *"The HERO-HCQ and COVID PREP studies are compared in Supplemental Table 3. Pooling the main results using the Mantel-Haenszel method resulted in an estimate of the common odds ratio of 0.74 (95% CI 0.55 to 1.00) with a p-value of 0.046"* [Naggie](#).

A [2022 meta analysis](#) of 7 RCTs by Harvard researchers confirms efficacy for prophylaxis [García-Albéniz](#), as does a meta analysis of 20 studies on HCQ use with rheumatic disease patients [Landsteiner de Sampaio Amêndola](#), along with our analysis of RCTs, and of all PrEP studies. All of these analyses produce similar results.

Some researchers claim that reaching *in vitro* effective concentrations is not feasible, however [direct measurement](#) in treated patients shows that this is false [Chaudhary, Ruiz](#). Notably, the achieved concentrations were highly variable between people, suggesting that not all people may benefit from the same dose.

Like many [other treatments](#), HCQ is effective. The only questions are how effective, under what conditions, what is the optimal combination of treatments, what is the best dosage and treatment regimen, etc.? For these answers, we need to analyze much more of the research.

Appendix 1. Methods and Data

We performed ongoing searches of PubMed, medRxiv, ClinicalTrials.gov, The Cochrane Library, Google Scholar, Collabovid, Research Square, ScienceDirect, Oxford University Press, the reference lists of other studies and meta-analyses, and submissions to the site [c19hcq.org](#), which regularly receives submissions of both positive and negative studies upon publication. Search terms were hydroxychloroquine or chloroquine and COVID-19 or SARS-CoV-2, or simply hydroxychloroquine or chloroquine. Automated searches are performed every hour with notifications of new matches. All studies regarding the use of HCQ or CQ for COVID-19 that report a result compared to a control group are included in the main analysis. This is a living analysis and is updated regularly.

We extracted effect sizes and associated data from all studies. If studies report multiple kinds of effects then the most serious outcome is used in calculations for that study. For example, if effects for mortality and cases are both reported, the effect for mortality is used, this may be different to the effect that a study focused on. If symptomatic results are reported at multiple times, we used the latest time, for example if mortality results are provided at 14 days and 28 days, the results at 28 days are used. Mortality alone is preferred over combined outcomes. Outcomes with zero events in both arms were not used (the next most serious outcome is used — no studies were excluded). For example, in low-risk populations with no mortality, a reduction in mortality with treatment is not possible, however a reduction in hospitalization, for example, is still valuable. Clinical outcome is considered more important than PCR testing status. When basically all patients recover in both treatment and control groups, preference for viral clearance and recovery is given to results mid-recovery where available (after most or all patients have recovered there is no room for an effective treatment to do better). When results provide an odds ratio, we computed the relative risk when possible, or converted to a relative risk according to [Zhang](#). Reported confidence intervals and *p*-values were used when available, using adjusted values when provided. If multiple types of adjustments are reported including propensity score matching (PSM), the PSM results are used. Adjusted primary outcome results have preference over unadjusted results for a more serious outcome when the adjustments significantly alter results. When needed, conversion between reported *p*-values and confidence intervals followed [Altman, Altman \(B\)](#), and Fisher's exact test was used to calculate *p*-values for event data. If

continuity correction for zero values is required, we use the reciprocal of the opposite arm with the sum of the correction factors equal to 1 *Sweeting*. If a study separates HCQ and HCQ+AZ, we use the combined results were possible, or the results for the larger group. Results are all expressed with $RR < 1.0$ suggesting effectiveness. Most results are the relative risk of something negative. If a study reports relative times, the results are expressed as the ratio of the time for the HCQ group versus the time for the control group. If a study reports the rate of reduction of viral load, the results are based on the percentage change in the rate. Calculations are done in Python (3.11.4) with scipy (1.11.1), pythonmeta (1.26), numpy (1.25.0), statsmodels (0.14.0), and plotly (5.15.0).

The forest plots are computed using PythonMeta *Deng* with the DerSimonian and Laird random effects model (the fixed effect assumption is not plausible in this case).

We received no funding, this research is done in our spare time. We have no affiliations with any pharmaceutical companies or political parties.

We have classified studies as early treatment if most patients are not already at a severe stage at the time of treatment, and treatment started within 5 days after the onset of symptoms, although a shorter time may be preferable. Antivirals are typically only considered effective when used within a shorter timeframe, for example 0-36 or 0-48 hours for oseltamivir, with longer delays not being effective *McLean, Treanor*.

A summary of study results is below. Please submit updates and corrections at <https://c19hcq.org/meta.html>.

Early treatment

Effect extraction follows pre-specified rules as detailed above and gives priority to more serious outcomes. Only the first (most serious) outcome is used in pooled analysis, which may differ from the effect a paper focuses on. Other outcomes are used in outcome specific analyses.

<i>Agusti</i> , 12/9/2020, prospective, Spain, peer-reviewed, median age 37.0, 13 authors, average treatment delay 5.0 days, dosage 400mg bid day 1, 200mg bid days 2-5.	risk of progression, 68.4% lower, $RR\ 0.32$, $p = 0.21$, treatment 2 of 87 (2.3%), control 4 of 55 (7.3%), NNT 20, pneumonia.
<i>Akram</i> , 11/22/2020, Randomized Controlled Trial, Pakistan, peer-reviewed, trial NCT04338698 (history) (PROTECT).	550 patient RCT with results missing over 2.5 years.
<i>Amaravadi</i> , 2/26/2021, Double Blind Randomized Controlled Trial, USA, preprint, 20 authors, study period 15 April, 2020 - 14 July, 2020, dosage 400mg bid days 1-14.	risk of not reaching lowest symptom score at day 7 mid-recovery, 60.0% lower, $RR\ 0.40$, $p = 0.13$, treatment 3 of 15 (20.0%), control 6 of 12 (50.0%), NNT 3.3.
	risk of not reaching lowest symptom score at day 5 mid-recovery, 50.0% lower, $RR\ 0.50$, $p = 0.13$, treatment 5 of 15 (33.3%), control 8 of 12 (66.7%), NNT 3.0.
	relative time to first occurrence of lowest symptom score, 42.9% lower, relative time 0.57, $p = 0.38$, treatment median 4.0 IQR 13.0 n=15, control median 7.0 IQR 10.0 n=12.
	relative time to release from quarantine, 27.3% lower, relative time 0.73, $p = 0.46$, treatment median 8.0 IQR 15.0 n=16, control median 11.0 IQR 14.0 n=13, primary outcome.
<i>Ashraf</i> , 4/24/2020, retrospective, database analysis, Iran, preprint, median age 58.0, 16 authors, dosage 200mg bid daily, 400mg qd was used when combined with Lopinavir-Ritonavir.	risk of death, 67.5% lower, $RR\ 0.32$, $p = 0.15$, treatment 10 of 77 (13.0%), control 2 of 5 (40.0%), NNT 3.7.

<i>Aston</i> , 12/31/2021, Randomized Controlled Trial, trial NCT04334382 (history) (HyAzOUT).	Estimated 1,550 patient RCT with results missing over 1.5 years.
<i>Atipornwanich</i> , 10/5/2021, Randomized Controlled Trial, Thailand, peer-reviewed, 16 authors, early treatment subset, study period 19 October, 2020 - 20 July, 2021, dosage 400mg days 1-14, 800mg/day or 400mg/day, this trial compares with another treatment - results may be better when compared to placebo, this trial uses multiple treatments in the treatment arm (combined with oseltamivir/favipiravir and duranivir/ritonavir for moderate/severe, oseltamivir and duranivir/ritonavir for mild) - results of individual treatments may vary, trial NCT04303299 (history).	risk of progression, 150.0% higher, RR 2.50, $p = 1.00$, treatment 1 of 60 (1.7%), control 0 of 30 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm), mild, early treatment result.
	time to viral-, 43.3% lower, relative time 0.57, $p = 0.04$, treatment mean 8.9 (± 6.0) $n=30$, control mean 15.7 (± 16.7) $n=30$, mild, HCQ 800, primary outcome, early treatment result.
	time to viral-, 36.3% lower, relative time 0.64, $p = 0.09$, treatment mean 10.0 (± 6.9) $n=30$, control mean 15.7 (± 16.7) $n=30$, mild, HCQ 400, primary outcome, early treatment result.
<i>Avezum</i> , 3/31/2022, Double Blind Randomized Controlled Trial, Brazil, peer-reviewed, 40 authors, study period 12 May, 2020 - 7 July, 2021, average treatment delay 4.0 days, dosage 400mg bid day 1, 200mg bid days 2-7, trial NCT04466540 (history).	risk of death, 0.7% lower, RR 0.99, $p = 1.00$, treatment 5 of 687 (0.7%), control 5 of 682 (0.7%), NNT 18741, all-cause death.
	risk of death, 56.0% higher, HR 1.56, $p = 0.54$, treatment 5 of 687 (0.7%), control 5 of 682 (0.7%), adjusted per study, univariate Firth's penalized likelihood.
	risk of mechanical ventilation, 32.4% higher, RR 1.32, $p = 0.79$, treatment 8 of 687 (1.2%), control 6 of 682 (0.9%).
	risk of ICU admission, 16.4% lower, RR 0.84, $p = 0.61$, treatment 16 of 687 (2.3%), control 19 of 682 (2.8%), NNT 219.
	risk of hospitalization, 23.5% lower, RR 0.77, $p = 0.18$, treatment 44 of 689 (6.4%), control 57 of 683 (8.3%), NNT 51.
	risk of hospitalization, 40.0% lower, RR 0.60, $p = 0.15$, treatment 267, control 265, <4 days.
<i>Bernabeu-Wittel</i> , 8/1/2020, retrospective, Spain, peer-reviewed, 13 authors, dosage 400mg bid day 1, 200mg bid days 2-7, this trial uses multiple treatments in the treatment arm (combined with lopinavir/ritonavir and antimicrobial treatments) - results of individual treatments may vary.	risk of death, 59.0% lower, RR 0.41, $p = 0.03$, treatment 189, control 83.
<i>Butler</i> , 6/22/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial ISRCTN86534580 (PRINCIPLE).	Estimated 400 patient RCT with results missing over 3 years.
<i>Cadegiani</i> , 11/4/2020, prospective, Brazil, peer-reviewed, 4 authors, average treatment delay 2.9 days, dosage 400mg days 1-5.	risk of death, 81.2% lower, RR 0.19, $p = 0.21$, treatment 0 of 159 (0.0%), control 2 of 137 (1.5%), NNT 68, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), control group 1.
	risk of mechanical ventilation, 95.1% lower, RR 0.05, $p < 0.001$, treatment 0 of 159 (0.0%), control 9 of 137 (6.6%), NNT 15, relative risk is not 0 because of continuity correction due to

	<p>zero events (with reciprocal of the contrasting arm), control group 1.</p> <p>risk of hospitalization, 98.3% lower, RR 0.02, $p < 0.001$, treatment 0 of 159 (0.0%), control 27 of 137 (19.7%), NNT 5.1, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), control group 1.</p>
<i>Chechter</i> , 11/5/2021, prospective, Brazil, peer-reviewed, mean age 37.6, 14 authors, dosage 800mg day 1, 400mg days 2-5, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary, excluded in exclusion analyses: unadjusted results with no group details.	risk of hospitalization, 94.7% lower, RR 0.05, $p = 0.004$, treatment 0 of 60 (0.0%), control 3 of 12 (25.0%), NNT 4.0, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
<i>Corradini</i> , 4/24/2021, retrospective, Italy, peer-reviewed, 60 authors, early treatment subset, dosage not specified.	risk of death, 67.4% lower, OR 0.33, $p = 0.01$, treatment 641, control 102, adjusted per study, Table S6, light condition patients, multivariable, RR approximated with OR, early treatment result.
<i>Derwand</i> , 7/3/2020, retrospective, USA, peer-reviewed, 3 authors, average treatment delay 4.0 days, dosage 200mg bid days 1-5, this trial uses multiple treatments in the treatment arm (combined with AZ and zinc) - results of individual treatments may vary.	risk of death, 79.4% lower, RR 0.21, $p = 0.12$, treatment 1 of 141 (0.7%), control 13 of 377 (3.4%), NNT 37, odds ratio converted to relative risk.
	risk of hospitalization, 81.6% lower, RR 0.18, $p < 0.001$, treatment 4 of 141 (2.8%), control 58 of 377 (15.4%), NNT 8.0, odds ratio converted to relative risk.
<i>Esper</i> , 4/15/2020, prospective, Brazil, preprint, 15 authors, average treatment delay 5.2 days, dosage 800mg day 1, 400mg days 2-7, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of hospitalization, 64.0% lower, RR 0.36, $p = 0.02$, treatment 8 of 412 (1.9%), control 12 of 224 (5.4%), NNT 29.
<i>Gautret</i> , 3/17/2020, prospective, France, peer-reviewed, 18 authors, average treatment delay 4.1 days, dosage 200mg tid days 1-10, excluded in exclusion analyses: excessive unadjusted differences between groups; results only for PCR status which may be significantly different to symptoms.	risk of no virological cure at day 6, 66.0% lower, RR 0.34, $p = 0.001$, treatment 6 of 20 (30.0%), control 14 of 16 (87.5%), NNT 1.7.
<i>Genton</i> , 12/31/2022, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04385264 (history) (PROLIFIC).	Estimated 800 patient RCT with results missing over 8 months.
<i>Guisado-Vasco</i> , 10/15/2020, retrospective, Spain, peer-reviewed, median age 69.0, 25 authors, early treatment subset, dosage not specified.	risk of death, 66.9% lower, RR 0.33, $p = 0.19$, treatment 2 of 65 (3.1%), control 139 of 542 (25.6%), NNT 4.4, adjusted per study, odds ratio converted to relative risk, multivariate.
<i>Guérin</i> , 5/31/2020, retrospective, France, peer-reviewed, 8 authors, dosage 600mg days 1-10, 7-10 days, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 61.4% lower, RR 0.39, $p = 1.00$, treatment 0 of 20 (0.0%), control 1 of 34 (2.9%), NNT 34, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).

	recovery time, 65.0% lower, relative time 0.35, $p < 0.001$, treatment 20, control 34.
<i>Gül</i> , 2/16/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04981379 (history).	1,120 patient RCT with results missing over 2.5 years.
<i>Heras</i> , 9/2/2020, retrospective, Andorra, peer-reviewed, median age 85.0, 13 authors, dosage not specified, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 95.6% lower, RR 0.04, $p = 0.004$, treatment 8 of 70 (11.4%), control 16 of 30 (53.3%), NNT 2.4, adjusted per study.
<i>Hong</i> , 7/16/2020, retrospective, South Korea, peer-reviewed, 7 authors, dosage not specified.	risk of prolonged viral shedding, early vs. late HCQ, 64.9% lower, RR 0.35, $p = 0.001$, treatment 42, control 48, odds ratio converted to relative risk.
<i>Huang (B)</i> , 5/28/2020, prospective, China, peer-reviewed, 36 authors, early treatment subset, dosage chloroquine 500mg days 1-10, two groups, 500mg qd and 500mg bid.	time to viral-, 59.1% lower, relative time 0.41, $p < 0.001$, treatment 32, control 37.
<i>Ip</i> , 8/25/2020, retrospective, database analysis, USA, peer-reviewed, 25 authors, dosage not specified.	risk of death, 54.5% lower, RR 0.45, $p = 0.43$, treatment 2 of 97 (2.1%), control 44 of 970 (4.5%), NNT 40.
	risk of ICU admission, 28.6% lower, RR 0.71, $p = 0.79$, treatment 3 of 97 (3.1%), control 42 of 970 (4.3%), NNT 81.
	risk of hospitalization, 37.3% lower, RR 0.63, $p = 0.04$, treatment 21 of 97 (21.6%), control 305 of 970 (31.4%), NNT 10, adjusted per study, odds ratio converted to relative risk.
<i>Kara</i> , 6/1/2021, Randomized Controlled Trial, Turkey, peer-reviewed, trial NCT04411433 (history).	1,008 patient RCT with results missing over 2 years.
<i>Kim</i> , 4/30/2020, Randomized Controlled Trial, trial NCT04307693 (history).	65 patient RCT with results missing over 3 years.
<i>Kirenga</i> , 9/9/2020, prospective, Uganda, peer-reviewed, 29 authors, dosage not specified.	median time to recovery, 25.6% lower, relative time 0.74, $p = 0.20$, treatment 29, control 27.
<i>Ly</i> , 8/21/2020, retrospective, France, peer-reviewed, mean age 83.0, 21 authors, dosage 200mg tid days 1-10, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 55.6% lower, RR 0.44, $p = 0.02$, treatment 18 of 116 (15.5%), control 29 of 110 (26.4%), NNT 9.2, adjusted per study, odds ratio converted to relative risk.
<i>Million (B)</i> , 5/27/2021, retrospective, France, peer-reviewed, 28 authors, average treatment delay 4.0 days, dosage 200mg tid days 1-10, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 83.0% lower, HR 0.17, $p < 0.001$, treatment 5 of 8,315 (0.1%), control 11 of 2,114 (0.5%), NNT 217, adjusted per study.
	risk of ICU admission, 44.0% lower, HR 0.56, $p = 0.18$, treatment 17 of 8,315 (0.2%), control 7 of 2,114 (0.3%), NNT 789, adjusted per study.
	risk of hospitalization, 4.0% lower, HR 0.96, $p = 0.77$,

	treatment 214 of 8,315 (2.6%), control 64 of 2,114 (3.0%), adjusted per study.
<i>Mitjà</i> , 7/16/2020, Randomized Controlled Trial, Spain, peer-reviewed, 45 authors, study period 17 March, 2020 - 26 May, 2020, dosage 800mg day 1, 400mg days 2-7.	risk of hospitalization, 16.0% lower, RR 0.84, $p = 0.64$, treatment 8 of 136 (5.9%), control 11 of 157 (7.0%), NNT 89.
	risk of no recovery, 34.0% lower, RR 0.66, $p = 0.38$, treatment 8 of 136 (5.9%), control 14 of 157 (8.9%), NNT 33.
<i>Mokhtari</i> , 4/6/2021, retrospective, Iran, peer-reviewed, 11 authors, dosage 400mg bid day 1, 200mg bid days 2-5.	risk of death, 69.7% lower, RR 0.30, $p < 0.001$, treatment 27 of 7,295 (0.4%), control 287 of 21,464 (1.3%), NNT 103, adjusted per study, odds ratio converted to relative risk.
	risk of hospitalization, 35.3% lower, RR 0.65, $p < 0.001$, treatment 523 of 7,295 (7.2%), control 2,382 of 21,464 (11.1%), NNT 25, adjusted per study, odds ratio converted to relative risk.
<i>Okasha</i> , 12/31/2020, Double Blind Randomized Controlled Trial, trial NCT04361318 (history).	Estimated 100 patient RCT with results missing over 2.5 years.
<i>Omrani</i> , 11/20/2020, Randomized Controlled Trial, Qatar, peer-reviewed, 19 authors, study period 13 April, 2020 - 1 August, 2020, dosage 600mg days 1-6, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of hospitalization, 12.5% lower, RR 0.88, $p = 1.00$, treatment 7 of 304 (2.3%), control 4 of 152 (2.6%), NNT 304, HCQ+AZ or HCQ vs. control.
	risk of symptomatic at day 21, 25.8% lower, RR 0.74, $p = 0.58$, treatment 9 of 293 (3.1%), control 6 of 145 (4.1%), NNT 94, HCQ+AZ or HCQ vs. control.
	risk of Ct \leq 40 at day 14, 10.3% higher, RR 1.10, $p = 0.13$, treatment 223 of 295 (75.6%), control 98 of 143 (68.5%), HCQ+AZ or HCQ vs. control.
<i>Pineda</i> , 12/31/2021, Double Blind Randomized Controlled Trial, trial NCT04954040 (history) (AMBUCOV).	Estimated 132 patient RCT with results missing over 1.5 years.
<i>Rathod</i> , 6/1/2023, retrospective, India, peer-reviewed, 6 authors, study period 28 March, 2020 - 3 June, 2020, average treatment delay 5.0 days, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 73.0% lower, HR 0.27, $p = 0.02$, treatment 513, control 52, Cox proportional hazards.
<i>Rodrigues</i> , 8/25/2021, Double Blind Randomized Controlled Trial, Brazil, peer-reviewed, 8 authors, study period 12 April, 2020 - 13 May, 2020, average treatment delay 3.8 days, dosage 400mg bid days 1-7, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of hospitalization, 200.0% higher, RR 3.00, $p = 1.00$, treatment 1 of 42 (2.4%), control 0 of 42 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).
	risk of no viral clearance, 14.4% lower, RR 0.86, $p = 0.15$, treatment 29 of 36 (80.6%), control 32 of 34 (94.1%), NNT 7.4, PP, day 3.
	risk of no viral clearance, 13.1% lower, RR 0.87, $p = 0.45$, treatment 23 of 36 (63.9%), control 25 of 34 (73.5%), NNT 10, PP, day 6.

	risk of no viral clearance, 23.3% lower, RR 0.77, $p = 0.47$, treatment 13 of 36 (36.1%), control 16 of 34 (47.1%), NNT 9.1, PP, day 9.
	risk of no viral clearance, 3.1% lower, RR 0.97, $p = 1.00$, treatment 31 of 42 (73.8%), control 32 of 42 (76.2%), NNT 42, ITT, day 3.
	risk of no viral clearance, no change, RR 1.00, $p = 1.00$, treatment 25 of 42 (59.5%), control 25 of 42 (59.5%), ITT, day 6.
	risk of no viral clearance, 6.2% lower, RR 0.94, $p = 1.00$, treatment 15 of 42 (35.7%), control 16 of 42 (38.1%), NNT 42, ITT, day 9.
	time to viral-, 8.8% lower, relative time 0.91, $p = 0.26$, treatment 36, control 34, PP.
	time to viral-, 1.4% lower, relative time 0.99, $p = 0.85$, treatment 42, control 42, ITT.
<p><i>Rouamba</i>, 2/26/2022, retrospective, Burkina Faso, peer-reviewed, mean age 42.2, 17 authors, early treatment subset, study period 9 March, 2020 - 31 October, 2020, dosage 200mg tid days 1-10, HCQ 200mg tid daily or CQ 250mg bid daily, trial NCT04445441 (history).</p>	<p>risk of progression, 73.0% lower, HR 0.27, $p = 0.05$, treatment 23 of 399 (5.8%), control 4 of 33 (12.1%), adjusted per study, outpatients, multivariable, Cox proportional hazards, early treatment result.</p>
	<p>time to viral clearance, 21.3% lower, HR 0.79, $p = 0.37$, treatment 399, control 33, adjusted per study, inverted to make HR<1 favor treatment, outpatients, multivariable, Cox proportional hazards, primary outcome, early treatment result.</p>
<p><i>Roy</i>, 3/12/2021, retrospective, database analysis, India, preprint, 5 authors, dosage not specified, excluded in exclusion analyses: no serious outcomes reported and fast recovery in treatment and control groups, there is little room for a treatment to improve results.</p>	<p>relative time to clinical response of wellbeing, 2.4% lower, relative time 0.98, $p = 0.96$, treatment 14, control 15, primary outcome.</p>
<p><i>Roy-García</i>, 4/16/2022, Double Blind Randomized Controlled Trial, Mexico, preprint, 11 authors, study period January 2021 - June 2021, average treatment delay 5.0 days, dosage 200mg bid days 1-10, trial NCT04964583 (history).</p>	<p>risk of progression, 100% higher, RR 2.00, $p = 1.00$, treatment 2 of 31 (6.5%), control 1 of 31 (3.2%), supplemental oxygen.</p>
	<p>risk of progression, 233.3% higher, RR 3.33, $p = 0.06$, treatment 10 of 31 (32.3%), control 3 of 31 (9.7%), pneumonia.</p>
	<p>risk of progression, 225.0% higher, RR 3.25, $p = 0.02$, treatment 13 of 31 (41.9%), control 4 of 31 (12.9%), oxygen saturation less than 90%, dyspnea, or pneumonia.</p>
<p><i>Sarwar</i>, 8/30/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04351191 (history) (PRECISE).</p>	<p>137 patient RCT with results missing over 3 years.</p>
<p><i>Sawanpanyalert</i>, 9/9/2021, retrospective, Thailand, peer-reviewed, 11 authors, dosage varies, this trial uses multiple treatments in the</p>	<p>risk of death, ICU, intubation, or high-flow oxygen, 42.0% lower, OR 0.58, $p = 0.37$, within 4 days of symptom onset, RR approximated with OR.</p>

treatment arm (combined with lopinavir/ritonavir or darunavir/ritonavir) - results of individual treatments may vary.	
<p><i>Simova</i>, 11/12/2020, retrospective, Bulgaria, peer-reviewed, 5 authors, dosage 200mg tid days 1-14, this trial uses multiple treatments in the treatment arm (combined with AZ and zinc) - results of individual treatments may vary.</p>	<p>risk of hospitalization, 93.8% lower, RR 0.06, $p = 0.01$, treatment 0 of 33 (0.0%), control 2 of 5 (40.0%), NNT 2.5, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).</p>
	<p>risk of viral+ at day 14, 95.8% lower, RR 0.04, $p = 0.001$, treatment 0 of 33 (0.0%), control 3 of 5 (60.0%), NNT 1.7, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).</p>
<p><i>Skipper</i>, 7/16/2020, Randomized Controlled Trial, USA, peer-reviewed, 24 authors, study period 17 March, 2020 - 20 May, 2020, dosage 800mg once, followed by 600mg in 6 to 8 hours, then 600mg daily for 4 more days, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04308668 (history).</p>	<p>risk of death/hospitalization, 36.7% lower, RR 0.63, $p = 0.58$, treatment 5 of 231 (2.2%), control 8 of 234 (3.4%), NNT 80, COVID-19 adjudicated hospitalization/death.</p>
	<p>risk of hospitalization, 49.4% lower, RR 0.51, $p = 0.38$, treatment 4 of 231 (1.7%), control 8 of 234 (3.4%), NNT 59, COVID-19 adjudicated hospitalization.</p>
	<p>risk of death/hospitalization, 49.4% lower, RR 0.51, $p = 0.29$, treatment 5 of 231 (2.2%), control 10 of 234 (4.3%), NNT 47, all hospitalization/death.</p>
	<p>risk of hospitalization, 59.5% lower, RR 0.41, $p = 0.17$, treatment 4 of 231 (1.7%), control 10 of 234 (4.3%), NNT 39, all hospitalizations.</p>
	<p>risk of no recovery at day 14, 20.0% lower, RR 0.80, $p = 0.21$, treatment 231, control 234.</p>
<p><i>Smith (B)</i>, 7/8/2020, Double Blind Randomized Controlled Trial, placebo-controlled, USA, preprint, 1 author, trial NCT04358068 (history).</p>	<p>risk of hospitalization, 64.0% lower, RR 0.36, $p = 1.00$, treatment 0 of 7 (0.0%), control 1 of 9 (11.1%), NNT 9.0, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).</p>
<p><i>Sobngwi</i>, 7/29/2021, Randomized Controlled Trial, Cameroon, peer-reviewed, mean age 39.0, 16 authors, study period 16 March, 2021 - 9 April, 2021, dosage 400mg days 1-5, this trial compares with another treatment - results may be better when compared to placebo.</p>	<p>risk of no recovery, 51.6% lower, RR 0.48, $p = 0.44$, treatment 2 of 95 (2.1%), control 4 of 92 (4.3%), NNT 45, day 10.</p>
	<p>risk of no recovery, 3.2% lower, RR 0.97, $p = 1.00$, treatment 18 of 95 (18.9%), control 18 of 92 (19.6%), NNT 162, day 3.</p>
	<p>risk of no viral clearance, 3.2% lower, RR 0.97, $p = 0.88$, treatment 32 of 95 (33.7%), control 32 of 92 (34.8%), NNT 91, day 10.</p>
<p><i>Sow</i>, 9/30/2020, Double Blind Randomized Controlled Trial, placebo-controlled, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04501965 (history) (PHYTCOVID-19).</p>	<p>231 patient RCT with results missing over 2.5 years.</p>
<p><i>Su</i>, 12/23/2020, retrospective, China, peer-reviewed, 9 authors, study period 20 January, 2020 - 30 April, 2020, dosage 400mg days 1-10,</p>	<p>risk of progression, 84.9% lower, HR 0.15, $p = 0.006$, adjusted per study, binary logistic regression.</p>

400mg daily for 10-14 days.	improvement time, 24.0% better, relative time 0.76, $p = 0.02$, adjusted per study, inverted to make $RR < 1$ favor treatment, Cox proportional hazards.
	risk of no viral clearance, 35.8% lower, HR 0.64, $p = 0.001$, inverted to make $HR < 1$ favor treatment, Cox proportional hazards.
<i>Sulaiman</i> , 9/13/2020, prospective, Saudi Arabia, preprint, 22 authors, dosage 400mg bid day 1, 200mg bid days 2-5.	risk of death, 63.7% lower, RR 0.36, $p = 0.01$, treatment 7 of 1,817 (0.4%), control 54 of 3,724 (1.5%), NNT 94, adjusted per study, odds ratio converted to relative risk.
	risk of hospitalization, 38.6% lower, RR 0.61, $p = 0.001$, treatment 171 of 1,817 (9.4%), control 617 of 3,724 (16.6%), NNT 14, adjusted per study, odds ratio converted to relative risk.
<i>Szente Fonseca</i> , 10/31/2020, retrospective, Brazil, peer-reviewed, mean age 50.6, 10 authors, average treatment delay 4.6 days, dosage 400mg bid day 1, 400mg qd days 2-5.	risk of hospitalization, 64.0% lower, RR 0.36, $p < 0.001$, treatment 25 of 175 (14.3%), control 89 of 542 (16.4%), adjusted per study, odds ratio converted to relative risk, HCQ vs. nothing, primary outcome.
	risk of hospitalization, 50.5% lower, RR 0.49, $p = 0.006$, treatment 25 of 175 (14.3%), control 89 of 542 (16.4%), adjusted per study, odds ratio converted to relative risk, HCQ vs. anything else.
<i>Yu</i> , 8/3/2020, retrospective, China, peer-reviewed, median age 62.0, 6 authors, early treatment subset, average treatment delay 5.0 days, dosage 200mg bid days 1-10.	risk of death, 85.0% lower, RR 0.15, $p = 0.02$, treatment 1 of 73 (1.4%), control 238 of 2,604 (9.1%), NNT 13, HCQ treatment started early vs. non-HCQ.

Late treatment

Effect extraction follows pre-specified rules as detailed above and gives priority to more serious outcomes. Only the first (most serious) outcome is used in pooled analysis, which may differ from the effect a paper focuses on. Other outcomes are used in outcome specific analyses.

<i>AbdelGhaffar</i> , 1/11/2022, retrospective, Egypt, peer-reviewed, 17 authors, study period April 2020 - July 2020.	risk of death, 99.9% lower, RR 0.001, $p < 0.001$, treatment 0 of 238 (0.0%), control 900 of 3,474 (25.9%), NNT 3.9, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
<i>Abdulrahman</i> , 11/30/2020, retrospective, propensity score matching, Bahrain, preprint, 9 authors.	risk of death, 16.7% lower, RR 0.83, $p = 1.00$, treatment 5 of 223 (2.2%), control 6 of 223 (2.7%), NNT 223, PSM.
	risk of death/intubation, 75.0% higher, RR 1.75, $p = 0.24$, treatment 12 of 223 (5.4%), control 7 of 223 (3.1%), adjusted per study, PSM.
<i>Aboulenain</i> , 11/30/2020, retrospective, USA, peer-reviewed, 13 authors, study period March 2020 - May 2020, excluded in exclusion analyses: substantial unadjusted confounding by indication possible.	risk of death, 15.0% higher, HR 1.15, $p = 0.72$, treatment 82, control 93, Cox proportional hazards.

<p><i>Ader</i>, 10/6/2020, Randomized Controlled Trial, multiple countries, preprint, baseline oxygen required 95.4%, 59 authors, study period 22 March, 2020 - 29 June, 2020, average treatment delay 9.0 days, excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline.</p>	<p>risk of death, 15.3% higher, RR 1.15, $p = 0.70$, treatment 11 of 150 (7.3%), control 13 of 149 (8.7%), adjusted per study, odds ratio converted to relative risk, day 90.</p>
	<p>risk of death, 10.1% lower, RR 0.90, $p = 0.75$, treatment 15 of 150 (10.0%), control 13 of 149 (8.7%), adjusted per study, odds ratio converted to relative risk, day 28.</p>
	<p>risk of no viral clearance, 23.8% lower, RR 0.76, $p = 0.68$, treatment 4 of 83 (4.8%), control 5 of 81 (6.2%), NNT 74, odds ratio converted to relative risk, Table S2, day 29.</p>
<p><i>Afşin</i>, 8/1/2023, retrospective, Turkey, peer-reviewed, 2 authors, study period August 2020 - November 2020, excluded in exclusion analyses: unadjusted results with no group details.</p>	<p>risk of death, 16.7% lower, RR 0.83, $p = 0.50$, treatment 15 of 36 (41.7%), control 22 of 44 (50.0%), NNT 12.</p>
<p><i>Aghajani</i>, 4/29/2021, retrospective, Iran, peer-reviewed, 7 authors.</p>	<p>risk of death, 19.5% lower, HR 0.81, $p = 0.09$, treatment 553, control 438, multivariate Cox proportional regression.</p>
<p><i>Alamdari</i>, 9/9/2020, retrospective, Iran, peer-reviewed, 14 authors, average treatment delay 5.72 days, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.</p>	<p>risk of death, 55.0% lower, RR 0.45, $p = 0.03$, treatment 54 of 427 (12.6%), control 9 of 32 (28.1%), NNT 6.5.</p>
<p><i>Albanghali</i>, 2/3/2022, retrospective, Saudi Arabia, peer-reviewed, 8 authors, excluded in exclusion analyses: unadjusted results with no group details; substantial unadjusted confounding by indication likely.</p>	<p>risk of death, 34.6% higher, RR 1.35, $p = 0.46$, treatment 20 of 466 (4.3%), control 11 of 345 (3.2%).</p>
<p><i>Albani</i>, 8/30/2020, retrospective, Italy, peer-reviewed, 11 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.</p>	<p>risk of death, 18.4% lower, RR 0.82, $p = 0.15$, treatment 60 of 211 (28.4%), control 172 of 605 (28.4%), adjusted per study, odds ratio converted to relative risk, HCQ vs. neither.</p>
	<p>risk of death, 9.0% higher, RR 1.09, $p = 0.54$, treatment 60 of 211 (28.4%), control 172 of 605 (28.4%), adjusted per study, odds ratio converted to relative risk, HCQ+AZ vs. neither.</p>
	<p>risk of ICU admission, 9.2% higher, RR 1.09, $p = 0.70$, treatment 73 of 211 (34.6%), control 46 of 605 (7.6%), adjusted per study, odds ratio converted to relative risk, HCQ vs. neither.</p>
	<p>risk of ICU admission, 71.3% higher, RR 1.71, $p < 0.001$, treatment 73 of 211 (34.6%), control 46 of 605 (7.6%), adjusted per study, odds ratio converted to relative risk, HCQ+AZ vs. neither.</p>
<p><i>Alberici</i>, 5/10/2020, retrospective, Italy, peer-reviewed, 31 authors, average treatment delay 4.0 days.</p>	<p>risk of death, 42.9% lower, RR 0.57, $p = 0.12$, treatment 17 of 72 (23.6%), control 9 of 22 (40.9%), NNT 5.8, odds ratio converted to relative risk.</p>
<p><i>Alghamdi</i>, 8/4/2021, retrospective, Saudi Arabia, peer-reviewed, 1 author, excluded in exclusion analyses: unadjusted results with no group details;</p>	<p>risk of death, 39.2% higher, RR 1.39, $p = 0.52$, treatment 29 of 128 (22.7%), control 7 of 43 (16.3%).</p>

very late stage, ICU patients.	
<i>Alghamdi (B)</i> , 3/31/2021, retrospective, Saudi Arabia, peer-reviewed, 10 authors, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 6.9% higher, RR 1.07, $p = 0.88$, treatment 44 of 568 (7.7%), control 15 of 207 (7.2%).
<i>Alhamlan</i> , 7/16/2021, retrospective, database analysis, Saudi Arabia, preprint, 10 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 52.0% higher, HR 1.52, $p = 0.57$.
<i>Almazrou</i> , 10/1/2020, retrospective, Saudi Arabia, peer-reviewed, 5 authors.	risk of mechanical ventilation, 65.0% lower, RR 0.35, $p = 0.16$, treatment 3 of 95 (3.2%), control 6 of 66 (9.1%), NNT 17.
	risk of ICU admission, 21.0% lower, RR 0.79, $p = 0.78$, treatment 8 of 95 (8.4%), control 7 of 66 (10.6%), NNT 46.
<i>Alosaimi</i> , 11/24/2022, retrospective, Saudi Arabia, peer-reviewed, 13 authors, study period April 2020 - March 2021, this trial compares with another treatment - results may be better when compared to placebo.	risk of death, 400.0% higher, RR 5.00, $p = 0.49$, treatment 2 of 37 (5.4%), control 0 of 37 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm), propensity score matching.
	hospitalization time, 42.9% lower, relative time 0.57, $p = 0.63$, treatment 37, control 37, propensity score matching.
	time to discharge, 28.6% lower, relative time 0.71, $p = 0.74$, treatment 37, control 37, propensity score matching.
<i>Alotaibi</i> , 9/14/2021, retrospective, Saudi Arabia, peer-reviewed, 11 authors, this trial compares with another treatment - results may be better when compared to placebo.	risk of death, 133.5% higher, RR 2.33, $p = 0.05$, treatment 193, control 244, multivariate.
<i>AlQadheeb</i> , 5/10/2023, retrospective, Saudi Arabia, peer-reviewed, mean age 55.8, 9 authors, study period March 2020 - August 2021.	risk of death, 34.8% lower, RR 0.65, $p < 0.001$, treatment 37 of 92 (40.2%), control 466 of 756 (61.6%), NNT 4.7.
<i>AlQahtani</i> , 3/23/2022, Randomized Controlled Trial, Bahrain, peer-reviewed, 13 authors, study period August 2020 - March 2021, trial NCT04387760 (history).	risk of ICU admission, 23.5% lower, RR 0.76, $p = 1.00$, treatment 3 of 51 (5.9%), control 4 of 52 (7.7%), NNT 55.
	risk of no recovery, 4.1% lower, RR 0.96, $p = 0.94$, treatment 5 of 49 (10.2%), control 5 of 47 (10.6%), NNT 230.
	risk of no viral clearance, 47.4% lower, RR 0.53, $p = 0.13$, treatment 7 of 38 (18.4%), control 14 of 40 (35.0%), NNT 6.0.
<i>Alqassieh</i> , 12/10/2020, prospective, Jordan, preprint, 10 authors.	hospitalization time, 18.2% lower, relative time 0.82, $p = 0.11$, treatment 63, control 68.
<i>Alshamrani</i> , 2/15/2023, retrospective, Saudi Arabia, peer-reviewed, 3 authors, study period	risk of death, 50.0% lower, RR 0.50, $p = 0.18$, treatment 6 of 161 (3.7%), control 50 of 653 (7.7%), NNT 25, adjusted per

March 2020 - January 2021.	study, odds ratio converted to relative risk, propensity score matching, multivariable.
	risk of progression, 37.0% lower, RR 0.63, $p = 0.21$, treatment 16 of 161 (9.9%), control 100 of 653 (15.3%), NNT 19, adjusted per study, odds ratio converted to relative risk, AKI, ARDS, multi-organ failure, or mortality, propensity score matching, multivariable.
	ICU time, 9.2% lower, relative time 0.91, $p = 0.66$, treatment 22, control 169, propensity score matching.
	hospitalization time, 3.0% higher, relative time 1.03, $p = 0.69$, treatment 161, control 653, propensity score matching.
<i>Alwafi</i> , 1/20/2022, retrospective, Saudi Arabia, peer-reviewed, 6 authors, study period 7 March, 2020 - 15 April, 2020, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of no viral clearance, 14.7% lower, RR 0.85, $p = 0.65$, treatment 12 of 45 (26.7%), control 15 of 48 (31.2%), NNT 22, day 5, primary outcome.
	risk of no viral clearance, 25.3% lower, RR 0.75, $p = 0.60$, treatment 7 of 45 (15.6%), control 10 of 48 (20.8%), NNT 19, day 12.
<i>An</i> , 7/7/2020, retrospective, South Korea, preprint, 12 authors.	time to viral clearance, 3.0% lower, HR 0.97, $p = 0.92$, treatment 31, control 195.
<i>Annie</i> , 10/12/2020, retrospective, database analysis, USA, peer-reviewed, 5 authors, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 4.3% lower, RR 0.96, $p = 0.83$, treatment 48 of 367 (13.1%), control 50 of 367 (13.6%), NNT 183, odds ratio converted to relative risk.
	risk of death, 20.5% higher, RR 1.21, $p = 0.46$, treatment 29 of 199 (14.6%), control 24 of 199 (12.1%), odds ratio converted to relative risk.
<i>Aparisi</i> , 10/8/2020, prospective, Spain, preprint, 18 authors, average treatment delay 7.0 days, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 63.0% lower, RR 0.37, $p = 0.008$, treatment 122 of 605 (20.2%), control 27 of 49 (55.1%), NNT 2.9.
<i>Arshad</i> , 7/1/2020, retrospective, USA, peer-reviewed, 12 authors.	risk of death, 51.3% lower, HR 0.49, $p = 0.009$, treatment 162 of 1,202 (13.5%), control 108 of 409 (26.4%), NNT 7.7.
<i>Ashinyo</i> , 9/15/2020, retrospective, Ghana, peer-reviewed, 16 authors.	hospitalization time, 33.0% lower, relative time 0.67, $p = 0.03$, treatment 61, control 61.
<i>Assad</i> , 10/21/2022, retrospective, Iraq, peer-reviewed, 1 author, study period June 2020 - September 2020, excluded in exclusion analyses: unadjusted results with no group details; confounding by time possible, propensity to use HCQ changed significantly during the study period.	risk of death, 59.7% lower, RR 0.40, $p = 0.002$, treatment 9 of 72 (12.5%), control 68 of 219 (31.1%), NNT 5.4, enoxaparin+HCQ vs. enoxaparin.
<i>Atipornwanich</i> , 10/5/2021, Randomized Controlled Trial, Thailand, peer-reviewed, 16 authors, study period 19 October, 2020 - 20 July, 2021, dosage 400mg days 1-14, 800mg/day or 400mg/day, this	risk of death, 56.2% lower, RR 0.44, $p = 0.07$, treatment 7 of 100 (7.0%), control 16 of 100 (16.0%), NNT 11, moderate/severe, HCQ arms vs. non-HCQ arms.

trial compares with another treatment - results may be better when compared to placebo, this trial uses multiple treatments in the treatment arm (combined with oseltamivir/favipiravir and duranivir/ritonavir for moderate/severe, oseltamivir and duranivir/ritonavir for mild) - results of individual treatments may vary, trial NCT04303299 (history).	risk of progression, 54.2% lower, RR 0.46, $p = 0.02$, treatment 11 of 100 (11.0%), control 24 of 100 (24.0%), NNT 7.7, moderate/severe, HCQ arms vs. non-HCQ arms.
	time to viral-, 7.1% lower, relative time 0.93, $p = 0.51$, treatment mean 10.4 (± 6.3) $n=50$, control mean 11.2 (± 5.7) $n=50$, moderate/severe, oseltamivir arms, primary outcome.
	time to viral-, 6.9% lower, relative time 0.93, $p = 0.47$, treatment mean 9.5 (± 5.0) $n=50$, control mean 10.2 (± 4.6) $n=50$, moderate/severe, favipiravir arms, primary outcome.
<i>Auld</i> , 4/26/2020, retrospective, USA, peer-reviewed, 14 authors.	risk of death, 2.8% higher, RR 1.03, $p = 1.00$, treatment 33 of 114 (28.9%), control 29 of 103 (28.2%).
<i>Awad</i> , 2/18/2021, retrospective, USA, peer-reviewed, 4 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 19.1% higher, RR 1.19, $p = 0.60$, treatment 56 of 188 (29.8%), control 37 of 148 (25.0%).
	risk of mechanical ventilation, 460.7% higher, RR 5.61, $p < 0.001$, treatment 64 of 188 (34.0%), control 9 of 148 (6.1%), adjusted per study, odds ratio converted to relative risk.
	risk of ICU admission, 463.4% higher, RR 5.63, $p < 0.001$, treatment 67 of 188 (35.6%), control 9 of 148 (6.1%), adjusted per study, odds ratio converted to relative risk.
<i>Aweimer</i> , 3/29/2023, retrospective, Germany, peer-reviewed, median age 67.0, 19 authors, study period 1 March, 2020 - 31 August, 2021.	risk of death, 40.2% lower, RR 0.60, $p = 0.12$, treatment 4 of 9 (44.4%), control 104 of 140 (74.3%), NNT 3.4.
<i>Ayerbe</i> , 9/30/2020, retrospective, database analysis, Spain, peer-reviewed, 3 authors.	risk of death, 52.2% lower, RR 0.48, $p < 0.001$, treatment 237 of 1,857 (12.8%), control 49 of 162 (30.2%), NNT 5.7, adjusted per study, odds ratio converted to relative risk.
<i>Azaña Gómez</i> , 3/10/2022, retrospective, Spain, peer-reviewed, 10 authors, study period 1 March, 2020 - 1 October, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 35.8% lower, RR 0.64, $p < 0.001$, treatment 500 of 1,378 (36.3%), control 238 of 421 (56.5%), NNT 4.9.
<i>Babalola</i> , 10/1/2021, Single Blind Randomized Controlled Trial, Nigeria, peer-reviewed, 6 authors, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary, trial PACTR202108891693522.	risk of no hospital discharge, 54.5% higher, RR 1.55, $p = 0.20$, treatment 17 of 30 (56.7%), control 11 of 30 (36.7%), day 7.
	risk of no viral clearance, 9.5% lower, RR 0.90, $p = 0.78$, treatment 19 of 30 (63.3%), control 21 of 30 (70.0%), NNT 15, day 5 mid-recovery.
<i>Babayigit</i> , 8/31/2022, retrospective, Turkey, peer-reviewed, mean age 51.9, 68 authors, study period 11 March, 2020 - 18 July, 2020.	risk of mechanical ventilation, 112.4% higher, RR 2.12, $p = 0.21$, treatment 63 of 1,378 (4.6%), control 6 of 94 (6.4%), adjusted per study, odds ratio converted to relative risk, multivariable.
	risk of ICU admission, 52.8% higher, RR 1.53, $p = 0.33$, treatment 107 of 1,363 (7.9%), control 9 of 93 (9.7%), adjusted per study, odds ratio converted to relative risk, multivariable.
	hospitalization time, 16.7% higher, relative time 1.17, $p = 0.05$,

	treatment 852, control 63.
<i>Barbosa</i> , 4/12/2020, retrospective, USA, preprint, 5 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of death, 147.0% higher, RR 2.47, $p = 0.58$, treatment 2 of 17 (11.8%), control 1 of 21 (4.8%).
<i>Barra</i> , 7/31/2021, retrospective, Argentina, preprint, 12 authors, average treatment delay 5.0 days, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 10.8% lower, RR 0.89, $p = 1.00$, treatment 2 of 18 (11.1%), control 81 of 650 (12.5%), NNT 74, unadjusted.
<i>Barrat-Due</i> , 7/13/2021, Double Blind Randomized Controlled Trial, Norway, peer-reviewed, 41 authors, study period 28 March, 2020 - 4 October, 2020, average treatment delay 8.0 days, trial NCT04321616 (history).	risk of death, 120.0% higher, RR 2.20, $p = 0.35$, treatment 4 of 45 (8.9%), control 2 of 48 (4.2%), adjusted per study.
<i>Barry</i> , 3/23/2021, retrospective, Saudi Arabia, peer-reviewed, 14 authors.	risk of death, 98.9% lower, RR 0.01, $p = 0.60$, treatment 0 of 6 (0.0%), control 91 of 599 (15.2%), NNT 6.6, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
<i>Bassets-Bosch</i> , 4/30/2022, retrospective, Spain, peer-reviewed, 5 authors, study period 11 March, 2020 - 30 April, 2020, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	time to viral-, 29.2% lower, relative time 0.71, $p = 0.45$, treatment median 17.0 IQR 16.0 n=5, control median 24.0 IQR 21.0 n=5, onset to clearance.
<i>Beaumont</i> , 2/13/2022, retrospective, France, peer-reviewed, 22 authors, average treatment delay 6.0 days.	risk of death/intubation, 14.1% lower, HR 0.86, $p = 0.55$, treatment 7 of 38 (18.4%), control 88 of 258 (34.1%), NNT 6.4, adjusted per study, odds ratio converted to relative risk, Cox proportional hazards.
<i>Beltran Gonzalez</i> , 2/23/2021, Double Blind Randomized Controlled Trial, Mexico, peer-reviewed, mean age 53.8, 13 authors, study period 4 May, 2020 - 6 November, 2020, average treatment delay 7.0 days, trial NCT04391127 (history).	risk of death, 62.6% lower, RR 0.37, $p = 0.27$, treatment 2 of 33 (6.1%), control 6 of 37 (16.2%), NNT 9.8.
	risk of respiratory deterioration or death, 25.3% lower, RR 0.75, $p = 0.57$, treatment 6 of 33 (18.2%), control 9 of 37 (24.3%), NNT 16.
	risk of no hospital discharge, 12.1% higher, RR 1.12, $p = 1.00$, treatment 3 of 33 (9.1%), control 3 of 37 (8.1%).
<i>Berenguer</i> , 8/3/2020, retrospective, Spain, peer-reviewed, 8 authors, average treatment delay 7.0 days.	risk of death, 18.2% lower, RR 0.82, $p < 0.001$, treatment 681 of 2,618 (26.0%), control 438 of 1,377 (31.8%), NNT 17.
<i>Bernaola</i> , 7/21/2020, retrospective, Spain, preprint, 7 authors.	risk of death, 17.0% lower, HR 0.83, $p < 0.001$, treatment 236 of 1,498 (15.8%), control 28 of 147 (19.0%), NNT 30.
<i>Bielza</i> , 12/11/2020, retrospective, Spain, peer-reviewed, median age 87.0, 24 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 21.5% lower, RR 0.78, $p = 0.09$, treatment 33 of 91 (36.3%), control 249 of 539 (46.2%), NNT 10.
<i>Boari</i> , 11/17/2020, retrospective, Italy, peer-reviewed, 20 authors, excluded in exclusion	risk of death, 54.5% lower, RR 0.45, $p < 0.001$, treatment 41 of 202 (20.3%), control 25 of 56 (44.6%), NNT 4.1.

analyses: unadjusted results with no group details.	
<p><i>Bosaeed</i>, 4/30/2021, Randomized Controlled Trial, Saudi Arabia, peer-reviewed, 30 authors, study period 21 May, 2020 - 26 January, 2021, average treatment delay 5.85 days, trial NCT04392973 (history) (FACCT), excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline.</p>	risk of death, 3.7% lower, RR 0.96, $p = 0.91$, treatment 14 of 125 (11.2%), control 15 of 129 (11.6%), NNT 234, 90 days.
	risk of death, 28.6% lower, RR 0.71, $p = 0.45$, treatment 9 of 125 (7.2%), control 13 of 129 (10.1%), NNT 35, 28 days.
	risk of death, 65.1% higher, RR 1.65, $p = 0.68$, treatment 8 of 125 (6.4%), control 5 of 129 (3.9%), 14 days.
	risk of mechanical ventilation, 8.4% higher, RR 1.08, $p = 0.78$, treatment 21 of 125 (16.8%), control 20 of 129 (15.5%).
	risk of ICU admission, 31.0% higher, RR 1.31, $p = 0.24$, treatment 33 of 125 (26.4%), control 26 of 129 (20.2%).
	recovery time, 28.6% higher, relative time 1.29, $p = 0.29$, treatment 125, control 129.
	hospitalization time, 12.5% higher, relative time 1.12, $p = 0.42$, treatment 125, control 129.
	risk of no viral clearance, 2.6% lower, RR 0.97, $p = 0.75$, treatment 100 of 125 (80.0%), control 106 of 129 (82.2%), NNT 46.
<p><i>Bousquet</i>, 6/23/2020, prospective, France, peer-reviewed, 10 authors.</p>	risk of death, 42.8% lower, RR 0.57, $p = 0.15$, treatment 5 of 27 (18.5%), control 23 of 81 (28.4%), NNT 10, adjusted per study, odds ratio converted to relative risk.
<p><i>Bowen</i>, 8/25/2022, retrospective, USA, peer-reviewed, 10 authors, study period 1 March, 2020 - 31 March, 2021.</p>	risk of death, 20.0% lower, HR 0.80, $p = 0.007$, treatment 1,317, control 3,314, Table S2, Cox proportional hazards.
<p><i>Bubenek-Turconi</i>, 11/17/2022, prospective, Romania, peer-reviewed, 16 authors, study period March 2020 - March 2021.</p>	risk of death, 22.0% lower, OR 0.78, $p = 0.01$, RR approximated with OR.
<p><i>Budhiraja</i>, 11/18/2020, retrospective, India, preprint, 12 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.</p>	risk of death, 65.4% lower, RR 0.35, $p < 0.001$, treatment 69 of 834 (8.3%), control 34 of 142 (23.9%), NNT 6.4.
<p><i>Burdick</i>, 11/26/2020, prospective, USA, peer-reviewed, 14 authors.</p>	risk of death, 59.0% higher, HR 1.59, $p = 0.12$, treatment 142, control 148, adjusted per study, all patients.
	risk of death, 71.0% lower, HR 0.29, $p = 0.01$, treatment 26, control 17, adjusted per study, subgroup of patients where treatment is predicted to be beneficial.
<p><i>Byakika-Kibwika</i>, 6/4/2021, Randomized Controlled Trial, Uganda, preprint, 17 authors, study period October 2020 - December 2020.</p>	recovery time, no change, relative time 1.00, $p = 0.91$, treatment 36, control 29.
	relative improvement in Ct value, 29.3% better, RR 0.71, $p = 0.47$, treatment 15, control 15.

	<p>risk of no viral clearance, 2.6% higher, RR 1.03, $p = 1.00$, treatment 35 of 55 (63.6%), control 31 of 50 (62.0%), day 6.</p> <p>risk of no viral clearance, 6.7% higher, RR 1.07, $p = 0.85$, treatment 27 of 55 (49.1%), control 23 of 50 (46.0%), day 10.</p>
<p><i>Calderón</i>, 11/23/2021, retrospective, Mexico, peer-reviewed, 7 authors, dosage 200mg bid days 1-7.</p>	<p>risk of death, 214.8% higher, RR 3.15, $p = 0.38$, treatment 5 of 27 (18.5%), control 1 of 17 (5.9%).</p>
	<p>risk of mechanical ventilation, 651.9% higher, RR 7.52, $p = 0.15$, treatment 4 of 27 (14.8%), control 0 of 17 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).</p>
	<p>risk of ICU admission, 145.5% higher, RR 2.45, $p < 0.001$, treatment 16 of 27 (59.3%), control 0 of 17 (0.0%), adjusted per study, inverted to make RR<1 favor treatment.</p>
	<p>hospitalization time, 107.4% higher, relative time 2.07, $p = 0.006$, treatment 27, control 17.</p>
<p><i>Cangiano</i>, 12/22/2020, retrospective, Italy, peer-reviewed, 14 authors.</p>	<p>risk of death, 73.4% lower, RR 0.27, $p = 0.03$, treatment 5 of 33 (15.2%), control 37 of 65 (56.9%), NNT 2.4.</p>
<p><i>Capsoni</i>, 12/1/2020, retrospective, Italy, preprint, 13 authors, average treatment delay 7.0 days.</p>	<p>risk of mechanical ventilation, 40.0% lower, RR 0.60, $p = 0.30$, treatment 12 of 40 (30.0%), control 6 of 12 (50.0%), NNT 5.0.</p>
<p><i>Catteau</i>, 8/24/2020, retrospective, database analysis, Belgium, peer-reviewed, 11 authors, average treatment delay 5.0 days.</p>	<p>risk of death, 32.0% lower, HR 0.68, $p < 0.001$, treatment 804 of 4,542 (17.7%), control 957 of 3,533 (27.1%), NNT 11.</p>
<p><i>Cavalcanti</i>, 7/23/2020, Randomized Controlled Trial, Brazil, peer-reviewed, baseline oxygen required 41.8%, 14 authors, study period 29 March, 2020 - 18 May, 2020, average treatment delay 7.0 days.</p>	<p>risk of death, 16.0% lower, RR 0.84, $p = 0.77$, treatment 8 of 331 (2.4%), control 5 of 173 (2.9%), NNT 211, HCQ+HCQ/AZ.</p>
	<p>risk of hospitalization, 28.0% higher, RR 1.28, $p = 0.30$, treatment 331, control 173, HCQ+HCQ/AZ.</p>
<p><i>Chari</i>, 12/24/2020, retrospective, multiple countries, peer-reviewed, median age 69.0, 25 authors, excluded in exclusion analyses: unadjusted results with no group details.</p>	<p>risk of death, 33.1% lower, RR 0.67, $p = 0.17$, treatment 8 of 29 (27.6%), control 195 of 473 (41.2%), NNT 7.3.</p>
<p><i>Chen</i>, 7/10/2020, Randomized Controlled Trial, Taiwan, peer-reviewed, 19 authors, study period 1 April, 2020 - 31 May, 2020, trial NCT04384380 (history).</p>	<p>risk of no viral clearance, 24.0% lower, RR 0.76, $p = 0.71$, treatment 4 of 21 (19.0%), control 3 of 12 (25.0%), NNT 17, day 14.</p>
	<p>median time to PCR-, 50.0% lower, relative time 0.50, $p = 0.40$, treatment 21, control 12.</p>
<p><i>Chen (B)</i>, 7/10/2020, retrospective, Taiwan, peer-reviewed, 19 authors.</p>	<p>risk of no viral clearance, 29.0% higher, RR 1.29, $p = 0.70$, treatment 16 of 28 (57.1%), control 4 of 9 (44.4%), day 14.</p>
<p><i>Chen (C)</i>, 6/22/2020, Randomized Controlled Trial, China, preprint, 19 authors, study period 18 February, 2020 - 30 March, 2020, dosage 200mg bid days 1-10.</p>	<p>time to clinical recovery, 20.0% lower, relative time 0.80, $p = 0.51$, treatment median 6.0 IQR 5.0 n=18, control median 7.5 IQR 11.25 n=12, HCQ.</p>

	time to clinical recovery, 26.7% lower, relative time 0.73, $p = 0.36$, treatment median 5.5 IQR 4.25 $n=18$, control median 7.5 IQR 11.25 $n=12$, CQ.
	median time to PCR-, 71.4% lower, relative time 0.29, $p < 0.001$, treatment median 2.0 IQR 1.5 $n=18$, control median 7.0 IQR 7.0 $n=12$, HCQ.
	median time to PCR-, 64.3% lower, relative time 0.36, $p = 0.001$, treatment median 2.5 IQR 1.8 $n=18$, control median 7.0 IQR 7.0 $n=12$, CQ.
<i>Chen (D)</i> , 3/31/2020, Randomized Controlled Trial, China, preprint, 9 authors, study period 4 February, 2020 - 28 February, 2020.	risk of no improvement in pneumonia at day 6, 57.0% lower, RR 0.43, $p = 0.04$, treatment 6 of 31 (19.4%), control 14 of 31 (45.2%), NNT 3.9.
<i>Chen (E)</i> , 3/6/2020, Randomized Controlled Trial, China, peer-reviewed, 14 authors, study period 6 February, 2020 - 25 February, 2020, trial NCT04261517 (history).	risk of radiological progression, 29.0% lower, RR 0.71, $p = 0.57$, treatment 5 of 15 (33.3%), control 7 of 15 (46.7%), NNT 7.5.
	risk of viral+ at day 7, 100% higher, RR 2.00, $p = 1.00$, treatment 2 of 15 (13.3%), control 1 of 15 (6.7%).
<i>Choi</i> , 10/27/2020, retrospective, database analysis, South Korea, peer-reviewed, 8 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.	median time to PCR-, 22.0% higher, relative time 1.22, $p < 0.001$, treatment 701, control 701.
<i>Coll</i> , 10/23/2020, retrospective, Spain, peer-reviewed, median age 61.0, 29 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 45.6% lower, RR 0.54, $p < 0.001$, treatment 55 of 307 (17.9%), control 108 of 328 (32.9%), NNT 6.7.
<i>Corradini</i> , 4/24/2021, retrospective, Italy, peer-reviewed, 60 authors, dosage not specified.	risk of death, 70.2% lower, OR 0.30, $p < 0.001$, treatment 1,439, control 274, adjusted per study, Table S6, all patients, multivariable, RR approximated with OR.
	risk of death, 76.8% lower, OR 0.23, $p < 0.001$, treatment 546, control 71, adjusted per study, Table S6, mild condition patients, multivariable, RR approximated with OR.
	risk of death, 84.2% lower, OR 0.16, $p < 0.001$, treatment 184, control 64, adjusted per study, Table S6, moderate condition patients, multivariable, RR approximated with OR.
	risk of death, 29.0% higher, OR 1.29, $p = 0.73$, treatment 68, control 37, adjusted per study, Table S6, severe condition patients, multivariable, RR approximated with OR.
<i>Cortez</i> , 11/11/2021, retrospective, Philippines, peer-reviewed, 29 authors, study period March 2020 - October 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 15.0% lower, RR 0.85, $p = 1.00$, treatment 1 of 25 (4.0%), control 12 of 255 (4.7%), NNT 142.
<i>Cravedi</i> , 7/10/2020, retrospective, USA, peer-reviewed, mean age 60.0, 25 authors, average treatment delay 6.0 days, excluded in exclusion	risk of death, 53.0% higher, RR 1.53, $p = 0.17$, treatment 36 of 101 (35.6%), control 10 of 43 (23.3%).

analyses: substantial unadjusted confounding by indication likely.	
<i>Cárdenas-Jaén</i> , 6/20/2023, retrospective, Spain, peer-reviewed, median age 57.0, 44 authors, study period May 2020 - September 2020, excluded in exclusion analyses: unadjusted for baseline differences with no group details.	risk of severe case, 56.2% lower, RR 0.44, $p = 0.13$, treatment 3 of 42 (7.1%), control 126 of 787 (16.0%), NNT 11, odds ratio converted to relative risk.
<i>D'Arminio Monforte</i> , 7/29/2020, retrospective, Italy, peer-reviewed, 5 authors.	risk of death, 34.0% lower, HR 0.66, $p = 0.12$, treatment 53 of 197 (26.9%), control 47 of 92 (51.1%), NNT 4.1, adjusted per study.
<i>Davido</i> , 8/2/2020, retrospective, France, peer-reviewed, 14 authors.	risk of intubation/hospitalization, 55.0% lower, HR 0.45, $p = 0.04$, treatment 12 of 80 (15.0%), control 13 of 40 (32.5%), NNT 5.7.
<i>de Gonzalo-Calvo</i> , 6/17/2023, retrospective, Spain, peer-reviewed, median age 65.0, 46 authors, study period March 2020 - February 2021, trial NCT04457505 (history), excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 37.6% lower, RR 0.62, $p = 0.23$, treatment 6 of 32 (18.8%), control 138 of 459 (30.1%), NNT 8.8.
<i>De Luna</i> , 12/14/2020, retrospective, Dominican Republic, preprint, 10 authors, excluded in exclusion analyses: unadjusted results with no group details; substantial unadjusted confounding by indication likely.	risk of death, 104.5% higher, RR 2.05, $p = 0.69$, treatment 15 of 132 (11.4%), control 1 of 18 (5.6%).
<i>De Rosa</i> , 5/1/2021, retrospective, Italy, peer-reviewed, 20 authors, average treatment delay 6.0 days.	risk of death, 35.0% lower, RR 0.65, $p = 0.02$, treatment 118 of 731 (16.1%), control 80 of 280 (28.6%), NNT 8.0, adjusted per study, odds ratio converted to relative risk, multivariate logistic regression, patients alive at day 7.
<i>Delgado</i> , 2/20/2023, retrospective, USA, preprint, 7 authors, study period 1 March, 2020 - 31 December, 2020.	risk of death, 26.0% lower, OR 0.74, $p = 0.002$, treatment 1,239, control 8,399, both periods combined, RR approximated with OR.
	risk of death, 28.0% lower, OR 0.72, $p = 0.001$, treatment 1,157, control 2,064, early 2020, propensity score matching, RR approximated with OR.
	risk of death, 10.0% higher, OR 1.10, $p = 0.82$, treatment 82, control 6,335, late 2020, propensity score matching, RR approximated with OR.
<i>Di Castelnuovo</i> , 1/29/2021, retrospective, Italy, peer-reviewed, 112 authors.	risk of death, 40.0% lower, RR 0.60, $p < 0.001$, treatment 3,270, control 1,000, odds ratio converted to relative risk, multivariate Cox proportional hazards model 4, control prevalence approximated with overall prevalence.
<i>Di Castelnuovo (B)</i> , 8/25/2020, retrospective, Italy, peer-reviewed, 110 authors.	risk of death, 30.0% lower, HR 0.70, $p < 0.001$, treatment 386 of 2,634 (14.7%), control 90 of 817 (11.0%), adjusted per study.
<i>Dubee</i> , 10/21/2020, Randomized Controlled Trial,	risk of death at day 28, 46.0% lower, RR 0.54, $p = 0.21$,

France, peer-reviewed, median age 77.0, 18 authors, study period 2 April, 2020 - 21 May, 2020, average treatment delay 5.0 days, trial NCT04325893 (history).	treatment 6 of 124 (4.8%), control 11 of 123 (8.9%), NNT 24.
	risk of combined intubation/death at day 28, 26.0% lower, RR 0.74, $p = 0.48$, treatment 9 of 124 (7.3%), control 12 of 123 (9.8%), NNT 40.
<i>Dubernet</i> , 8/20/2020, retrospective, France, peer-reviewed, median age 66.0, 20 authors.	risk of ICU admission, 87.6% lower, RR 0.12, $p = 0.008$, treatment 1 of 17 (5.9%), control 9 of 19 (47.4%), NNT 2.4.
<i>Ebongue</i> , 3/18/2022, retrospective, Cameroon, peer-reviewed, 27 authors, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 43.0% lower, HR 0.57, $p = 0.04$, treatment 93 of 522 (17.8%), control 36 of 58 (62.1%), NNT 2.3, adjusted per study, multivariable.
<i>El-Sherbiny</i> , 8/15/2020, Randomized Controlled Trial, trial NCT04477083 (history).	Estimated 40 patient RCT with results missing over 3 years.
<i>Falcone</i> , 11/19/2020, prospective, propensity score matching, Italy, peer-reviewed, 19 authors, average treatment delay 6.5 days.	risk of death, 65.0% lower, RR 0.35, $p = 0.20$, treatment 40 of 238 (16.8%), control 30 of 77 (39.0%), NNT 4.5, adjusted per study, PSM.
	risk of death, 25.0% lower, RR 0.75, $p = 0.36$, treatment 40 of 238 (16.8%), control 30 of 77 (39.0%), NNT 4.5, adjusted per study, multivariate Cox regression.
	risk of death, 57.0% lower, RR 0.43, $p < 0.001$, treatment 40 of 238 (16.8%), control 30 of 77 (39.0%), NNT 4.5, adjusted per study, univariate Cox regression.
<i>Farooq</i> , 6/28/2020, Single Blind Randomized Controlled Trial, placebo-controlled, trial NCT04328272 (history).	Estimated 75 patient RCT with results missing over 3 years.
<i>Faíco-Filho</i> , 6/21/2020, prospective, Brazil, peer-reviewed, median age 58.0, 6 authors.	$\Delta t7-12 \Delta Ct$ improvement, 80.8% lower, RR 0.19, $p = 0.40$, treatment 34, control 32, mid-recovery, relative median Ct improvement, Figure 2.
	$\Delta t < 7 \Delta Ct$ improvement, 24.0% lower, RR 0.76, $p = 0.36$, treatment 34, control 32, relative median Ct improvement, Figure 2.
	$\Delta t > 12 \Delta Ct$ improvement, 15.0% higher, RR 1.15, $p = 0.52$, treatment 34, control 32, relative median Ct improvement, Figure 2.
<i>Fernández-Cruz</i> , 1/31/2022, retrospective, Spain, peer-reviewed, 10 authors, study period March 2020 - May 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 27.0% lower, RR 0.73, $p = 0.47$, treatment 23 of 63 (36.5%), control 4 of 8 (50.0%), NNT 7.4.
<i>Ferreira</i> , 11/26/2021, retrospective, Brazil, peer-reviewed, 5 authors, study period 12 March, 2020 - 8 July, 2020, average treatment delay 7.0 days, dosage not specified.	risk of death, 151.5% higher, RR 2.51, $p = 0.03$, treatment 17 of 111 (15.3%), control 11 of 81 (13.6%), odds ratio converted to relative risk, multivariate.
	risk of death/intubation, 45.9% higher, RR 1.46, $p = 0.23$, treatment 30 of 111 (27.0%), control 15 of 81 (18.5%).

	risk of death/intubation/ICU, 61.3% higher, RR 1.61, $p = 0.04$, treatment 42 of 111 (37.8%), control 19 of 81 (23.5%).
<i>Fontana</i> , 6/22/2020, retrospective, Italy, peer-reviewed, 8 authors.	risk of death, 50.0% lower, RR 0.50, $p = 0.53$, treatment 4 of 12 (33.3%), control 2 of 3 (66.7%), NNT 3.0.
<i>Fried</i> , 8/28/2020, retrospective, database analysis, USA, peer-reviewed, 11 authors, excluded in exclusion analyses: excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.	risk of death, 27.0% higher, RR 1.27, $p < 0.001$, treatment 1,048 of 4,232 (24.8%), control 1,466 of 7,489 (19.6%).
<i>Frontera</i> , 10/26/2020, retrospective, propensity score matching, USA, preprint, median age 64.0, 14 authors, this trial uses multiple treatments in the treatment arm (combined with zinc) - results of individual treatments may vary.	risk of death, 37.0% lower, HR 0.63, $p = 0.01$, treatment 121 of 1,006 (12.0%), control 424 of 2,467 (17.2%), NNT 19, adjusted per study, PSM.
	risk of death, 24.0% lower, HR 0.76, $p = 0.02$, treatment 121 of 1,006 (12.0%), control 424 of 2,467 (17.2%), NNT 19, adjusted per study, regression.
<i>Gadhiya</i> , 4/8/2021, retrospective, USA, peer-reviewed, 4 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 4.8% higher, RR 1.05, $p = 0.89$, treatment 22 of 55 (40.0%), control 33 of 216 (15.3%), adjusted per study, odds ratio converted to relative risk, multivariate logistic regression.
<i>Geleris</i> , 5/7/2020, retrospective, USA, peer-reviewed, 12 authors, excluded in exclusion analyses: significant issues found with adjustments.	risk of death/intubation, 4.0% higher, HR 1.04, $p = 0.76$, treatment 262 of 811 (32.3%), control 84 of 565 (14.9%), adjusted per study.
<i>Gerlovin</i> , 6/24/2021, retrospective, USA, peer-reviewed, 21 authors.	risk of death, 22.0% higher, HR 1.22, $p = 0.18$, treatment 90 of 429 (21.0%), control 141 of 770 (18.3%), adjusted per study, HCQ+AZ.
	risk of death, 21.0% higher, HR 1.21, $p = 0.33$, treatment 49 of 228 (21.5%), control 141 of 770 (18.3%), adjusted per study, HCQ.
	risk of mechanical ventilation, 55.0% higher, HR 1.55, $p = 0.02$, treatment 64 of 429 (14.9%), control 69 of 770 (9.0%), adjusted per study, HCQ+AZ.
	risk of mechanical ventilation, 33.0% higher, HR 1.33, $p = 0.25$, treatment 32 of 228 (14.0%), control 69 of 770 (9.0%), adjusted per study, HCQ.
<i>Go</i> , 9/27/2022, retrospective, USA, peer-reviewed, 2 authors, study period March 2020 - June 2020, this trial uses multiple treatments in the treatment arm (combined with AZ) - results of individual treatments may vary.	risk of death, 55.0% lower, HR 0.45, $p = 0.03$, adjusted per study, multivariable, Cox proportional hazards.
<i>Goldman</i> , 5/27/2020, retrospective, multiple countries, peer-reviewed, 26 authors, excluded in	risk of death, 22.3% lower, RR 0.78, $p = 0.46$, treatment 10 of 109 (9.2%), control 34 of 288 (11.8%), NNT 38.

exclusion analyses: unadjusted results with no group details.	
<i>Gonzalez</i> , 8/21/2020, retrospective, database analysis, Spain, preprint, 25 authors.	risk of death, 26.6% lower, RR 0.73, $p = 0.06$, treatment 1,246 of 8,476 (14.7%), control 341 of 1,168 (29.2%), NNT 6.9, adjusted per study, odds ratio converted to relative risk.
<i>Guglielmetti</i> , 10/25/2021, retrospective, Italy, peer-reviewed, 19 authors, study period 21 February, 2020 - 15 May, 2020.	risk of death, 28.0% lower, HR 0.72, $p = 0.10$, treatment 474, control 126, multivariable Cox proportional hazards.
<i>Guglielmetti (B)</i> , 12/9/2020, retrospective, Italy, peer-reviewed, 16 authors, average treatment delay 8.0 days.	risk of death, 35.0% lower, RR 0.65, $p = 0.22$, treatment 181, control 37, adjusted per study, multivariable Cox.
<i>Guisado-Vasco (B)</i> , 10/15/2020, retrospective, Spain, peer-reviewed, median age 69.0, 25 authors.	risk of death, 20.3% lower, RR 0.80, $p = 0.36$, treatment 127 of 558 (22.8%), control 14 of 49 (28.6%), NNT 17, adjusted per study, odds ratio converted to relative risk.
<i>Gupta</i> , 7/15/2020, retrospective, USA, peer-reviewed, baseline oxygen required 87.1%, 34 authors, excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline.	risk of death, 6.3% higher, RR 1.06, $p = 0.41$, treatment 631 of 1,761 (35.8%), control 153 of 454 (33.7%).
	risk of death, 3.7% lower, RR 0.96, $p = 0.53$, treatment 388 of 1,117 (34.7%), control 396 of 1,098 (36.1%), NNT 75, HCQ+AZ.
<i>Gómez</i> , 10/13/2022, retrospective, Spain, peer-reviewed, 10 authors, study period 1 March, 2020 - 1 October, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 35.8% lower, RR 0.64, $p < 0.001$, treatment 500 of 1,378 (36.3%), control 238 of 421 (56.5%), NNT 4.9.
<i>Güner</i> , 12/29/2020, retrospective, Turkey, peer-reviewed, 23 authors.	risk of ICU admission, 77.3% lower, RR 0.23, $p = 0.16$, treatment 604, control 100, inverted to make $RR < 1$ favor treatment, IPTW multivariate analysis, HCQ vs. favipiravir.
<i>Hafez</i> , 4/8/2022, retrospective, United Arab Emirates, peer-reviewed, 6 authors.	viral clearance time, 12.3% lower, HR 0.88, $p = 0.59$, treatment 40, control 1,446, inverted to make $HR < 1$ favor treatment, Cox proportional hazards.
	viral clearance time, 58.7% lower, HR 0.41, $p = 0.09$, treatment 4, control 1,446, inverted to make $HR < 1$ favor treatment, HCQ + favipiravir + lopinavir/ritonavir, Cox proportional hazards.
<i>Haji Aghajani</i> , 4/29/2021, retrospective, Iran, peer-reviewed, 7 authors.	risk of death, 19.5% lower, HR 0.81, $p = 0.09$, treatment 553, control 438, adjusted per study, Cox proportional hazards, RR approximated with OR.
<i>Hall</i> , 2/18/2022, retrospective, USA, peer-reviewed, 15 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 11.2% lower, RR 0.89, $p = 0.31$, treatment 31 of 56 (55.4%), control 280 of 449 (62.4%), NNT 14.
<i>Hawari</i> , 7/20/2022, Randomized Controlled Trial, trial NCT05113810 (history).	Estimated 110 patient RCT with results missing over 1 year.
<i>Heberto</i> , 9/12/2020, prospective, Mexico, peer-reviewed, 8 authors, this trial uses multiple treatments in the treatment arm (combined with	risk of death, 53.9% lower, RR 0.46, $p = 0.04$, treatment 139, control 115, odds ratio converted to relative risk.

AZ) - results of individual treatments may vary.	risk of mechanical ventilation, 65.1% lower, RR 0.35, $p = 0.008$, treatment 139, control 115, odds ratio converted to relative risk.
<i>Hernandez-Cardenas</i> , 2/5/2021, Randomized Controlled Trial, Mexico, preprint, 6 authors, study period 8 April, 2020 - 12 July, 2020, average treatment delay 7.4 days.	risk of death, 12.0% lower, RR 0.88, $p = 0.66$, treatment 106, control 108.
	risk of death, 57.0% lower, RR 0.43, $p = 0.29$, subgroup not intubated at baseline.
<i>Higgins</i> , 12/16/2022, Randomized Controlled Trial, multiple countries, peer-reviewed, 1896 authors, study period 9 March, 2020 - 22 June, 2021, trial NCT02735707 (history) (REMAP-CAP).	risk of death, 51.0% higher, HR 1.51, $p = 0.06$, treatment 16 of 41 (39.0%), control 107 of 311 (34.4%), adjusted per study, day 180.
<i>Ho</i> , 3/31/2023, retrospective, Malaysia, peer-reviewed, 11 authors, average treatment delay 8.05 days, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of progression, 889.7% higher, RR 9.90, $p = 0.03$, treatment 4 of 91 (4.4%), control 1 of 234 (0.4%), odds ratio converted to relative risk.
<i>Hong (B)</i> , 5/4/2022, retrospective, South Korea, peer-reviewed, 11 authors, study period 28 February, 2020 - 28 April, 2020.	recovery time, 24.9% lower, HR 0.75, $p = 0.45$, treatment 15, control 15, inverted to make HR<1 favor treatment, propensity score matching.
	hospitalization time, 12.7% higher, HR 1.13, $p = 0.75$, treatment 15, control 15, inverted to make HR<1 favor treatment, propensity score matching.
	viral clearance time, 0.5% lower, HR 1.00, $p = 0.99$, treatment 15, control 15, inverted to make HR<1 favor treatment, propensity score matching.
<i>Hraiech</i> , 5/24/2020, retrospective, France, peer-reviewed, 8 authors, average treatment delay 7.0 days, excluded in exclusion analyses: very late stage, ICU patients.	risk of death, 64.7% lower, RR 0.35, $p = 0.21$, treatment 2 of 17 (11.8%), control 5 of 15 (33.3%), NNT 4.6, day 38 +- 7.
	risk of death, 376.5% higher, RR 4.76, $p = 0.49$, treatment 2 of 17 (11.8%), control 0 of 15 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm), day 6 from ARDS.
	risk of no viral clearance, 2.9% higher, RR 1.03, $p = 1.00$, treatment 14 of 17 (82.4%), control 8 of 10 (80.0%), day 6 from treatment.
<i>Huang (C)</i> , 5/28/2020, prospective, China, peer-reviewed, 36 authors.	time to viral-, 67.0% lower, relative time 0.33, $p < 0.001$, treatment 197, control 176.
	time to viral-, 59.1% lower, relative time 0.41, $p < 0.001$, treatment 32, control 37, early treatment.
<i>Ip (B)</i> , 5/25/2020, retrospective, database analysis, USA, peer-reviewed, 32 authors, average treatment delay 5.0 days.	risk of death, 1.0% lower, HR 0.99, $p = 0.93$, treatment 432 of 1,914 (22.6%), control 115 of 598 (19.2%), adjusted per study.
<i>Izoulet</i> , 4/21/2020, retrospective, multiple countries, preprint, 1 author, dosage not specified, excluded in exclusion analyses: excessive	risk of death, 85.0% lower, RR 0.15, $p < 0.001$.

unadjusted differences between groups.	
<i>Jacobs</i> , 7/6/2021, prospective, USA, peer-reviewed, 14 authors, excluded in exclusion analyses: unadjusted results with no group details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 6.6% lower, RR 0.93, $p = 0.74$, treatment 24 of 46 (52.2%), control 86 of 154 (55.8%), NNT 27.
<i>Johnston</i> , 12/9/2020, Randomized Controlled Trial, USA, peer-reviewed, 30 authors, study period 15 April, 2020 - 27 July, 2020, average treatment delay 5.9 days, dosage 400mg bid day 1, 200mg bid days 2-10, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04354428 (history).	risk of hospitalization, 29.9% lower, RR 0.70, $p = 0.73$, treatment 5 of 148 (3.4%), control 4 of 83 (4.8%), NNT 69, HCQ + folic acid and HCQ + AZ vs. vitamin C + folic acid.
	risk of no recovery, 2.0% lower, RR 0.98, $p = 0.95$, treatment 30 of 60 (50.0%), control 34 of 72 (47.2%), adjusted per study, inverted to make RR<1 favor treatment, HCQ + folic acid vs. vitamin C + folic acid.
	risk of no recovery, 9.9% higher, RR 1.10, $p = 0.70$, treatment 34 of 65 (52.3%), control 34 of 72 (47.2%), adjusted per study, inverted to make RR<1 favor treatment, HCQ + AZ vs. vitamin C + folic acid.
	risk of no viral clearance, 38.3% lower, RR 0.62, $p = 0.047$, treatment 6 of 49 (12.2%), control 12 of 52 (23.1%), NNT 9.2, adjusted per study, inverted to make RR<1 favor treatment, HCQ + folic acid vs. vitamin C + folic acid.
	risk of no viral clearance, 20.0% lower, RR 0.80, $p = 0.49$, treatment 11 of 51 (21.6%), control 12 of 52 (23.1%), adjusted per study, inverted to make RR<1 favor treatment, HCQ + AZ vs. vitamin C + folic acid.
<i>Kalligeros</i> , 8/5/2020, retrospective, USA, peer-reviewed, 13 authors, average treatment delay 6.0 days.	risk of death, 67.0% higher, HR 1.67, $p = 0.57$, treatment 36, control 72.
<i>Kamran</i> , 8/4/2020, prospective, Pakistan, preprint, 10 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of progression, 5.0% lower, RR 0.95, $p = 1.00$, treatment 11 of 349 (3.2%), control 5 of 151 (3.3%), NNT 627.
	risk of progression, 54.8% lower, RR 0.45, $p = 0.30$, treatment 4 of 31 (12.9%), control 2 of 7 (28.6%), NNT 6.4, with comorbidities.
	risk of viral+ at day 14, 10.0% higher, RR 1.10, $p = 0.52$, treatment 349, control 151.
<i>Karruli</i> , 9/1/2021, retrospective, Italy, peer-reviewed, 13 authors, study period March 2020 - May 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 4.8% lower, RR 0.95, $p = 1.00$, treatment 20 of 28 (71.4%), control 3 of 4 (75.0%), NNT 28.
<i>Kelly</i> , 7/22/2020, retrospective, Ireland, peer-reviewed, 14 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death, 143.0% higher, RR 2.43, $p = 0.03$, treatment 23 of 82 (28.0%), control 6 of 52 (11.5%).

<i>Kim (B)</i> , 5/18/2020, retrospective, South Korea, preprint, 11 authors.	hospitalization time, 51.0% lower, relative time 0.49, $p = 0.01$, treatment 22, control 40.
	time to viral-, 56.0% lower, relative time 0.44, $p = 0.005$, treatment 22, control 40.
<i>Kokturk</i> , 4/28/2021, retrospective, database analysis, Turkey, peer-reviewed, 68 authors.	risk of death, 3.8% higher, RR 1.04, $p = 0.97$, treatment 62 of 1,382 (4.5%), control 5 of 118 (4.2%), adjusted per study, odds ratio converted to relative risk.
<i>Komissarov</i> , 6/30/2020, retrospective, Russia, preprint, 8 authors.	risk of viral load, 25.0% higher, RR 1.25, $p = 0.45$, treatment 26, control 10.
<i>Krishnan (B)</i> , 4/5/2023, retrospective, India, peer-reviewed, mean age 52.8, 48 authors, study period March 2020 - March 2021.	risk of death, 40.0% lower, OR 0.60, $p = 0.05$, treatment 603, control 1,828, adjusted per study, case control OR, multivariable.
<i>Krishnan</i> , 7/20/2020, retrospective, USA, peer-reviewed, 13 authors, dosage not specified, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 20.4% lower, RR 0.80, $p = 0.48$, treatment 86 of 144 (59.7%), control 6 of 8 (75.0%), NNT 6.5.
<i>Kuderer</i> , 5/28/2020, retrospective, USA, peer-reviewed, 73 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death, 134.2% higher, RR 2.34, $p < 0.001$, treatment 45 of 181 (24.9%), control 76 of 747 (10.2%), odds ratio converted to relative risk, HCQ+AZ.
<i>Lagier</i> , 6/4/2021, retrospective, France, peer-reviewed, 32 authors.	risk of death, 32.0% lower, HR 0.68, $p = 0.004$, treatment 93 of 1,270 (7.3%), control 146 of 841 (17.4%), NNT 10.0, adjusted per study, multivariable, Cox proportional hazards.
<i>Lagier (B)</i> , 6/25/2020, retrospective, France, peer-reviewed, 22 authors, dosage 200mg tid days 1-10.	risk of death, 59.0% lower, HR 0.41, $p = 0.048$, treatment 35 of 3,119 (1.1%), control 58 of 618 (9.4%), adjusted per study.
<i>Lamback</i> , 2/19/2021, retrospective, Brazil, peer-reviewed, 10 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 8.9% lower, RR 0.91, $p = 0.83$, treatment 11 of 101 (10.9%), control 11 of 92 (12.0%), NNT 94.
	risk of ICU admission, 19.9% higher, RR 1.20, $p = 0.61$, treatment 25 of 101 (24.8%), control 19 of 92 (20.7%).
<i>Lambermont</i> , 11/28/2020, retrospective, Belgium, peer-reviewed, 15 authors.	risk of death, 32.3% lower, RR 0.68, $p = 0.46$, treatment 97 of 225 (43.1%), control 14 of 22 (63.6%), NNT 4.9, adjusted per study.
<i>Lammers</i> , 9/29/2020, prospective, Netherlands, peer-reviewed, 18 authors.	risk of death/ICU, 32.0% lower, HR 0.68, $p = 0.02$, treatment 30 of 189 (15.9%), control 101 of 498 (20.3%), adjusted per study.
<i>Lano</i> , 10/21/2020, retrospective, France, peer-reviewed, median age 73.5, 30 authors.	risk of death, 33.1% lower, RR 0.67, $p = 0.28$, treatment 56, control 66, adjusted per study, odds ratio converted to relative risk.
	risk of death/ICU, 38.9% lower, RR 0.61, $p = 0.23$, treatment 17

	<p>of 56 (30.4%), control 28 of 66 (42.4%), NNT 8.3, adjusted per study, odds ratio converted to relative risk.</p> <p>risk of death/ICU, 68.7% lower, RR 0.31, $p = 0.11$, treatment 4 of 36 (11.1%), control 11 of 31 (35.5%), NNT 4.1, not requiring O2 on diagnosis (relatively early treatment).</p>
<i>Lauriola</i> , 9/14/2020, retrospective, Italy, peer-reviewed, mean age 71.8, 10 authors.	risk of death, 73.5% lower, HR 0.27, $p < 0.001$, treatment 102 of 297 (34.3%), control 35 of 63 (55.6%), NNT 4.7, adjusted per study.
<i>Lavilla Ollerios</i> , 1/21/2022, retrospective, Spain, peer-reviewed, 22 authors.	risk of death, 36.2% lower, RR 0.64, $p < 0.001$, treatment 2,285 of 12,772 (17.9%), control 774 of 2,149 (36.0%), NNT 5.5, adjusted per study, odds ratio converted to relative risk, multivariable.
<i>Lecronier</i> , 7/11/2020, retrospective, France, peer-reviewed, baseline oxygen required 100.0%, 25 authors, HCQ vs. control, excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline.	risk of death, 42.0% lower, RR 0.58, $p = 0.24$, treatment 9 of 38 (23.7%), control 9 of 22 (40.9%), NNT 5.8.
	risk of treatment escalation, 6.0% lower, RR 0.94, $p = 0.73$, treatment 15 of 38 (39.5%), control 9 of 22 (40.9%), NNT 70.
	risk of viral+ at day 7, 15.0% lower, RR 0.85, $p = 0.61$, treatment 19 of 26 (73.1%), control 12 of 14 (85.7%), NNT 7.9.
<i>Levi</i> , 12/11/2020, Randomized Controlled Trial, placebo-controlled, trial NCT04355052 (history) (COSTA).	Estimated 250 patient RCT with results missing over 2.5 years.
<i>Li</i> , 1/18/2021, retrospective, China, peer-reviewed, 21 authors.	risk of no hospital discharge, 50.0% lower, HR 0.50, $p = 0.09$, treatment 14, control 14, RCT patients vs. matched sample of non-treated patients.
<i>Li (B)</i> , 1/12/2021, retrospective, database analysis, China, preprint, 5 authors.	time to viral-, 40.0% higher, relative time 1.40, $p = 0.06$, treatment 18, control 19.
<i>Lora-Tamayo</i> , 2/11/2021, retrospective, Spain, peer-reviewed, 10 authors.	risk of death, 50.5% lower, RR 0.50, $p < 0.001$, treatment 7,192, control 1,361, odds ratio converted to relative risk, univariate, control prevalence approximated with overall prevalence.
<i>Lotfy</i> , 1/1/2021, retrospective, Saudi Arabia, peer-reviewed, mean age 55.0, 3 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 24.8% higher, RR 1.25, $p = 0.76$, treatment 6 of 99 (6.1%), control 5 of 103 (4.9%).
	risk of mechanical ventilation, 41.2% higher, RR 1.41, $p = 0.34$, treatment 19 of 99 (19.2%), control 14 of 103 (13.6%).
	risk of ICU admission, 16.5% higher, RR 1.17, $p = 0.53$, treatment 28 of 99 (28.3%), control 25 of 103 (24.3%).
<i>Luo</i> , 6/17/2020, retrospective, USA, peer-reviewed, 31 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death, 2.2% higher, RR 1.02, $p = 0.99$, treatment 11 of 35 (31.4%), control 4 of 13 (30.8%), odds ratio converted to relative risk.
<i>Luo (B)</i> , 5/21/2020, retrospective, China, peer-reviewed, 9 authors.	risk of death, 32.4% lower, OR 0.68, $p = 0.72$, treatment 19, control 264, inverted to make OR<1 favor treatment,

	multivariate, RR approximated with OR.
<i>Lyashchenko</i> , 8/12/2022, retrospective, USA, peer-reviewed, 6 authors, study period March 2020 - June 2020, average treatment delay 9.5 days, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death, 47.7% higher, RR 1.48, $p < 0.001$, treatment 389 of 1,419 (27.4%), control 341 of 1,837 (18.6%).
<i>Lyngbakken</i> , 7/17/2020, Randomized Controlled Trial, Norway, peer-reviewed, median age 62.0, 11 authors, average treatment delay 8.0 days, trial NCT04316377 (history).	risk of death, 3.7% lower, RR 0.96, $p = 1.00$, treatment 1 of 27 (3.7%), control 1 of 26 (3.8%), NNT 702.
	improvement in viral load reduction rate, 71.0% lower, relative rate 0.29, $p = 0.51$, treatment 27, control 26.
<i>López</i> , 11/2/2020, retrospective, Spain, peer-reviewed, 7 authors.	risk of progression, 64.3% lower, RR 0.36, $p = 0.02$, treatment 5 of 36 (13.9%), control 14 of 36 (38.9%), NNT 4.0.
<i>Magagnoli</i> , 4/21/2020, retrospective, database analysis, USA, peer-reviewed, 7 authors.	risk of death, 11.0% lower, HR 0.89, $p = 0.74$, treatment 39 of 148 (26.4%), control 18 of 163 (11.0%), adjusted per study, HCQ+AZ w/dispositions.
	risk of death, 1.0% lower, HR 0.99, $p = 0.98$, treatment 30 of 114 (26.3%), control 18 of 163 (11.0%), adjusted per study, HCQ w/dispositions.
	risk of death, 31.0% higher, HR 1.31, $p = 0.28$, treatment 49 of 214 (22.9%), control 37 of 395 (9.4%), adjusted per study, HCQ+AZ.
	risk of death, 83.0% higher, HR 1.83, $p = 0.009$, treatment 38 of 198 (19.2%), control 37 of 395 (9.4%), adjusted per study, HCQ.
<i>Mahale</i> , 12/31/2020, retrospective, India, peer-reviewed, 22 authors, study period 22 March, 2020 - 21 May, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 28.7% lower, RR 0.71, $p = 0.36$, treatment 25 of 102 (24.5%), control 11 of 32 (34.4%), NNT 10.
<i>Mahévas</i> , 5/14/2020, retrospective, France, peer-reviewed, 34 authors, average treatment delay 7.0 days.	risk of death, 20.0% higher, HR 1.20, $p = 0.75$, treatment 9 of 84 (10.7%), control 8 of 89 (9.0%), adjusted per study.
<i>Maldonado</i> , 11/5/2020, retrospective, Spain, peer-reviewed, 10 authors, excluded in exclusion analyses: treatment or control group size extremely small.	risk of death, 90.9% lower, RR 0.09, $p = 0.17$, treatment 1 of 11 (9.1%), control 1 of 1 (100.0%), NNT 1.1.
<i>Mallat</i> , 5/2/2020, retrospective, United Arab Emirates, peer-reviewed, 8 authors, average treatment delay 4.0 days.	time to viral-, 203.0% higher, relative time 3.03, $p = 0.02$, treatment 23, control 11, inverted to make $RR < 1$ favor treatment.
<i>Malundo</i> , 7/14/2022, retrospective, Philippines, peer-reviewed, 16 authors, study period 12 March, 2021 - 9 September, 2021, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 24.4% higher, RR 1.24, $p = 0.32$, treatment 20 of 90 (22.2%), control 201 of 1,125 (17.9%).
<i>Martin-Vicente</i> , 3/8/2021, retrospective, Spain,	risk of death, 59.3% lower, RR 0.41, $p = 0.41$, treatment 37 of

preprint, 38 authors, excluded in exclusion analyses: unadjusted results with no group details; treatment or control group size extremely small.	91 (40.7%), control 1 of 1 (100.0%), NNT 1.7.
<i>Martinez-Lopez</i> , 6/30/2020, retrospective, Spain, peer-reviewed, median age 71.0, 25 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 33.0% lower, RR 0.67, $p = 0.20$, treatment 47 of 148 (31.8%), control 9 of 19 (47.4%), NNT 6.4.
<i>Matangila</i> , 12/18/2020, retrospective, DR Congo, peer-reviewed, median age 54.0, 12 authors, average treatment delay 7.0 days.	risk of death, 54.9% lower, RR 0.45, $p = 0.21$, treatment 25 of 147 (17.0%), control 8 of 13 (61.5%), NNT 2.2, adjusted per study, odds ratio converted to relative risk.
<i>McGrail</i> , 7/19/2020, retrospective, USA, preprint, 2 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of death, 70.0% higher, RR 1.70, $p = 0.69$, treatment 4 of 33 (12.1%), control 3 of 42 (7.1%).
<i>Membrillo de Novales</i> , 5/5/2020, retrospective, Spain, preprint, 19 authors, average treatment delay 7.0 days.	risk of death, 55.1% lower, RR 0.45, $p = 0.002$, treatment 27 of 123 (22.0%), control 21 of 43 (48.8%), NNT 3.7.
<i>Menardi</i> , 9/30/2021, retrospective, Italy, peer-reviewed, 10 authors, excluded in exclusion analyses: excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.	risk of death, 35.2% lower, RR 0.65, $p = 0.12$, treatment 32 of 200 (16.0%), control 19 of 77 (24.7%), NNT 12.
<i>Mežnar</i> , 7/31/2020, Randomized Controlled Trial, trial NCT04355026 (history).	Estimated 90 patient RCT with results missing over 3 years.
<i>Mikami</i> , 6/30/2020, retrospective, USA, peer-reviewed, 7 authors.	risk of death, 47.0% lower, HR 0.53, $p < 0.001$, treatment 575 of 2,077 (27.7%), control 231 of 743 (31.1%), adjusted per study.
<i>Modrák</i> , 12/4/2020, retrospective, Czech Republic, preprint, 26 authors.	risk of death, 59.0% lower, RR 0.41, $p = 0.04$, treatment 108, control 105, Cox (single).
<i>Mohandas</i> , 4/26/2021, retrospective, India, peer-reviewed, 6 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; unadjusted results with no group details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 81.0% higher, RR 1.81, $p = 0.007$, treatment 27 of 384 (7.0%), control 115 of 2,961 (3.9%).
<i>Mordmüller</i> , 2/26/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04342221 (history).	30 patient RCT with results missing over 2.5 years.
<i>Mulhem</i> , 4/7/2021, retrospective, database analysis, USA, peer-reviewed, 3 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 28.3% higher, RR 1.28, $p = 0.10$, treatment 435 of 2,496 (17.4%), control 81 of 723 (11.2%), adjusted per study, odds ratio converted to relative risk, logistic regression.

<p><i>Nachega</i>, 10/2/2020, retrospective, database analysis, DR Congo, peer-reviewed, median age 46.0, 25 authors.</p>	<p>risk of death, 27.6% lower, RR 0.72, $p = 0.17$, treatment 69 of 630 (11.0%), control 28 of 96 (29.2%), NNT 5.5, adjusted per study, odds ratio converted to relative risk.</p>
	<p>risk of no improvement, 25.8% better, RR 0.74, $p = 0.13$, adjusted per study, odds ratio converted to relative risk.</p>
<p><i>Naseem</i>, 12/14/2020, retrospective, Pakistan, preprint, 5 authors.</p>	<p>risk of death, 33.3% lower, RR 0.67, $p = 0.34$, treatment 77, control 1,137, multivariate Cox.</p>
<p><i>Niwas</i>, 11/1/2020, retrospective, India, peer-reviewed, mean age 45.5, 17 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.</p>	<p>recovery time, 29.2% lower, relative time 0.71, $p = 0.008$, treatment mean 6.3 (± 2.7) $n=12$, control mean 8.9 (± 2.2) $n=17$.</p>
	<p>risk of no viral clearance, 183.3% higher, RR 2.83, $p = 0.55$, treatment 2 of 12 (16.7%), control 1 of 17 (5.9%).</p>
<p><i>Novartis</i>, 7/27/2020, Double Blind Randomized Controlled Trial, placebo-controlled, USA, preprint, 1 author, trial NCT04358081 (history).</p>	<p>risk of no hospital discharge, 70.6% lower, RR 0.29, $p = 0.42$, treatment 0 of 7 (0.0%), control 1 of 5 (20.0%), NNT 5.0, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), day 15.</p>
	<p>risk of no improvement, 70.6% lower, RR 0.29, $p = 0.42$, treatment 0 of 7 (0.0%), control 1 of 5 (20.0%), NNT 5.0, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), clinical response, day 15.</p>
	<p>risk of no viral clearance, 78.6% higher, RR 1.79, $p = 0.56$, treatment 5 of 7 (71.4%), control 2 of 5 (40.0%), day 10.</p>
<p><i>Núñez-Gil</i>, 9/9/2022, retrospective, Spain, peer-reviewed, 32 authors.</p>	<p>risk of death, 53.0% lower, OR 0.47, $p < 0.001$, treatment 581, control 581, propensity score matching, RR approximated with OR.</p>
<p><i>Núñez-Gil (B)</i>, 11/9/2020, retrospective, database analysis, multiple countries, peer-reviewed, median age 68.0, 49 authors.</p>	<p>risk of death, 7.9% lower, RR 0.92, $p = 0.005$, treatment 200 of 686 (29.2%), control 100 of 268 (37.3%), adjusted per study, odds ratio converted to relative risk.</p>
<p><i>Omma</i>, 1/31/2022, retrospective, Turkey, peer-reviewed, 11 authors, study period 1 April, 2020 - 31 December, 2020.</p>	<p>risk of death, 28.2% lower, RR 0.72, $p = 0.30$, treatment 17 of 213 (8.0%), control 20 of 180 (11.1%), NNT 32.</p>
	<p>risk of ICU admission, 50.2% lower, RR 0.50, $p = 0.004$, treatment 23 of 213 (10.8%), control 39 of 180 (21.7%), NNT 9.2.</p>
	<p>hospitalization time, 16.7% lower, relative time 0.83, $p = 0.007$, treatment 213, control 180.</p>
<p><i>Orioli</i>, 12/14/2020, retrospective, Belgium, peer-reviewed, 9 authors.</p>	<p>risk of death, 12.7% lower, RR 0.87, $p = 1.00$, treatment 8 of 55 (14.5%), control 3 of 18 (16.7%), NNT 47.</p>
<p><i>Osawa</i>, 7/1/2022, retrospective, Brazil, peer-reviewed, mean age 62.7, 2 authors, study period 18 March, 2020 - 26 October, 2020.</p>	<p>risk of death, 28.6% lower, RR 0.71, $p = 0.07$, treatment 25 of 71 (35.2%), control 71 of 144 (49.3%), NNT 7.1.</p>
<p><i>Ouedraogo</i>, 2/5/2021, retrospective, Burkina Faso,</p>	<p>risk of death, 33.0% lower, HR 0.67, $p = 0.38$, treatment 397,</p>

peer-reviewed, 14 authors.	control 59, multivariate.
	risk of ARDS, 68.0% lower, OR 0.32, $p = 0.001$, treatment 397, control 59, multivariate, RR approximated with OR.
<i>Ozturk</i> , 12/4/2020, retrospective, Turkey, peer-reviewed, 70 authors.	risk of death, 43.9% lower, RR 0.56, $p = 0.14$, treatment 165 of 1,127 (14.6%), control 6 of 23 (26.1%), NNT 8.7, CQ/HCQ.
<i>Pablos</i> , 8/12/2020, retrospective, Spain, peer-reviewed, mean age 63.0, 15 authors.	risk of severe case, 126.0% higher, OR 2.26, $p = 0.002$, treatment 172, control 56, RR approximated with OR.
<i>Paccoud</i> , 6/18/2020, retrospective, France, peer-reviewed, 20 authors.	risk of death, 11.0% lower, HR 0.89, $p = 0.88$, treatment 21 of 38 (55.3%), control 26 of 46 (56.5%), NNT 79, adjusted per study.
<i>Panda</i> , 9/30/2021, Randomized Controlled Trial, India, peer-reviewed, 13 authors, study period June 2020 - May 2021, this trial uses multiple treatments in the treatment arm (combined with ribavirin) - results of individual treatments may vary, trial CTRI/2020/06/025575.	risk of death, 47.5% lower, RR 0.53, $p = 0.45$, treatment 3 of 20 (15.0%), control 6 of 21 (28.6%), NNT 7.4.
<i>Pasquini</i> , 8/23/2020, retrospective, Italy, peer-reviewed, 9 authors, average treatment delay 10.0 days, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 16.4% lower, RR 0.84, $p = 0.34$, treatment 23 of 33 (69.7%), control 15 of 18 (83.3%), NNT 7.3.
<i>Peng</i> , 12/4/2020, retrospective, China, peer-reviewed, 21 authors.	risk of progression, 10.8% lower, RR 0.89, $p = 0.63$, treatment 29 of 453 (6.4%), control 256 of 3,567 (7.2%), NNT 129, CQ/HCQ risk of AKI.
<i>Peters</i> , 8/15/2020, retrospective, Netherlands, peer-reviewed, 21 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of death, 9.0% higher, HR 1.09, $p = 0.57$, treatment 419 of 1,596 (26.3%), control 53 of 353 (15.0%), adjusted per study.
<i>Pinato</i> , 8/18/2020, retrospective, multiple countries, peer-reviewed, 64 authors.	risk of death, 59.0% lower, HR 0.41, $p < 0.001$, treatment 30 of 182 (16.5%), control 181 of 446 (40.6%), NNT 4.1.
<i>Pseudos</i> , 12/31/2020, retrospective, USA, peer-reviewed, 3 authors, excluded in exclusion analyses: unadjusted results with no group details; no treatment details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 63.5% higher, RR 1.63, $p = 0.52$, treatment 17 of 52 (32.7%), control 3 of 15 (20.0%).
<i>Purwati (B)</i> , 2/9/2021, Double Blind Randomized Controlled Trial, Indonesia, peer-reviewed, 12 authors, study period July 2020 - August 2020.	risk of no viral clearance, 66.3% lower, RR 0.34, $p < 0.001$, treatment 38 of 121 (31.4%), control 111 of 119 (93.3%), NNT 1.6, day 7.
<i>Qin</i> , 11/23/2020, retrospective, China, peer-reviewed, 17 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 34.3% lower, RR 0.66, $p = 0.61$, treatment 3 of 43 (7.0%), control 75 of 706 (10.6%), NNT 27.
<i>Ramírez-García</i> , 5/31/2021, retrospective, Spain,	risk of death, 67.0% lower, RR 0.33, $p < 0.001$, treatment 48 of

peer-reviewed, 5 authors, excluded in exclusion analyses: excessive unadjusted differences between groups; substantial unadjusted confounding by indication likely.	350 (13.7%), control 22 of 53 (41.5%), NNT 3.6.
	risk of ICU admission, 6.0% higher, RR 1.06, $p = 1.00$, treatment 35 of 350 (10.0%), control 5 of 53 (9.4%).
<i>RECOVERY</i> , 6/5/2020, Randomized Controlled Trial, United Kingdom, preprint, baseline oxygen required 76.8%, 29 authors, study period 25 March, 2020 - 5 June, 2020, average treatment delay 9.0 days, trial NCT04381936 (history) (RECOVERY), excluded in exclusion analyses: excessive dosage in late stage patients, results do not apply to typical dosages.	risk of death, 9.0% higher, RR 1.09, $p = 0.15$, treatment 421 of 1,561 (27.0%), control 790 of 3,155 (25.0%).
	risk of mechanical ventilation, 15.0% higher, RR 1.15, $p = 0.19$, treatment 128 of 1,300 (9.8%), control 225 of 2,623 (8.6%).
<i>Reis</i> , 4/22/2021, Double Blind Randomized Controlled Trial, Brazil, peer-reviewed, 18 authors, study period 2 June, 2020 - 30 September, 2020, dosage 800mg day 1, 400mg days 2-10, trial NCT04403100 (history) (TOGETHER).	risk of death, 66.0% lower, RR 0.34, $p = 1.00$, treatment 0 of 214 (0.0%), control 1 of 227 (0.4%), NNT 227, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of hospitalization, 24.0% lower, HR 0.76, $p = 0.57$, treatment 8 of 214 (3.7%), control 11 of 227 (4.8%), NNT 90, ITT, Cox proportional hazards.
	risk of no viral clearance, 4.1% lower, RR 0.96, $p = 0.10$, treatment 97 of 185 (52.4%), control 102 of 179 (57.0%), NNT 22, adjusted per study, odds ratio converted to relative risk, ITT, mixed-effect logistic model.
<i>Rivera</i> , 7/22/2020, retrospective, USA, peer-reviewed, 45 authors.	risk of death, 2.4% higher, RR 1.02, $p = 0.92$, treatment 44 of 179 (24.6%), control 59 of 327 (18.0%), adjusted per study, odds ratio converted to relative risk.
<i>Rivera-Izquierdo</i> , 7/9/2020, retrospective, Spain, peer-reviewed, 21 authors.	risk of death, 19.0% lower, RR 0.81, $p = 0.75$, treatment 215, control 23.
<i>Rodriguez</i> , 11/9/2020, prospective, Spain, peer-reviewed, 13 authors, average treatment delay 8.0 days, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 59.0% lower, RR 0.41, $p = 0.23$, treatment 8 of 39 (20.5%), control 2 of 4 (50.0%), NNT 3.4.
<i>Rodriguez-Gonzalez</i> , 11/28/2020, retrospective, Spain, peer-reviewed, 20 authors, average treatment delay 6.0 days.	risk of death, 22.8% lower, RR 0.77, $p = 0.26$, treatment 251 of 1,148 (21.9%), control 17 of 60 (28.3%), NNT 15.
<i>Rodriguez-Nava</i> , 11/5/2020, retrospective, USA, peer-reviewed, median age 68.0, 8 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; excessive unadjusted differences between groups; unadjusted results with no group details.	risk of death, 6.3% higher, RR 1.06, $p = 0.77$, treatment 22 of 65 (33.8%), control 79 of 248 (31.9%), unadjusted.
<i>Rogado</i> , 5/29/2020, retrospective, Spain, peer-reviewed, 9 authors.	risk of death, 91.6% lower, RR 0.08, $p = 0.02$, treatment 1 of 8 (12.5%), control 7 of 9 (77.8%), NNT 1.5, odds ratio converted to relative risk, multivariate logistic regression.
<i>Roger</i> , 7/10/2021, prospective, France, peer-reviewed, 34 authors, average treatment delay 8.0	risk of death, no change, RR 1.00, $p = 0.94$, treatment 53 of 289 (18.3%), control 120 of 677 (17.7%), odds ratio converted

days, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	to relative risk.
<i>Roig</i> , 1/31/2021, retrospective, Spain, peer-reviewed, 6 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 15.6% lower, RR 0.84, $p = 0.76$, treatment 33 of 67 (49.3%), control 7 of 12 (58.3%), NNT 11.
<i>Roomi</i> , 8/13/2020, retrospective, USA, peer-reviewed, 11 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death, 37.7% higher, RR 1.38, $p = 0.54$, treatment 13 of 144 (9.0%), control 6 of 32 (18.8%), adjusted per study, odds ratio converted to relative risk.
<i>Rosenberg</i> , 5/11/2020, retrospective, USA, peer-reviewed, 14 authors.	risk of death, 35.0% higher, HR 1.35, $p = 0.31$, treatment 189 of 735 (25.7%), control 28 of 221 (12.7%), adjusted per study.
<i>Rosenthal</i> , 12/10/2020, retrospective, database analysis, USA, peer-reviewed, 5 authors, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 8.0% higher, OR 1.08, $p = 0.13$, adjusted per study, multivariable, RR approximated with OR.
<i>Rouamba</i> , 2/26/2022, retrospective, Burkina Faso, peer-reviewed, mean age 42.2, 17 authors, study period 9 March, 2020 - 31 October, 2020, dosage 200mg tid days 1-10, HCQ 200mg tid daily or CQ 250mg bid daily, trial NCT04445441 (history).	risk of death, 80.0% lower, HR 0.20, $p < 0.001$, treatment 20 of 336 (6.0%), control 24 of 73 (32.9%), NNT 3.7, adjusted per study, inpatients, multivariable, Cox proportional hazards.
	risk of progression, 20.0% lower, HR 0.80, $p = 0.43$, treatment 75 of 745 (10.1%), control 19 of 118 (16.1%), adjusted per study, all patients, multivariable, Cox proportional hazards.
	risk of progression, 7.0% higher, HR 1.07, $p = 0.83$, treatment 52 of 347 (15.0%), control 15 of 85 (17.6%), adjusted per study, inpatients, multivariable, Cox proportional hazards.
	time to viral clearance, 30.6% lower, HR 0.69, $p = 0.26$, treatment 746, control 118, adjusted per study, inverted to make HR<1 favor treatment, all patients, propensity score matching, multivariable, Cox proportional hazards, primary outcome.
	time to viral clearance, 13.0% lower, HR 0.87, $p = 0.29$, treatment 746, control 118, adjusted per study, inverted to make HR<1 favor treatment, all patients, without PSM, multivariable, Cox proportional hazards, primary outcome.
	time to viral clearance, 13.8% lower, HR 0.86, $p = 0.37$, treatment 345, control 86, adjusted per study, inverted to make HR<1 favor treatment, inpatients, multivariable, Cox proportional hazards, primary outcome.
<i>Rubio-Sánchez</i> , 3/3/2021, retrospective, Spain, peer-reviewed, 3 authors, study period 14 March, 2020 - 5 June, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of severe case, 40.0% lower, RR 0.60, $p = 0.02$, treatment 51 of 161 (31.7%), control 19 of 36 (52.8%), NNT 4.7.
<i>Réa-Neto</i> , 4/27/2021, Randomized Controlled	risk of death, 57.0% higher, RR 1.57, $p = 0.20$, treatment 16 of

Trial, Brazil, peer-reviewed, 6 authors, study period 16 April, 2020 - 6 August, 2020, average treatment delay 8.0 days, trial NCT04420247 (history).	53 (30.2%), control 10 of 52 (19.2%).
	risk of mechanical ventilation, 115.0% higher, RR 2.15, $p = 0.03$, treatment 53, control 52.
	9-point scale clinical status, 147.0% higher, OR 2.47, $p = 0.02$, treatment 53, control 52, RR approximated with OR.
<i>Saib</i> , 6/9/2021, prospective, propensity score matching, France, peer-reviewed, 9 authors, average treatment delay 7.2 days, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	risk of death/intubation, 125.0% higher, RR 2.25, $p = 0.23$, treatment 9 of 52 (17.3%), control 4 of 52 (7.7%), PSM.
<i>Said</i> , 5/1/2023, retrospective, Saudi Arabia, peer-reviewed, 12 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 77.5% lower, RR 0.22, $p < 0.001$, treatment 14 of 435 (3.2%), control 58 of 405 (14.3%), NNT 9.0.
<i>Salazar</i> , 11/4/2020, retrospective, USA, peer-reviewed, 19 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; unadjusted results with no group details.	risk of death, 37.0% higher, RR 1.37, $p = 0.28$, treatment 12 of 92 (13.0%), control 80 of 811 (9.9%).
<i>Saleemi</i> , 8/11/2020, retrospective, Saudi Arabia, preprint, 5 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely.	median time to PCR-, 21.0% higher, relative time 1.21, $p < 0.05$, treatment 65, control 20.
<i>Salehi</i> , 3/11/2022, retrospective, Iran, preprint, mean age 62.0, 11 authors, study period April 2021 - September 2021, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 14.5% higher, RR 1.14, $p = 0.44$, treatment 53 of 86 (61.6%), control 21 of 39 (53.8%).
<i>Salvador</i> , 3/4/2021, prospective, Portugal, peer-reviewed, 10 authors.	risk of death, 32.9% lower, RR 0.67, $p = 0.10$, treatment 28 of 121 (23.1%), control 58 of 124 (46.8%), NNT 4.2, odds ratio converted to relative risk, multivariate.
	risk of mechanical ventilation, 447.8% higher, RR 5.48, $p = 0.003$, treatment 32 of 121 (26.4%), control 12 of 124 (9.7%), odds ratio converted to relative risk, multivariate.
	risk of death/intubation, 16.7% lower, RR 0.83, $p = 0.21$, treatment 51 of 121 (42.1%), control 63 of 124 (50.8%), NNT 12, odds ratio converted to relative risk, univariate.
<i>Sammartino</i> , 5/10/2021, retrospective, propensity score matching, USA, peer-reviewed, 7 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 240.0% higher, OR 3.40, $p = 0.002$, treatment 137, control 191, PSM, model 1a, RR approximated with OR.
<i>Sands</i> , 1/1/2021, retrospective, database analysis, USA, peer-reviewed, 10 authors, excluded in exclusion analyses: includes PCR+ patients that	risk of death, 69.9% higher, RR 1.70, $p = 0.01$, treatment 101 of 973 (10.4%), control 56 of 696 (8.0%), odds ratio converted to relative risk.

may be asymptomatic for COVID-19 but in hospital for other reasons; substantial unadjusted confounding by indication likely.	
<i>Santos</i> , 7/27/2020, prospective, Spain, peer-reviewed, median age 78.4, mean age 75.3, 6 authors, study period 1 March, 2020 - 1 June, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 9.7% lower, RR 0.90, $p = 1.00$, treatment 8 of 31 (25.8%), control 2 of 7 (28.6%), NNT 36, HCQ, late treatment result.
	risk of death, 50.8% lower, RR 0.49, $p = 0.65$, treatment 1 of 7 (14.3%), control 9 of 31 (29.0%), NNT 6.8, CQ, late treatment result.
<i>Sarfaraz</i> , 1/2/2021, retrospective, Pakistan, preprint, 7 authors, average treatment delay 7.0 days, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; significant unadjusted confounding possible; unadjusted results with no group details.	risk of death, 45.0% higher, RR 1.45, $p = 0.07$, treatment 40 of 94 (42.6%), control 27 of 92 (29.3%).
<i>Sarhan</i> , 11/2/2021, Randomized Controlled Trial, Egypt, peer-reviewed, 8 authors, study period 1 October, 2020 - 10 March, 2021, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04779047 (history), excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline; significant unadjusted differences between groups.	risk of death, 25.7% lower, RR 0.74, $p = 0.39$, treatment 12 of 56 (21.4%), control 15 of 52 (28.8%), NNT 13.
	risk of no hospital discharge, 25.7% lower, RR 0.74, $p = 0.39$, treatment 12 of 56 (21.4%), control 15 of 52 (28.8%), NNT 13.
	hospitalization time, 25.0% higher, relative time 1.25, $p = 0.06$, treatment 56, control 52.
<i>Sbidian</i> , 6/19/2020, retrospective, database analysis, France, preprint, 21 authors, excluded in exclusion analyses: significant issues found with adjustments.	risk of death, 5.0% higher, RR 1.05, $p = 0.74$, treatment 111 of 623 (17.8%), control 830 of 3,792 (21.9%), adjusted per study, whole population HCQ AIPW adjusted.
	risk of no hospital discharge, 20.0% lower, RR 0.80, $p = 0.002$, treatment 623, control 3,792, adjusted per study, inverted to make $RR < 1$ favor treatment, whole population HCQ AIPW adjusted.
<i>Schmidt</i> , 11/12/2021, retrospective, USA, peer-reviewed, 42 authors, study period 17 March, 2020 - 11 February, 2021, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 333.0% higher, OR 4.33, $p < 0.001$, treatment 70, control 407, adjusted per study, propensity score matching, multivariable, RR approximated with OR.
	risk of severe case, 613.0% higher, OR 7.13, $p < 0.001$, treatment 70, control 407, adjusted per study, propensity score matching, multivariable, RR approximated with OR.
<i>Schwartz</i> , 6/18/2021, Double Blind Randomized Controlled Trial, Canada, peer-reviewed, 20 authors, study period April 2020 - September 2020, average treatment delay 7.0 days, dosage 800mg day 1, 400mg days 2-5.	risk of ICU admission, 133.3% higher, RR 2.33, $p = 1.00$, treatment 1 of 111 (0.9%), control 0 of 37 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).
	risk of hospitalization, 533.3% higher, RR 6.33, $p = 0.57$, treatment 4 of 111 (3.6%), control 0 of 37 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).
	risk of ICU admission, 141.9% higher, RR 2.42, $p = 1.00$, treatment 1 of 74 (1.4%), control 0 of 31 (0.0%), continuity

	correction due to zero event (with reciprocal of the contrasting arm), per-protocol.
	risk of hospitalization, 141.9% higher, RR 2.42, $p = 1.00$, treatment 1 of 74 (1.4%), control 0 of 31 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm), per-protocol.
	lack of improvement ≥ 1 year, 37.0% lower, OR 0.63, $p = 0.15$, treatment 90, control 89, day 365, RR approximated with OR.
	persistence ≥ 1 year, 14.0% lower, OR 0.86, $p = 0.16$, treatment 90, control 89, day 365, RR approximated with OR.
	presence of symptoms, 19.0% lower, OR 0.81, $p = 0.37$, treatment 90, control 89, RR approximated with OR.
	ongoing symptoms, 27.8% higher, RR 1.28, $p = 0.64$, treatment 23 of 111 (20.7%), control 6 of 37 (16.2%), day 30.
<i>Self</i> , 11/9/2020, Double Blind Randomized Controlled Trial, USA, peer-reviewed, 33 authors, study period 2 April, 2020 - 19 June, 2020, average treatment delay 5.0 days, trial NCT04332991 (history) (ORCHID).	risk of death, 6.2% higher, RR 1.06, $p = 0.85$, treatment 25 of 241 (10.4%), control 25 of 236 (10.6%), NNT 455, adjusted per study, odds ratio converted to relative risk.
	risk of death, 51.0% higher, RR 1.51, $p = 0.28$, treatment 18 of 241 (7.5%), control 14 of 236 (5.9%), adjusted per study, odds ratio converted to relative risk, day 14.
	risk of 7-point scale, 3.1% higher, OR 1.03, $p = 0.87$, treatment 241, control 236, inverted to make OR<1 favor treatment, day 28, RR approximated with OR.
	risk of 7-point scale, 2.0% lower, OR 0.98, $p = 0.91$, treatment 241, control 236, inverted to make OR<1 favor treatment, day 14, RR approximated with OR.
	risk of 7-point scale, 39.0% lower, OR 0.61, $p = 0.09$, treatment 241, control 236, inverted to make OR<1 favor treatment, subgroup not on oxygen at baseline, day 14, RR approximated with OR.
<i>Serrano</i> , 9/22/2020, retrospective, Spain, peer-reviewed, 8 authors.	risk of death, 43.0% lower, RR 0.57, $p = 0.14$, treatment 6 of 14 (42.9%), control 6 of 8 (75.0%), NNT 3.1.
<i>Shabrawishi</i> , 5/11/2020, retrospective, Saudi Arabia, preprint, mean age 43.9, 5 authors.	risk of no virological cure at day 5, 14.7% lower, RR 0.85, $p = 0.66$, treatment 12 of 45 (26.7%), control 15 of 48 (31.2%), NNT 22.
<i>Shamsi</i> , 7/17/2023, retrospective, Iran, peer-reviewed, 4 authors, study period 1 March, 2020 - 1 August, 2021, dosage not specified, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 39.1% higher, RR 1.39, $p = 0.51$, treatment 4 of 23 (17.4%), control 20 of 160 (12.5%).
<i>Sheshah</i> , 11/13/2020, retrospective, Saudi Arabia, peer-reviewed, 8 authors.	risk of death, 80.0% lower, RR 0.20, $p < 0.001$, treatment 267, control 33, odds ratio converted to relative risk.

<i>Shoaibi</i> , 9/24/2020, retrospective, database analysis, USA, preprint, 5 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 15.4% lower, RR 0.85, $p < 0.001$, treatment 686 of 5,047 (13.6%), control 3,923 of 24,404 (16.1%), NNT 40.
<i>Signes-Costa</i> , 12/16/2020, retrospective, multiple countries, peer-reviewed, 28 authors.	risk of death, 47.0% lower, RR 0.53, $p < 0.001$, treatment 4,854, control 993, adjusted per study.
<i>Silva</i> , 5/20/2022, retrospective, Brazil, peer-reviewed, mean age 58.4, 28 authors, study period 25 March, 2020 - 21 October, 2020.	risk of death, 46.1% higher, RR 1.46, $p = 0.21$, treatment 21, control 374, adjusted per study, odds ratio converted to relative risk, multivariable, control prevalence approximated with overall prevalence.
<i>Singh (B)</i> , 6/8/2021, Randomized Controlled Trial, India, preprint, 13 authors, study period March 2020 - October 2020, this trial uses multiple treatments in the treatment arm (combined with ribavirin) - results of individual treatments may vary.	risk of death, 47.5% lower, RR 0.53, $p = 0.45$, treatment 3 of 20 (15.0%), control 6 of 21 (28.6%), NNT 7.4, severe.
	risk of death, 50.0% lower, RR 0.50, $p = 0.48$, treatment 3 of 37 (8.1%), control 6 of 37 (16.2%), NNT 12, all patients.
	risk of no recovery, 14.1% lower, RR 0.86, $p = 0.76$, treatment 9 of 20 (45.0%), control 11 of 21 (52.4%), NNT 14, severe.
	risk of no recovery, 8.3% lower, RR 0.92, $p = 1.00$, treatment 11 of 37 (29.7%), control 12 of 37 (32.4%), NNT 37, all patients.
<i>Singh</i> , 5/19/2020, retrospective, database analysis, USA, preprint, 4 authors, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 5.0% lower, RR 0.95, $p = 0.72$, treatment 104 of 910 (11.4%), control 109 of 910 (12.0%), NNT 182.
	risk of mechanical ventilation, 19.0% lower, RR 0.81, $p = 0.26$, treatment 46 of 910 (5.1%), control 57 of 910 (6.3%), NNT 83.
<i>Sivapalan</i> , 6/3/2021, Double Blind Randomized Controlled Trial, Denmark, peer-reviewed, 32 authors, study period 6 April, 2020 - 21 December, 2020, average treatment delay 8.0 days, trial NCT04322396 (history).	risk of death, 92.0% lower, RR 0.08, $p = 0.32$, treatment 1 of 61 (1.6%), control 2 of 56 (3.6%), adjusted per study.
	risk of ICU admission, 22.4% higher, RR 1.22, $p = 1.00$, treatment 4 of 61 (6.6%), control 3 of 56 (5.4%).
	relative days alive and discharged from hospital within 14 days (inverse), 8.4% worse, RR 1.08, $p = 0.36$, treatment 61, control 56, adjusted per study.
<i>Smith</i> , 5/31/2021, retrospective, USA, preprint, 4 authors, excluded in exclusion analyses: immortal time bias may significantly affect results.	risk of death, 27.2% lower, RR 0.73, $p = 0.002$, treatment 19 of 37 (51.4%), control 182 of 218 (83.5%), NNT 3.1, odds ratio converted to relative risk, >3g HCQ and >1g AZ, multivariable cox proportional hazard regression.
<i>Solh</i> , 10/20/2020, retrospective, database analysis, USA, preprint, 5 authors, excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline; substantial unadjusted confounding by indication likely.	risk of death, 18.0% higher, HR 1.18, $p = 0.17$, treatment 131 of 265 (49.4%), control 134 of 378 (35.4%), adjusted per study.
<i>SOLIDARITY</i> , 10/15/2020, Randomized Controlled Trial, multiple countries, peer-reviewed, baseline oxygen required 64.0%, 15 authors, study period 22 March, 2020 - 4 October, 2020, trial NCT04315948 (history) (SOLIDARITY), excluded in	risk of death, 19.0% higher, RR 1.19, $p = 0.23$, treatment 104 of 947 (11.0%), control 84 of 906 (9.3%).

exclusion analyses: excessive dosage in late stage patients, results do not apply to typical dosages; very late stage, >50% on oxygen/ventilation at baseline.	
<i>Sosa-García</i> , 6/29/2020, retrospective, Mexico, peer-reviewed, baseline oxygen required 100.0%, 6 authors, average treatment delay 9.0 days, excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline; substantial unadjusted confounding by indication likely.	risk of death, 10.5% higher, RR 1.11, $p = 1.00$, treatment 7 of 38 (18.4%), control 3 of 18 (16.7%).
<i>Soto</i> , 3/2/2022, retrospective, Peru, peer-reviewed, median age 58.0, 10 authors, study period April 2020 - August 2020, dosage not specified, excluded in exclusion analyses: unadjusted results with no group details; substantial unadjusted confounding by indication likely; substantial confounding by time possible due to significant changes in SOC and treatment propensity near the start of the pandemic.	risk of death, 6.0% higher, HR 1.06, $p = 0.46$, treatment 292 of 590 (49.5%), control 362 of 828 (43.7%), Cox proportional hazards.
<i>Soto-Becerra</i> , 10/8/2020, retrospective, database analysis, Peru, preprint, median age 59.4, 4 authors, study period 1 April, 2020 - 19 July, 2020, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 18.1% lower, HR 0.82, $p < 0.001$, treatment 346 of 692 (50.0%), control 1,606 of 2,630 (61.1%), NNT 9.0, day 54 (last day available) weighted KM.
	risk of death, 84.0% higher, HR 1.84, $p = 0.02$, treatment 165 of 692 (23.8%), control 401 of 2,630 (15.2%), adjusted per study, day 30.
<i>Spivak</i> , 3/2/2023, Randomized Controlled Trial, placebo-controlled, USA, peer-reviewed, mean age 41.9, 13 authors, study period April 2020 - April 2021, dosage 800mg day 1, 400mg days 2-5, trial NCT04342169 (history).	risk of hospitalization, 72.7% higher, RR 1.73, $p = 0.54$, treatment 7 of 152 (4.6%), control 4 of 150 (2.7%), day 28.
	symptom score difference, 20.4% lower, RR 0.80, $p = 0.19$, treatment 167, control 165, adjusted per study, adjusted symptom score difference relative to placebo score.
	viral shedding, 17.4% lower, HR 0.83, $p = 0.19$, treatment 185, control 182, inverted to make $HR < 1$ favor treatment.
<i>Stewart</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 18.0% higher, RR 1.18, $p = 0.27$, treatment 90 of 429 (21.0%), control 141 of 737 (19.1%), adjusted per study, VA, HCQ+AZ.
<i>Stewart (B)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols	risk of mechanical ventilation, 29.0% higher, RR 1.29, $p = 0.09$, treatment 48 of 305 (15.7%), control 95 of 1,302 (7.3%), adjusted per study, Aetion, HCQ.

improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	
<i>Stewart (C)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 16.0% higher, RR 1.16, $p = 0.26$, treatment 428 of 1,711 (25.0%), control 123 of 688 (17.9%), adjusted per study, COTA/HMH, HCQ+AZ.
<i>Stewart (D)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 90.0% higher, RR 1.90, $p = 0.09$, treatment 46 of 208 (22.1%), control 47 of 1,334 (3.5%), adjusted per study, Dascena, HCQ+AZ.
<i>Stewart (E)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 9.0% higher, RR 1.09, $p = 0.65$, treatment 212 of 1,157 (18.3%), control 203 of 1,101 (18.4%), NNT 873, adjusted per study, Health Catalyst, HCQ+AZ.
<i>Stewart (F)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 129.9% higher, RR 2.30, $p < 0.001$, treatment 32 of 108 (29.6%), control 33 of 256 (12.9%), Synapse, HCQ+AZ.
<i>Stewart (G)</i> , 3/17/2021, retrospective, USA, peer-reviewed, 37 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; includes PCR+ patients that may be asymptomatic for COVID-19 but in hospital for other reasons.	risk of death, 1.0% lower, RR 0.99, $p = 0.95$, treatment 66 of 578 (11.4%), control 188 of 1,243 (15.1%), adjusted per study, TriNetX, HCQ+AZ.
<i>Synolaki</i> , 9/5/2020, retrospective, Greece, preprint, 20 authors.	risk of death, 23.6% lower, RR 0.76, $p = 0.27$, treatment 21 of 98 (21.4%), control 60 of 214 (28.0%), NNT 15.
<i>Sánchez-Álvarez</i> , 4/27/2020, retrospective, database analysis, Spain, peer-reviewed, mean	risk of death, 45.9% lower, RR 0.54, $p = 0.005$, treatment 322, control 53, odds ratio converted to relative risk.

age 67.0, 10 authors.	
<i>Taccone</i> , 12/23/2020, retrospective, Belgium, peer-reviewed, 10 authors, average treatment delay 5.0 days.	risk of death, 24.7% lower, RR 0.75, $p = 0.02$, treatment 449 of 1,308 (34.3%), control 183 of 439 (41.7%), NNT 14, odds ratio converted to relative risk.
<i>Taieb</i> , 6/30/2021, retrospective, Senegal, peer-reviewed, 29 authors, average treatment delay 6.0 days.	risk of no hospital discharge, 38.7% lower, OR 0.61, $p = 0.02$, treatment 674, control 252, inverted to make OR<1 favor treatment, multivariate, RR approximated with OR.
<i>Tamura</i> , 7/13/2021, retrospective, Brazil, peer-reviewed, 4 authors, study period 10 March, 2020 - 13 November, 2020, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 299.0% higher, OR 3.99, $p = 0.04$, treatment 25, control 163, adjusted per study, multivariable, RR approximated with OR.
<i>Tan</i> , 12/14/2020, retrospective, China, peer-reviewed, 7 authors.	hospitalization time, 35.2% lower, relative time 0.65, $p = 0.04$, treatment 8, control 277.
<i>Tang</i> , 4/14/2020, Randomized Controlled Trial, China, peer-reviewed, 24 authors, study period 11 February, 2020 - 19 February, 2020, average treatment delay 16.6 days.	risk of no virological cure at day 21, 21.4% lower, RR 0.79, $p = 0.51$, treatment 11 of 75 (14.7%), control 14 of 75 (18.7%), NNT 25.
<i>Tehrani</i> , 10/30/2020, retrospective, Sweden, peer-reviewed, 5 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; unadjusted results with no group details.	risk of death, 13.4% lower, RR 0.87, $p = 0.63$, treatment 16 of 65 (24.6%), control 54 of 190 (28.4%), NNT 26.
<i>Teixeira</i> , 12/31/2020, retrospective, USA, peer-reviewed, 6 authors, excluded in exclusion analyses: unadjusted results with no group details; no treatment details; substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 79.3% higher, RR 1.79, $p = 0.10$, treatment 17 of 65 (26.2%), control 14 of 96 (14.6%).
<i>Trullàs</i> , 7/14/2020, retrospective, Spain, preprint, median age 75.0, 8 authors, average treatment delay 9.0 days.	risk of death, 35.6% lower, RR 0.64, $p = 0.12$, treatment 20 of 66 (30.3%), control 16 of 34 (47.1%), NNT 6.0.
<i>Tsanovska</i> , 3/3/2022, prospective, Bulgaria, peer-reviewed, 8 authors, study period 6 November, 2020 - 28 December, 2020.	risk of death, 57.9% lower, RR 0.42, $p = 0.03$, treatment 8 of 70 (11.4%), control 19 of 70 (27.1%), NNT 6.4, propensity score matching.
	risk of mechanical ventilation, 73.9% lower, RR 0.26, $p < 0.001$, treatment 6 of 70 (8.6%), control 23 of 70 (32.9%), NNT 4.1, propensity score matching.
	risk of ICU admission, 70.4% lower, RR 0.30, $p < 0.001$, treatment 8 of 70 (11.4%), control 27 of 70 (38.6%), NNT 3.7, propensity score matching.

<i>Tu</i> , 1/13/2022, retrospective, Sierra Leone, peer-reviewed, 11 authors, study period 31 March, 2020 - 11 August, 2020, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 17.2% lower, RR 0.83, $p = 0.81$, treatment 6 of 37 (16.2%), control 28 of 143 (19.6%), NNT 30.
<i>Turrini</i> , 6/11/2021, retrospective, Italy, peer-reviewed, 16 authors.	risk of death, 9.8% lower, RR 0.90, $p = 0.15$, treatment 103 of 160 (64.4%), control 33 of 45 (73.3%), NNT 11, adjusted per study, odds ratio converted to relative risk, multivariate.
<i>Ubaldo</i> , 2/1/2021, retrospective, Philippines, peer-reviewed, 3 authors, excluded in exclusion analyses: substantial unadjusted confounding by indication likely; very late stage, ICU patients; unadjusted results with no group details.	risk of death, 18.4% lower, RR 0.82, $p = 0.64$, treatment 17 of 25 (68.0%), control 5 of 6 (83.3%), NNT 6.5, COVID-19 positive patients.
<i>Ulrich</i> , 9/23/2020, Randomized Controlled Trial, USA, peer-reviewed, baseline oxygen required 63.3%, mean age 66.2, 18 authors, study period 17 April, 2020 - 12 May, 2020, average treatment delay 7.0 days, trial NCT04369742 (history) (TEACH), excluded in exclusion analyses: very late stage, >50% on oxygen/ventilation at baseline.	risk of death, 6.0% higher, RR 1.06, $p = 1.00$, treatment 7 of 67 (10.4%), control 6 of 61 (9.8%).
	risk of mechanical ventilation, 51.7% higher, RR 1.52, $p = 0.72$, treatment 5 of 67 (7.5%), control 3 of 61 (4.9%).
	risk of ICU admission, 173.1% higher, RR 2.73, $p = 0.13$, treatment 9 of 67 (13.4%), control 3 of 61 (4.9%).
<i>Uyaroğlu</i> , 3/17/2022, retrospective, propensity score matching, Turkey, peer-reviewed, 6 authors, study period 20 March, 2020 - 30 September, 2020, this trial compares with another treatment - results may be better when compared to placebo.	risk of death, 200.0% higher, RR 3.00, $p = 1.00$, treatment 1 of 42 (2.4%), control 0 of 42 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).
	risk of ICU admission, 66.7% lower, RR 0.33, $p = 1.00$, treatment 0 of 42 (0.0%), control 1 of 42 (2.4%), NNT 42, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	hospitalization time, 9.8% lower, relative time 0.90, $p = 0.90$, treatment 42, control 42.
<i>Uygen</i> , 9/15/2021, retrospective, Turkey, peer-reviewed, 4 authors.	time to viral-, 12.2% lower, relative time 0.88, $p = 0.05$, treatment 15, control 25.
<i>van Halem</i> , 11/27/2020, retrospective, Belgium, peer-reviewed, 10 authors.	risk of death, 31.6% lower, RR 0.68, $p = 0.05$, treatment 34 of 164 (20.7%), control 47 of 155 (30.3%), NNT 10.
<i>Vernaz</i> , 12/31/2020, retrospective, propensity score matching, Switzerland, peer-reviewed, 15 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically; substantial unadjusted confounding by indication likely.	risk of death, 15.3% lower, RR 0.85, $p = 0.71$, treatment 12 of 93 (12.9%), control 16 of 105 (15.2%), NNT 43, HCQ vs. SOC, PSM.
	hospitalization time, 49.0% higher, relative time 1.49, $p = 0.002$, treatment 93, control 105, HCQ vs. SOC, PSM.
<i>Wang (C)</i> , 6/10/2020, retrospective, database analysis, USA, preprint, 3 authors, excluded in exclusion analyses: confounding by indication is likely and adjustments do not consider COVID-19 severity at baseline.	risk of death, 5.8% lower, RR 0.94, $p = 0.63$, treatment 1,866, control 5,726, odds ratio converted to relative risk.

<i>WellStar</i> , 12/7/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04429867 (history).	Estimated 700 patient RCT with results missing over 2.5 years.
<i>Xia</i> , 2/11/2020, retrospective, China, preprint, 1 author, excluded in exclusion analyses: minimal details provided.	risk of no viral clearance, 37.5% lower, RR 0.62, $p = 0.17$, treatment 5 of 10 (50.0%), control 12 of 15 (80.0%), NNT 3.3.
<i>Yegerov</i> , 1/8/2021, retrospective, Kazakhstan, preprint, 8 authors, average treatment delay 1.0 days, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 95.3% lower, RR 0.05, $p = 1.00$, treatment 0 of 23 (0.0%), control 20 of 1,049 (1.9%), NNT 52, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
<i>Yilgwan</i> , 5/11/2023, retrospective, Nigeria, peer-reviewed, 12 authors, study period 25 February, 2020 - 30 August, 2021.	risk of death, 93.0% lower, OR 0.07, $p < 0.001$, treatment 1,039, control 2,423, adjusted per study, RR approximated with OR.
<i>Yu (B)</i> , 8/3/2020, retrospective, China, peer-reviewed, median age 62.0, 6 authors.	risk of progression to critical, 82.5% lower, RR 0.17, $p = 0.049$, treatment 1 of 231 (0.4%), control 32 of 1,291 (2.5%), NNT 49, baseline critical cohort reported separately in Yu et al..
	risk of death, 85.0% lower, RR 0.15, $p = 0.02$, treatment 1 of 73 (1.4%), control 238 of 2,604 (9.1%), NNT 13, HCQ treatment started early vs. non-HCQ.
<i>Yu (C)</i> , 5/15/2020, retrospective, China, peer-reviewed, 8 authors.	risk of death, 60.5% lower, RR 0.40, $p = 0.002$, treatment 9 of 48 (18.8%), control 238 of 502 (47.4%), NNT 3.5.
<i>Zhong Nanshan</i> (钟南山), 3/26/2020, retrospective, China, preprint, 1 author.	risk of no virological cure at day 10, 80.0% lower, RR 0.20, $p < 0.001$, treatment 5 of 115 (4.3%), control 17 of 82 (20.7%), NNT 6.1, adjusted per study.
<i>Águila-Gordo</i> , 11/11/2020, retrospective, Spain, peer-reviewed, mean age 84.4, 6 authors.	risk of death, 67.0% lower, RR 0.33, $p = 0.10$, treatment 151 of 346 (43.6%), control 47 of 70 (67.1%), NNT 4.3, adjusted per study.
<i>Çivriz Bozdağ</i> , 9/15/2021, retrospective, Turkey, peer-reviewed, 62 authors, excluded in exclusion analyses: substantial confounding by time likely due to declining usage over the early stages of the pandemic when overall treatment protocols improved dramatically.	risk of death, 399.2% higher, RR 4.99, $p = 0.003$, treatment 35, control 140.
<i>Çiyiltepe</i> , 4/30/2021, retrospective, Turkey, peer-reviewed, 5 authors, excluded in exclusion analyses: treatment group only includes patients where treatment failed resulting in ICU admission.	risk of death, 3.2% lower, RR 0.97, $p = 0.85$, treatment 69 of 95 (72.6%), control 39 of 52 (75.0%), NNT 42.
<i>Ñamendys-Silva</i> , 10/21/2020, retrospective, database analysis, Mexico, peer-reviewed, mean age 57.3, 18 authors, average treatment delay 7.0 days.	risk of death, 32.3% lower, RR 0.68, $p = 0.18$, treatment 24 of 54 (44.4%), control 42 of 64 (65.6%), NNT 4.7, HCQ+AZ vs. neither HCQ or CQ.
	risk of death, 37.1% lower, RR 0.63, $p = 0.09$, treatment 19 of 46 (41.3%), control 42 of 64 (65.6%), NNT 4.1, CQ vs. neither HCQ or CQ.

risk of death, 34.5% lower, RR 0.66, $p = 0.006$, treatment 43 of 100 (43.0%), control 42 of 64 (65.6%), NNT 4.4, HCQ+AZ or CQ.

Pre-Exposure Prophylaxis

Effect extraction follows pre-specified rules as detailed above and gives priority to more serious outcomes. Only the first (most serious) outcome is used in pooled analysis, which may differ from the effect a paper focuses on. Other outcomes are used in outcome specific analyses.

<i>Abella</i> , 9/30/2020, Randomized Controlled Trial, USA, peer-reviewed, 18 authors, study period 9 April, 2020 - 14 July, 2020, PATCH trial.	risk of case, 5.0% lower, RR 0.95, $p = 1.00$, treatment 4 of 64 (6.2%), control 4 of 61 (6.6%), NNT 325.
<i>Agarwal</i> , 9/14/2021, prospective, India, preprint, 1 author.	risk of hospitalization, 94.8% lower, RR 0.05, $p = 0.61$, treatment 0 of 29 (0.0%), control 17 of 455 (3.7%), NNT 27, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	relative severity, 26.9% better, RR 0.73, $p = 0.21$, treatment 29, control 455.
	risk of case, 4.6% higher, RR 1.05, $p = 0.81$, treatment 6 of 29 (20.7%), control 90 of 455 (19.8%).
<i>Ahmed</i> , 11/23/2021, retrospective, Saudi Arabia, peer-reviewed, 7 authors.	risk of case, 99.3% lower, OR 0.007, $p = 0.08$, treatment 0 of 50 (0.0%) cases, 13 of 50 (26.0%) controls, NNT 1.7, case control OR.
<i>Ajili</i> , 7/31/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04377646 (history) (COVID-Milit).	Estimated 660 patient RCT with results missing over 3 years.
<i>Alegiani</i> , 4/15/2021, retrospective, case control, database analysis, Italy, peer-reviewed, 16 authors.	risk of death, 8.0% higher, OR 1.08, $p = 0.64$, HCQ vs. other cDMARDs, RR approximated with OR.
	risk of hospitalization, 18.0% lower, OR 0.82, $p = 0.03$, HCQ vs. other cDMARDs, RR approximated with OR.
	risk of death, 19.0% higher, OR 1.19, $p = 0.32$, HCQ vs. MTX, RR approximated with OR.
	risk of hospitalization, 12.0% lower, OR 0.88, $p = 0.17$, HCQ vs. MTX, RR approximated with OR.
<i>Alqatari</i> , 6/1/2023, retrospective, Saudi Arabia, peer-reviewed, 15 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of mechanical ventilation, 89.0% lower, RR 0.11, $p = 0.13$, treatment 0 of 13 (0.0%), control 5 of 21 (23.8%), NNT 4.2, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of ICU admission, 64.1% lower, RR 0.36, $p = 0.14$, treatment 2 of 13 (15.4%), control 9 of 21 (42.9%), NNT 3.6.

	critical case, 64.1% lower, RR 0.36, $p = 0.14$, treatment 2 of 13 (15.4%), control 9 of 21 (42.9%), NNT 3.6.
<i>Alzahrani</i> , 4/15/2021, retrospective, Saudi Arabia, peer-reviewed, 3 authors.	risk of death, 58.7% lower, RR 0.41, $p = 1.00$, treatment 0 of 14 (0.0%), control 1 of 33 (3.0%), NNT 33, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of mechanical ventilation, 81.0% lower, RR 0.19, $p = 0.54$, treatment 0 of 14 (0.0%), control 3 of 33 (9.1%), NNT 11, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of severe case, 32.7% lower, RR 0.67, $p = 0.70$, treatment 2 of 14 (14.3%), control 7 of 33 (21.2%), NNT 14.
<i>Arleo</i> , 10/27/2020, retrospective, USA, preprint, 5 authors.	risk of death, 50.0% lower, RR 0.50, $p = 0.67$, treatment 1 of 20 (5.0%), control 5 of 50 (10.0%), NNT 20, all patients.
	risk of death, 52.0% lower, RR 0.48, $p = 0.64$, treatment 1 of 10 (10.0%), control 5 of 24 (20.8%), NNT 9.2, inpatients.
<i>Badyal</i> , 6/7/2021, prospective, India, peer-reviewed, 18 authors, study period May 2020 - September 2020.	risk of case, 60.1% lower, RR 0.40, $p < 0.001$, treatment 247 of 617 (40.0%), control 611 of 1,473 (41.5%), adjusted per study, odds ratio converted to relative risk, ≥ 6 weeks.
	risk of case, 35.1% lower, RR 0.65, $p = 0.003$, treatment 88 of 185 (47.6%), control 611 of 1,473 (41.5%), adjusted per study, odds ratio converted to relative risk, 4-5 weeks.
	risk of case, 23.2% lower, RR 0.77, $p = 0.03$, treatment 80 of 181 (44.2%), control 611 of 1,473 (41.5%), adjusted per study, odds ratio converted to relative risk, 2-3 weeks.
<i>Bae</i> , 2/20/2021, retrospective, propensity score matching, South Korea, peer-reviewed, 8 authors.	risk of case, 30.3% lower, RR 0.70, $p = 0.18$, treatment 16 of 743 (2.2%), control 91 of 2,698 (3.4%), NNT 82, odds ratio converted to relative risk, PSM.
	risk of case, 19.5% lower, RR 0.81, $p = 0.50$, treatment 16 of 743 (2.2%), control 91 of 2,698 (3.4%), odds ratio converted to relative risk, PSM, adjusted for region.
	risk of case, 30.3% lower, RR 0.70, $p = 0.30$, treatment 16 of 743 (2.2%), control 91 of 2,698 (3.4%), NNT 82, odds ratio converted to relative risk, PSM, adjusted for immunosuppressant use.
<i>Becetti</i> , 8/5/2022, retrospective, Qatar, peer-reviewed, mean age 43.2, 12 authors, study period 1 April, 2020 - 31 July, 2020.	risk of case, 36.8% lower, RR 0.63, $p = 0.17$, treatment 26 of 314 (8.3%), control 49 of 386 (12.7%), NNT 23, adjusted per study, odds ratio converted to relative risk, multivariable.
	risk of case, 52.0% lower, RR 0.48, $p < 0.001$, treatment 16 of 46 (34.8%), control 29 of 40 (72.5%), NNT 2.7, patients with close contact to cases, close contact.
<i>Behera</i> , 11/3/2020, retrospective, India, peer-reviewed, 13 authors.	risk of case, 27.9% lower, RR 0.72, $p = 0.29$, treatment 7 of 19 (36.8%), control 179 of 353 (50.7%), NNT 7.2, adjusted per

	study, odds ratio converted to relative risk, model 2 conditional logistic regression.
	risk of case, 26.3% lower, RR 0.74, $p = 0.25$, treatment 7 of 19 (36.8%), control 179 of 353 (50.7%), NNT 7.2, odds ratio converted to relative risk, matched pair analysis.
<i>Belmont</i> , 10/6/2021, prospective, USA, preprint, 1 author, trial NCT04354870 (history).	risk of symptomatic case, 78.6% lower, RR 0.21, $p = 0.21$, treatment 1 of 56 (1.8%), control 2 of 24 (8.3%), NNT 15.
	risk of case, 14.3% lower, RR 0.86, $p = 1.00$, treatment 4 of 56 (7.1%), control 2 of 24 (8.3%), NNT 84.
<i>Bhatt</i> , 8/4/2021, prospective, India, preprint, 4 authors.	risk of case, 49.3% higher, RR 1.49, $p = 0.02$, treatment 167 of 731 (22.8%), control 30 of 196 (15.3%).
<i>Bhattacharya</i> , 6/9/2020, retrospective, India, preprint, 7 authors.	risk of case, 80.7% lower, RR 0.19, $p = 0.001$, treatment 4 of 54 (7.4%), control 20 of 52 (38.5%), NNT 3.2.
<i>Burney</i> , 10/15/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04370015 (history).	Estimated 374 patient RCT with results missing over 2.5 years.
<i>Cassione</i> , 5/12/2020, retrospective, Italy, peer-reviewed, survey, median age 52.5, 6 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of case, 49.6% higher, RR 1.50, $p = 0.59$, treatment 10 of 127 (7.9%), control 2 of 38 (5.3%).
<i>Chatterjee</i> , 5/28/2020, retrospective, India, peer-reviewed, survey, 11 authors.	risk of case, 66.8% lower, RR 0.33, $p < 0.001$, treatment 12 of 68 (17.6%), control 206 of 387 (53.2%), NNT 2.8, full course vs. unused.
<i>Chauffe</i> , 6/1/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04363450 (history) (HCQPreP).	Estimated 1,700 patient RCT with results missing over 2 years.
<i>Chevalier</i> , 3/22/2023, retrospective, France, peer-reviewed, mean age 70.3, 24 authors.	risk of death, 34.7% lower, RR 0.65, $p = 0.19$, treatment 7 of 55 (12.7%), control 109 of 535 (20.4%), NNT 13, odds ratio converted to relative risk.
	risk of hospitalization, 19.1% lower, RR 0.81, $p = 0.36$, treatment 15 of 116 (12.9%), control 180 of 1,097 (16.4%), NNT 29, odds ratio converted to relative risk.
<i>Connor</i> , 8/24/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04352946 (history) (HERO).	Estimated 374 patient RCT with results missing over 3 years.
<i>Cordtz</i> , 8/27/2021, retrospective, population-based cohort, Denmark, peer-reviewed, 8 authors, study period 1 March, 2020 - 2 February, 2021.	risk of hospitalization, 40.0% lower, HR 0.60, $p = 0.39$, treatment 1,170, control 1,363, adjusted per study.
<i>Cordtz (B)</i> , 12/28/2020, retrospective, population-based cohort, Denmark, peer-reviewed, 10 authors.	risk of hospitalization, 24.0% lower, HR 0.76, $p = 0.67$, treatment 3 of 2,722 (0.1%), control 38 of 26,718 (0.1%), NNT 3124, adjusted per study, time-dependent exposure model.

	risk of hospitalization, 55.0% lower, HR 0.45, $p = 0.28$, treatment 3 of 2,722 (0.1%), control 38 of 26,718 (0.1%), adjusted per study, time-fixed exposure model.
<i>Datta</i> , 11/6/2020, retrospective, India, peer-reviewed, 7 authors.	risk of case, 22.1% lower, RR 0.78, $p = 0.47$, treatment 16 of 146 (11.0%), control 19 of 135 (14.1%), NNT 32.
<i>de la Iglesia</i> , 9/2/2020, retrospective, database analysis, Spain, preprint, 17 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of hospitalization, 50.0% higher, RR 1.50, $p = 1.00$, treatment 3 of 687 (0.4%), control 2 of 688 (0.3%).
	risk of case, 42.6% higher, RR 1.43, $p = 0.15$, treatment 42 of 648 (6.5%), control 30 of 660 (4.5%), suspected COVID-19.
	risk of case, 7.8% lower, RR 0.92, $p = 0.84$, treatment 12 of 678 (1.8%), control 13 of 677 (1.9%), NNT 665, confirmed COVID-19.
<i>Desbois</i> , 7/20/2020, retrospective, France, preprint, mean age 58.8, 13 authors.	risk of case, 16.9% lower, RR 0.83, $p = 1.00$, treatment 3 of 27 (11.1%), control 23 of 172 (13.4%), NNT 44.
<i>Dev</i> , 3/24/2021, retrospective, India, peer-reviewed, 5 authors.	risk of case, 26.0% lower, RR 0.74, $p = 0.003$, treatment 260, control 499, any number of HCQ doses vs. no HCQ prophylaxis.
<i>Dulcey</i> , 5/31/2023, retrospective, Colombia, peer-reviewed, 8 authors.	risk of case, 21.0% lower, OR 0.79, $p = 0.27$, treatment 322, control 645, RR approximated with OR.
<i>Erden</i> , 1/23/2022, retrospective, Turkey, peer-reviewed, 11 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of death, 150.0% higher, RR 2.50, $p = 1.00$, treatment 1 of 6 (16.7%), control 0 of 3 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm).
	risk of hospitalization, 75.0% lower, RR 0.25, $p = 0.23$, treatment 1 of 6 (16.7%), control 2 of 3 (66.7%), NNT 2.0.
<i>Ferreira (B)</i> , 6/29/2020, retrospective, population-based cohort, database analysis, Portugal, peer-reviewed, 3 authors.	risk of case, 47.1% lower, RR 0.53, $p < 0.001$, adjusted per study, odds ratio converted to relative risk.
<i>Ferri</i> , 8/27/2020, retrospective, Italy, peer-reviewed, survey, 29 authors.	risk of COVID-19 case, 63.0% lower, RR 0.37, $p = 0.01$, treatment 9 of 994 (0.9%), control 16 of 647 (2.5%), NNT 64.
<i>Finkelstein</i> , 6/29/2023, retrospective, USA, peer-reviewed, 2 authors, study period January 2020 - September 2020.	risk of case, 21.0% lower, OR 0.79, $p < 0.001$, treatment 13,932, control 27,864, adjusted per study, propensity score matching, multivariable, RR approximated with OR.
<i>Fitzgerald</i> , 2/5/2021, retrospective, USA, preprint, 34 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of case, 8.5% lower, RR 0.91, $p = 0.54$, treatment 65 of 1,072 (6.1%), control 200 of 3,594 (5.6%), adjusted per study, odds ratio converted to relative risk.
<i>Fung</i> , 10/1/2021, retrospective, population-based cohort, USA, peer-reviewed, 6 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of death, 13.0% lower, HR 0.87, $p = 0.15$, vs. past use (better match for systemic autoimmune diseases).
	risk of hospitalization, 3.0% lower, HR 0.97, $p = 0.63$, vs. past use (better match for systemic autoimmune diseases).

	<p>risk of case, 9.0% lower, HR 0.91, $p = 0.02$, vs. past use (better match for systemic autoimmune diseases).</p> <p>risk of death, 8.0% higher, HR 1.08, $p = 0.26$, vs. never used.</p> <p>risk of hospitalization, 6.0% higher, HR 1.06, $p = 0.13$, vs. never used.</p> <p>risk of case, 5.0% lower, HR 0.95, $p = 0.03$, vs. never used.</p>
<i>Gagneux-Brunon</i> , 3/30/2022, Double Blind Randomized Controlled Trial, placebo-controlled, France, peer-reviewed, study period 14 April, 2020 - 30 March, 2022, trial NCT04328285 (history).	118 patient RCT with results missing over 1 year.
<i>Gendebien</i> , 6/25/2020, retrospective, Belgium, peer-reviewed, survey, 9 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of case, 3.9% lower, RR 0.96, $p = 0.93$, treatment 12 of 152 (7.9%), control 6 of 73 (8.2%), NNT 308.
<i>Gendelman</i> , 5/5/2020, retrospective, database analysis, Israel, peer-reviewed, 5 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of case, 8.1% lower, RR 0.92, $p = 0.88$, treatment 3 of 36 (8.3%), control 1,314 of 14,484 (9.1%), NNT 135.
<i>Gentry</i> , 9/21/2020, retrospective, database analysis, USA, peer-reviewed, 6 authors.	<p>risk of death, 91.3% lower, RR 0.09, $p = 0.10$, treatment 0 of 10,703 (0.0%), control 7 of 21,406 (0.0%), NNT 3058, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), COVID-19 mortality within all patients.</p> <p>risk of death, 90.7% lower, RR 0.09, $p = 0.19$, treatment 0 of 31 (0.0%), control 7 of 78 (9.0%), NNT 11, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), mortality for infected patients.</p> <p>risk of case, 20.9% lower, RR 0.79, $p = 0.27$, treatment 31 of 10,703 (0.3%), control 78 of 21,406 (0.4%), NNT 1338, odds ratio converted to relative risk.</p>
<i>Gianfrancesco</i> , 5/28/2020, retrospective, database analysis, multiple countries, peer-reviewed, 28 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of hospitalization, 3.3% lower, RR 0.97, $p = 0.82$, treatment 58 of 130 (44.6%), control 219 of 470 (46.6%), NNT 50, odds ratio converted to relative risk.
<i>Goenka</i> , 10/24/2020, retrospective, India, preprint, 11 authors.	risk of IgG positive, 87.2% lower, RR 0.13, $p = 0.03$, treatment 1 of 77 (1.3%), control 115 of 885 (13.0%), NNT 8.6, adjusted per study, odds ratio converted to relative risk.
<i>Granados-Montiel</i> , 6/30/2021, Double Blind Randomized Controlled Trial, placebo-controlled, Mexico, peer-reviewed, this trial uses multiple	Estimated 214 patient RCT with results missing over 2 years.

treatments in the treatment arm (combined with bromhexine) - results of individual treatments may vary, trial NCT04340349 (history) (ELEVATE).	
<i>Grau-Pujol</i> , 9/21/2020, Randomized Controlled Trial, Spain, peer-reviewed, 22 authors, study period 4 April, 2020 - 12 June, 2020.	risk of case, 10.6% lower, RR 0.89, $p = 1.00$, treatment 1 of 142 (0.7%), control 1 of 127 (0.8%), NNT 1202.
<i>Guillaume</i> , 9/16/2021, retrospective, France, peer-reviewed, survey, 25 authors, study period 17 April, 2020 - 30 April, 2020, trial NCT04345159 (history), excluded in exclusion analyses: statistical analysis shows significant mismatch with prior research, potential overfitting.	risk of hospitalization, 2.4% higher, RR 1.02, $p = 1.00$, treatment 2 of 181 (1.1%), control 3 of 278 (1.1%).
	risk of case, 2.9% higher, RR 1.03, $p = 0.96$, treatment 6 of 181 (3.3%), control 12 of 278 (4.3%), adjusted per study, odds ratio converted to relative risk.
	risk of case, 23.2% lower, RR 0.77, $p = 0.63$, treatment 6 of 181 (3.3%), control 12 of 278 (4.3%), NNT 100.
<i>Gönnenli</i> , 12/16/2020, retrospective, Turkey, peer-reviewed, survey, mean age 36.0, 9 authors, study period 14 May, 2020 - 13 June, 2020.	risk of pneumonia, 29.7% lower, RR 0.70, $p = 0.77$, treatment 3 of 148 (2.0%), control 12 of 416 (2.9%), NNT 117.
	risk of case, 18.9% higher, RR 1.19, $p = 0.58$, treatment 8 of 148 (5.4%), control 20 of 416 (4.8%), odds ratio converted to relative risk.
<i>Huang</i> , 6/16/2020, retrospective, China, peer-reviewed, 15 authors, excluded in exclusion analyses: significant unadjusted confounding possible.	risk of hospitalization, 80.0% lower, RR 0.20, $p < 0.001$, treatment 8, control 1,247.
<i>Huh</i> , 12/19/2020, retrospective, database analysis, South Korea, peer-reviewed, 8 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of progression, 251.0% higher, RR 3.51, $p = 0.11$, treatment 5 of 8 (62.5%), control 873 of 2,797 (31.2%), adjusted per study, multivariate.
	risk of case, 6.0% lower, RR 0.94, $p = 0.82$, treatment 17 of 122 (13.9%), control 7,324 of 43,924 (16.7%), adjusted per study, multivariate.
<i>Isnardi</i> , 10/6/2022, retrospective, Argentina, peer-reviewed, mean age 51.4, 199 authors, study period 13 August, 2020 - 31 July, 2021, trial NCT04568421 (history).	risk of death, 33.9% lower, RR 0.66, $p = 0.23$, treatment 11 of 361 (3.0%), control 72 of 1,554 (4.6%), NNT 63, odds ratio converted to relative risk.
	risk of severe case, 48.0% lower, RR 0.52, $p = 0.02$, treatment 14 of 361 (3.9%), control 117 of 1,554 (7.5%), NNT 27, odds ratio converted to relative risk.
	risk of hospitalization, 17.0% lower, RR 0.83, $p = 0.09$, treatment 83 of 512 (16.2%), control 429 of 1,554 (27.6%), NNT 8.8, odds ratio converted to relative risk.
<i>James</i> , 4/30/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04352933 (history) (PROLIFIC).	Estimated 500 patient RCT with results missing over 2 years.
<i>Juneja</i> , 1/7/2022, retrospective, India, peer-reviewed, 9 authors, study period 2 April, 2020 - 3	risk of severe case, 141.8% higher, RR 2.42, $p = 0.59$, treatment 2 of 996 (0.2%), control 1 of 1,204 (0.1%).

September, 2020, excluded in exclusion analyses: excessive unadjusted differences between groups.	risk of case, 6.4% higher, RR 1.06, $p = 0.67$, treatment 103 of 996 (10.3%), control 117 of 1,204 (9.7%).
<i>Jung</i> , 12/11/2020, retrospective, South Korea, peer-reviewed, 6 authors.	risk of death, 59.3% lower, RR 0.41, $p = 1.00$, treatment 0 of 649 (0.0%), control 1 of 1,417 (0.1%), NNT 1417, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of case, 13.1% higher, RR 1.13, $p = 0.86$, treatment 15 of 649 (2.3%), control 31 of 1,417 (2.2%), adjusted per study.
<i>Kadnur</i> , 7/22/2020, prospective, India, peer-reviewed, mean age 31.2, 16 authors, study period 23 April, 2020 - 11 June, 2020.	risk of case, 62.3% lower, RR 0.38, $p = 0.01$, treatment 10 of 258 (3.9%), control 15 of 100 (15.0%), NNT 9.0, odds ratio converted to relative risk, multivariate logistic regression.
<i>Kamstrup</i> , 6/1/2021, retrospective, population-based cohort, Denmark, peer-reviewed, 21 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	risk of hospitalization, 44.0% higher, OR 1.44, $p = 0.25$, treatment 5,488, control 54,846, RR approximated with OR.
	risk of case, 10.0% lower, HR 0.90, $p = 0.23$, treatment 188 of 5,488 (3.4%), control 2,040 of 54,846 (3.7%), NNT 340, adjusted Cox proportional hazards regression.
<i>Khoubnasabjafari</i> , 1/13/2021, retrospective, Iran, peer-reviewed, 10 authors.	risk of case, 16.7% lower, RR 0.83, $p = 0.59$, treatment 34 of 1,436 (2.4%), control 12 of 422 (2.8%), NNT 210.
<i>Khurana</i> , 7/24/2020, retrospective, India, preprint, survey, 5 authors.	risk of case, 51.0% lower, RR 0.49, $p = 0.02$, treatment 6 of 22 (27.3%), control 88 of 159 (55.3%), NNT 3.6, odds ratio converted to relative risk.
<i>Klebanov</i> , 7/1/2023, retrospective, USA, peer-reviewed, 10 authors.	risk of death, 30.6% lower, RR 0.69, $p = 0.80$, treatment 3 of 3,074 (0.1%), control 83 of 58,995 (0.1%), NNT 2320.
	risk of case, 5.9% higher, RR 1.06, $p = 0.70$, treatment 51 of 3,074 (1.7%), control 973 of 58,995 (1.6%), odds ratio converted to relative risk.
<i>Konig</i> , 5/7/2020, retrospective, database analysis, multiple countries, peer-reviewed, 11 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of hospitalization, 3.0% lower, RR 0.97, $p = 0.88$, treatment 16 of 29 (55.2%), control 29 of 51 (56.9%), NNT 59.
<i>Korkmaz</i> , 6/1/2021, retrospective, Turkey, preprint, 4 authors.	risk of death, 82.1% lower, RR 0.18, $p = 0.19$, treatment 0 of 385 (0.0%), control 2 of 299 (0.7%), NNT 150, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).
	risk of case, 93.7% lower, RR 0.06, $p < 0.001$, treatment 2 of 395 (0.5%), control 24 of 299 (8.0%), NNT 13.
<i>Küçükakkaş</i> , 7/20/2021, retrospective, Turkey, preprint, 2 authors, excluded in exclusion analyses: minimal details of groups provided.	risk of ICU admission, 42.9% higher, RR 1.43, $p = 1.00$, treatment 1 of 7 (14.3%), control 1 of 10 (10.0%).
<i>Laplana</i> , 9/9/2020, retrospective, Spain, peer-	risk of case, 56.0% higher, RR 1.56, $p = 0.24$, treatment 17 of

reviewed, survey, 3 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.	319 (5.3%), control 11 of 319 (3.4%).
<i>Llanos-Cuentas</i> , 2/28/2023, Randomized Controlled Trial, Peru, peer-reviewed, mean age 39.2, 10 authors, study period July 2020 - November 2020, trial NCT04414241 (history).	risk of case, 69.0% higher, RR 1.69, $p = 0.46$, treatment 5 of 36 (13.9%), control 3 of 32 (9.4%), adjusted per study.
<i>Loucera</i> , 8/16/2022, retrospective, Spain, preprint, 8 authors, study period January 2020 - November 2020.	risk of death, 69.3% lower, HR 0.31, $p < 0.001$, treatment 320, control 15,648, Cox proportional hazards, day 30.
<i>MacFadden</i> , 3/29/2022, retrospective, Canada, peer-reviewed, 9 authors, study period 15 January, 2020 - 31 December, 2020.	risk of case, 12.0% lower, OR 0.88, $p = 0.01$, RR approximated with OR.
<i>Macias</i> , 5/16/2020, retrospective, database analysis, Spain, preprint, 12 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of hospitalization, 25.5% lower, RR 0.74, $p = 1.00$, treatment 1 of 290 (0.3%), control 2 of 432 (0.5%), NNT 846.
	risk of case, 49.0% higher, RR 1.49, $p = 0.53$, treatment 5 of 290 (1.7%), control 5 of 432 (1.2%).
<i>Mahto</i> , 2/15/2021, retrospective, India, peer-reviewed, 6 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of IgG positive, 26.9% lower, RR 0.73, $p = 0.38$, treatment 9 of 89 (10.1%), control 84 of 600 (14.0%), NNT 26, unadjusted, odds ratio converted to relative risk.
<i>Mathai</i> , 11/6/2020, retrospective, India, peer-reviewed, 3 authors.	risk of case, 89.5% lower, RR 0.10, $p < 0.001$, treatment 10 of 491 (2.0%), control 22 of 113 (19.5%), NNT 5.7.
	risk of case, 88.5% lower, RR 0.12, $p < 0.001$, treatment 5 of 491 (1.0%), control 10 of 113 (8.8%), NNT 13, symptomatic.
<i>Mathew</i> , 2/28/2023, prospective, India, peer-reviewed, 8 authors, study period April 2020 - October 2021.	risk of death, 20.0% lower, OR 0.80, $p = 0.80$, treatment 23, control 41, RR approximated with OR.
	risk of hospitalization, no change, OR 1.00, $p = 0.94$, treatment 23, control 41, RR approximated with OR.
	risk of severe case, 40.0% lower, OR 0.60, $p = 0.37$, treatment 23, control 41, RR approximated with OR.
<i>McCullough</i> , 8/20/2021, prospective, USA, preprint, 1 author.	risk of case, 51.7% lower, RR 0.48, $p = 0.01$, treatment 13 of 101 (12.9%), control 32 of 120 (26.7%), NNT 7.2.
<i>McKinnon</i> , 12/23/2021, Double Blind Randomized Controlled Trial, USA, peer-reviewed, 10 authors, study period 7 April, 2020 - 15 December, 2020, trial NCT04341441 (history) (WHIP COVID-19).	risk of symptomatic case, 2.5% lower, RR 0.98, $p = 1.00$, treatment 2 of 365 (0.5%), control 1 of 178 (0.6%), NNT 7219, daily and weekly HCQ combined.
	risk of symptomatic case, no change, RR 1.00, $p = 1.00$, treatment 1 of 178 (0.6%), control 1 of 178 (0.6%), daily HCQ.
	risk of symptomatic case, 4.8% lower, RR 0.95, $p = 1.00$, treatment 1 of 187 (0.5%), control 1 of 178 (0.6%), NNT 3698, weekly HCQ.

	<p>risk of symptomatic case, 53.3% lower, RR 0.47, $p = 1.00$, treatment 0 of 25 (0.0%), control 1 of 178 (0.6%), NNT 178, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), AD patients.</p>
	<p>risk of case, 51.2% lower, RR 0.49, $p = 0.60$, treatment 2 of 365 (0.5%), control 2 of 178 (1.1%), NNT 174, daily and weekly HCQ combined.</p>
	<p>risk of case, 50.0% lower, RR 0.50, $p = 1.00$, treatment 1 of 178 (0.6%), control 2 of 178 (1.1%), NNT 178, daily HCQ.</p>
	<p>risk of case, 52.4% lower, RR 0.48, $p = 0.61$, treatment 1 of 187 (0.5%), control 2 of 178 (1.1%), NNT 170, weekly HCQ.</p>
	<p>risk of case, 69.5% lower, RR 0.30, $p = 1.00$, treatment 0 of 25 (0.0%), control 2 of 178 (1.1%), NNT 89, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), AD patients.</p>
<p><i>Mitchell</i>, 5/5/2020, retrospective, multiple countries, preprint, 2 authors, excluded in exclusion analyses: excessive unadjusted differences between groups.</p>	<p>risk of death, 99.0% lower, RR 0.01, $p < 0.001$.</p>
<p><i>Moraes</i>, 4/30/2021, Randomized Controlled Trial, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04384458 (history).</p>	<p>Estimated 400 patient RCT with results missing over 2 years.</p>
<p><i>Morales-Asencio</i>, 4/1/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04400019 (history) (PREVICHARM).</p>	<p>Estimated 1,930 patient RCT with results missing over 2 years.</p>
<p><i>Naggie</i>, 8/25/2021, Double Blind Randomized Controlled Trial, placebo-controlled, USA, peer-reviewed, mean age 43.6, 23 authors, study period April 2020 - November 2020, trial NCT04334148 (history) (HERO-HCQ).</p>	<p>risk of symptomatic case, 23.5% lower, RR 0.76, $p = 0.18$, treatment 41 of 683 (6.0%), control 53 of 676 (7.8%), NNT 54, odds ratio converted to relative risk, logistic regression.</p>
	<p>risk of symptomatic case, 29.3% lower, RR 0.71, $p = 0.18$, treatment 41 of 683 (6.0%), control 53 of 676 (7.8%), NNT 54, odds ratio converted to relative risk, Mantel-Haenszel.</p>
	<p>risk of symptomatic case, 50.5% lower, RR 0.49, $p = 0.34$, treatment 3 of 683 (0.4%), control 6 of 676 (0.9%), NNT 223, PCR confirmed.</p>
<p><i>Nanni</i>, 9/30/2021, Randomized Controlled Trial, Italy, peer-reviewed, trial NCT04363827 (history) (PROTECT).</p>	<p>Estimated 2,300 patient RCT with results missing over 2 years.</p>
<p><i>Nasri</i>, 1/27/2023, Randomized Controlled Trial, Iran, peer-reviewed, mean age 29.7, 11 authors, study period 11 August, 2020 - 11 November, 2020, trial IRCT20200414047076N1.</p>	<p>risk of symptomatic case, 92.2% lower, RR 0.08, $p = 0.03$, treatment 0 of 70 (0.0%), control 6 of 73 (8.2%), NNT 12, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), severe cases.</p>

	<p>risk of symptomatic case, 85.1% lower, RR 0.15, $p = 0.003$, treatment 2 of 70 (2.9%), control 14 of 73 (19.2%), NNT 6.1, moderate or severe cases.</p> <p>risk of symptomatic case, 47.9% lower, RR 0.52, $p = 0.16$, treatment 7 of 70 (10.0%), control 14 of 73 (19.2%), NNT 11, all cases.</p>
<i>Niriella</i> , 7/3/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial SLCTR/2020/011.	402 patient RCT with results missing over 3 years.
<i>Obrișcă</i> , 9/28/2022, prospective, Romania, peer-reviewed, mean age 39.0, 12 authors, study period 26 February, 2020 - 1 May, 2021.	risk of case, 86.7% lower, RR 0.13, $p = 0.01$, treatment 10 of 81 (12.3%), control 5 of 14 (35.7%), NNT 4.3, adjusted per study, odds ratio converted to relative risk, multivariable.
<i>Oku</i> , 9/6/2022, retrospective, Japan, peer-reviewed, 8 authors, study period 3 June, 2020 - 30 June, 2021.	<p>risk of death, 92.2% lower, RR 0.08, $p = 1.00$, treatment 0 of 14 (0.0%), control 11 of 206 (5.3%), NNT 19, unadjusted, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).</p> <p>risk of hospitalization, 11.5% lower, RR 0.88, $p = 0.34$, treatment 9 of 14 (64.3%), control 177 of 206 (85.9%), NNT 4.6, adjusted per study, odds ratio converted to relative risk, multivariable.</p>
<i>Opdam</i> , 2/23/2022, retrospective, Netherlands, peer-reviewed, 9 authors.	risk of hospitalization, 45.0% lower, OR 0.55, $p = 0.18$, treatment 8 of 81 (9.9%) cases, 59 of 396 (14.9%) controls, NNT 17, case control OR.
<i>Oztas</i> , 3/21/2022, retrospective, Turkey, peer-reviewed, 15 authors, excluded in exclusion analyses: not adjusting for the different baseline risk of systemic autoimmune patients; excessive unadjusted differences between groups.	<p>risk of hospitalization, 215.1% higher, RR 3.15, $p = 0.36$, treatment 3 of 317 (0.9%), control 1 of 333 (0.3%).</p> <p>risk of symptomatic case, 40.1% higher, RR 1.40, $p = 0.44$, treatment 16 of 317 (5.0%), control 12 of 333 (3.6%).</p> <p>risk of case, 5.0% higher, RR 1.05, $p = 0.88$, treatment 22 of 317 (6.9%), control 22 of 333 (6.6%).</p>
<i>Patel</i> , 7/15/2022, retrospective, USA, preprint, mean age 60.0, 12 authors, excluded in exclusion analyses: unadjusted results with no group details.	risk of case, 46.3% lower, RR 0.54, $p = 0.001$, treatment 28 of 18,358 (0.2%), control 223 of 78,509 (0.3%), cases vs. total person-months, unadjusted.
<i>Patil</i> , 8/24/2021, prospective, India, preprint, 20 authors.	<p>risk of death, 65.9% lower, RR 0.34, $p = 0.10$, treatment 5,266, control 3,946.</p> <p>risk of case, 9.1% lower, RR 0.91, $p = 0.43$, treatment 167 of 5,266 (3.2%), control 147 of 3,946 (3.7%), NNT 181, adjusted per study.</p>
<i>Pellegrini</i> , 9/12/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial ACTRN12620000501943 (COVID-SHIELD).	Estimated 2,250 patient RCT with results missing over 3 years.
<i>Pham</i> , 3/2/2021, retrospective, USA, peer-reviewed, 5 authors.	risk of death, 19.7% lower, RR 0.80, $p = 0.77$, treatment 2 of 14 (14.3%), control 5 of 28 (17.9%), NNT 28, odds ratio converted to relative risk, univariate.

	<p>risk of ICU admission, 35.5% higher, RR 1.35, $p = 0.61$, treatment 4 of 14 (28.6%), control 6 of 28 (21.4%), odds ratio converted to relative risk, univariate.</p>
<p><i>Polo</i>, 8/5/2022, Double Blind Randomized Controlled Trial, placebo-controlled, Spain, peer-reviewed, median age 38.0, 189 authors, study period 15 April, 2020 - 11 July, 2021, trial NCT04334928 (history) (EPICOS).</p>	<p>risk of symptomatic case, 51.0% lower, RR 0.49, $p = 0.79$, treatment 3 of 224 (1.3%), control 5 of 211 (2.4%), NNT 97, Kaplan–Meier, primary outcome.</p>
	<p>risk of case, 27.0% lower, RR 0.73, $p = 0.31$, treatment 21 of 224 (9.4%), control 23 of 211 (10.9%), Kaplan–Meier.</p>
<p><i>Raabe</i>, 7/3/2022, prospective, USA, preprint, 7 authors, trial NCT04354870 (history).</p>	<p>risk of symptomatic case, 82.2% lower, RR 0.18, $p = 0.17$, treatment 1 of 59 (1.7%), control 2 of 21 (9.5%), NNT 13.</p>
	<p>risk of symptomatic case, 88.4% lower, RR 0.12, $p = 0.07$, treatment 0 of 59 (0.0%), control 2 of 21 (9.5%), NNT 10, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm), fever.</p>
	<p>risk of case, 28.8% lower, RR 0.71, $p = 0.65$, treatment 4 of 59 (6.8%), control 2 of 21 (9.5%), NNT 36, seroconversion.</p>
<p><i>Rajasingham</i>, 9/21/2020, Randomized Controlled Trial, USA, peer-reviewed, 22 authors, study period 6 April, 2020 - 13 July, 2020, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04328467 (history) (COVID PREP).</p>	<p>risk of hospitalization, 50.1% lower, RR 0.50, $p = 1.00$, treatment 1 of 989 (0.1%), control 1 of 494 (0.2%), NNT 987, COVID-19.</p>
	<p>risk of hospitalization, 39.0% lower, RR 0.61, $p = 0.34$, treatment 11 of 989 (1.1%), control 9 of 494 (1.8%), NNT 141, all cause.</p>
	<p>risk of case, 27.0% lower, HR 0.73, $p = 0.12$, treatment 58 of 989 (5.9%), control 39 of 494 (7.9%), NNT 49.</p>
<p><i>Rangel</i>, 1/10/2021, retrospective, USA, peer-reviewed, 5 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.</p>	<p>risk of death, 25.1% lower, RR 0.75, $p = 0.77$, treatment 4 of 50 (8.0%), control 11 of 103 (10.7%), NNT 37, from all patients.</p>
	<p>risk of hospitalization, 22.2% lower, RR 0.78, $p = 0.29$, treatment 17 of 50 (34.0%), control 45 of 103 (43.7%), NNT 10.</p>
	<p>hospitalization time, 41.2% lower, relative time 0.59, $p = 0.12$, treatment 21, control 54.</p>
<p><i>Rao</i>, 12/4/2021, prospective, India, peer-reviewed, 8 authors, excluded in exclusion analyses: unadjusted results with minimal group details.</p>	<p>risk of case, 11.0% lower, RR 0.89, $p = 0.68$, treatment 16 of 273 (5.9%), control 67 of 1,021 (6.6%), NNT 143.</p>
<p><i>Rentsch</i>, 9/9/2020, retrospective, population-based cohort, database analysis, United Kingdom, peer-reviewed, 34 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients; medication adherence unknown and may significantly change results.</p>	<p>risk of death, 3.0% higher, HR 1.03, $p = 0.83$, treatment 70 of 30,569 (0.2%), control 477 of 164,068 (0.3%), adjusted per study.</p>

<p><i>Revollo</i>, 11/21/2020, retrospective, propensity score matching, Spain, peer-reviewed, 16 authors.</p>	<p>risk of case, 23.0% lower, RR 0.77, $p = 0.52$, treatment 16 of 69 (23.2%), control 65 of 418 (15.6%), adjusted per study, PSM, risk of PCR+.</p>
	<p>risk of case, 43.0% higher, RR 1.43, $p = 0.42$, treatment 17 of 60 (28.3%), control 62 of 404 (15.3%), adjusted per study, PSM, risk of IgG+.</p>
<p><i>Rojas-Serrano</i>, 5/16/2021, Double Blind Randomized Controlled Trial, placebo-controlled, Mexico, peer-reviewed, median age 31.5, 8 authors, study period 14 April, 2020 - 31 March, 2021, trial NCT04318015 (history).</p>	<p>risk of symptomatic case, 82.0% lower, RR 0.18, $p = 0.12$, treatment 1 of 62 (1.6%), control 6 of 65 (9.2%), NNT 13, adjusted per study.</p>
<p><i>Sahebari</i>, 9/7/2022, retrospective, Iran, peer-reviewed, 6 authors.</p>	<p>risk of case, 56.0% lower, RR 0.44, $p = 0.02$, treatment 10 of 108 (9.3%), control 56 of 368 (15.2%), odds ratio converted to relative risk.</p>
<p><i>Salvarani</i>, 8/6/2020, retrospective, population-based cohort, Italy, peer-reviewed, 18 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.</p>	<p>risk of case, 6.0% lower, OR 0.94, $p = 0.75$, RR approximated with OR.</p>
<p><i>Samajdar</i>, 11/17/2021, retrospective, India, peer-reviewed, 9 authors, study period 1 September, 2020 - 31 December, 2020, dosage not specified, excluded in exclusion analyses: minimal details provided; unadjusted results with no group details; results may be significantly affected by survey bias.</p>	<p>risk of case, 74.5% lower, RR 0.25, $p < 0.001$, treatment 12 of 129 (9.3%), control 29 of 81 (35.8%), NNT 3.8, odds ratio converted to relative risk, physician survey.</p>
	<p>risk of case, 48.6% lower, RR 0.51, $p = 0.03$, treatment 11 of 109 (10.1%), control 39 of 200 (19.5%), NNT 11, odds ratio converted to relative risk, combined ivermectin or HCQ in community.</p>
<p><i>Santos</i>, 7/27/2020, prospective, Spain, peer-reviewed, median age 78.4, mean age 75.3, 6 authors, study period 1 March, 2020 - 1 June, 2020, excluded in exclusion analyses: unadjusted results with no group details.</p>	<p>risk of death, 92.5% lower, RR 0.08, $p = 0.19$, treatment 0 of 7 (0.0%), control 10 of 31 (32.3%), NNT 3.1, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).</p>
<p><i>Satti</i>, 4/22/2022, retrospective, Qatar, peer-reviewed, 6 authors, excluded in exclusion analyses: unadjusted results with no group details.</p>	<p>risk of case, 61.5% lower, RR 0.39, $p = 0.04$, treatment 10 of 63 (15.9%), control 7 of 17 (41.2%), NNT 4.0.</p>
<p><i>Seet</i>, 4/14/2021, Cluster Randomized Controlled Trial, Singapore, peer-reviewed, 15 authors, study period 13 May, 2020 - 31 August, 2020, dosage 400mg day 1, 200mg days 2-42, this trial compares with another treatment - results may be better when compared to placebo, trial NCT04446104 (history).</p>	<p>risk of symptomatic case, 35.1% lower, RR 0.65, $p = 0.047$, treatment 29 of 432 (6.7%), control 64 of 619 (10.3%), NNT 28.</p>
	<p>risk of case, 32.0% lower, RR 0.68, $p = 0.009$, treatment 212 of 432 (49.1%), control 433 of 619 (70.0%), NNT 4.8, adjusted per study, odds ratio converted to relative risk, model 6.</p>
<p><i>Sen</i>, 4/24/2023, retrospective, multiple countries, peer-reviewed, survey, 8 authors, study period 31 January, 2022 - 21 May, 2022, COVAD trial.</p>	<p>risk of PASC, 40.0% lower, OR 0.60, $p = 0.08$, RR approximated with OR.</p>
<p><i>Shahrin</i>, 12/7/2022, retrospective, Bangladesh, peer-reviewed, median age 34.0, 11 authors,</p>	<p>risk of case, 87.8% higher, RR 1.88, $p = 0.09$, treatment 43 of 230 (18.7%), control 11 of 106 (10.4%), adjusted per study,</p>

study period 31 March, 2020 - 12 July, 2020.	odds ratio converted to relative risk, multivariable.
	risk of case, 8.0% lower, OR 0.92, $p = 0.89$, adjusted per study, excluding the first 14 days and including participants that worked for at least 16 days, multivariable, RR approximated with OR.
<i>Shaw</i> , 7/1/2021, retrospective, USA, peer-reviewed, 10 authors, study period 1 March, 2020 - 15 May, 2020.	risk of case, 13.0% lower, OR 0.87, $p = 0.006$, treatment 45, control 99, adjusted per study, propensity score matching, multivariable, RR approximated with OR.
<i>Shukla</i> , 12/13/2022, retrospective, India, peer-reviewed, survey, 31 authors, study period July 2021 - October 2021, trial CTRI/2021/06/034255.	risk of PASC, 5.0% lower, RR 0.95, $p = 0.78$, treatment 22 of 76 (28.9%), control 184 of 603 (30.5%), NNT 64, odds ratio converted to relative risk.
<i>Singer</i> , 8/5/2020, retrospective, database analysis, USA, peer-reviewed, 3 authors, excluded in exclusion analyses: not fully adjusting for the baseline risk differences within systemic autoimmune patients.	risk of case, 9.0% higher, RR 1.09, $p = 0.62$, treatment 55 of 10,700 (0.5%), control 104 of 22,058 (0.5%).
<i>Strangfeld</i> , 1/27/2021, retrospective, multiple countries, peer-reviewed, 37 authors, study period 24 March, 2020 - 1 July, 2020.	risk of death, 48.0% lower, RR 0.52, $p < 0.001$, treatment 27 of 426 (6.3%), control 124 of 739 (16.8%), NNT 9.6, adjusted per study, inverted to make $RR < 1$ favor treatment, odds ratio converted to relative risk, HCQ/CQ vs. no DMARD therapy, multivariable.
<i>Sukumar</i> , 11/14/2022, retrospective, India, peer-reviewed, survey, 5 authors, study period July 2020 - September 2020.	risk of case, 37.6% lower, OR 0.62, $p = 0.30$, treatment 10 of 57 (17.5%) cases, 15 of 59 (25.4%) controls, NNT 8.6, case control OR.
<i>Syed</i> , 5/17/2021, Randomized Controlled Trial, Pakistan, peer-reviewed, 8 authors, study period 1 May, 2020 - 25 September, 2020, trial NCT04359537 (history).	risk of symptomatic case, 59.7% higher, RR 1.60, $p = 0.41$, treatment 10 of 48 (20.8%), control 6 of 46 (13.0%), group 1.
	risk of symptomatic case, 110.5% higher, RR 2.10, $p = 0.13$, treatment 14 of 51 (27.5%), control 6 of 46 (13.0%), group 2.
	risk of symptomatic case, 16.4% lower, RR 0.84, $p = 0.77$, treatment 6 of 55 (10.9%), control 6 of 46 (13.0%), NNT 47, group 3.
	risk of case, 91.7% higher, RR 1.92, $p = 0.12$, treatment 15 of 38 (39.5%), control 7 of 34 (20.6%), group 1.
	risk of case, 136.6% higher, RR 2.37, $p = 0.02$, treatment 19 of 39 (48.7%), control 7 of 34 (20.6%), group 2.
	risk of case, 21.4% higher, RR 1.21, $p = 0.77$, treatment 8 of 32 (25.0%), control 7 of 34 (20.6%), group 3.
<i>Tirupakuzhi Vijayaraghavan</i> , 6/1/2022, Randomized Controlled Trial, India, peer-reviewed, mean age 32.1, 21 authors, study period 29 June, 2020 - 4 February, 2021, trial CTRI/2020/05/025067 (HOPE).	risk of progression, 196.2% higher, RR 2.96, $p = 1.00$, treatment 1 of 211 (0.5%), control 0 of 203 (0.0%), continuity correction due to zero event (with reciprocal of the contrasting arm), ICU/HDU.
	risk of hospitalization, 51.9% lower, RR 0.48, $p = 0.62$, treatment 1 of 211 (0.5%), control 2 of 203 (1.0%), NNT 196.

	<p>risk of case, 14.2% lower, RR 0.86, $p = 0.73$, treatment 11 of 211 (5.2%), control 12 of 203 (5.9%), NNT 143, adjusted per study, odds ratio converted to relative risk, confirmed cases, multivariable.</p>
	<p>risk of case, 5.7% lower, RR 0.94, $p = 0.90$, treatment 12 of 211 (5.7%), control 12 of 203 (5.9%), NNT 446, adjusted per study, odds ratio converted to relative risk, multivariable.</p>
<p><i>Trefond</i>, 1/27/2021, retrospective, France, peer-reviewed, 21 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients; significant unadjusted confounding possible; excessive unadjusted differences between groups.</p>	<p>risk of death, 16.6% higher, RR 1.17, $p = 0.80$, treatment 4 of 68 (5.9%), control 12 of 183 (6.6%), adjusted per study, odds ratio converted to relative risk.</p>
	<p>risk of death/ICU, 78.2% higher, RR 1.78, $p = 0.21$, treatment 8 of 71 (11.3%), control 18 of 191 (9.4%), adjusted per study, odds ratio converted to relative risk.</p>
	<p>risk of hospitalization, 44.9% higher, RR 1.45, $p = 0.12$, treatment 24 of 71 (33.8%), control 53 of 191 (27.7%), adjusted per study, odds ratio converted to relative risk.</p>
<p><i>Treluyer</i>, 6/18/2020, Randomized Controlled Trial, placebo-controlled, trial NCT04344379 (history) (PREP-COVID).</p>	<p>122 patient RCT with results missing over 3 years.</p>
<p><i>Ugarte-Gil</i>, 2/16/2022, retrospective, multiple countries, peer-reviewed, 58 authors.</p>	<p>risk of severe case, 44.4% lower, OR 0.56, $p = 0.007$, treatment 665, control 230, adjusted per study, inverted to make OR<1 favor treatment, HCQ/CQ only vs. no SLE medication, multivariable, RR approximated with OR.</p>
<p><i>Vivanco-Hidalgo</i>, 3/9/2021, retrospective, Spain, peer-reviewed, 8 authors, excluded in exclusion analyses: not fully adjusting for the different baseline risk of systemic autoimmune patients.</p>	<p>risk of hospitalization, 46.0% higher, RR 1.46, $p = 0.10$, treatment 40 of 6,746 (0.6%), control 50 of 13,492 (0.4%), adjusted per study.</p>
	<p>risk of case, 8.0% higher, RR 1.08, $p = 0.50$, treatment 97 of 6,746 (1.4%), control 183 of 13,492 (1.4%), adjusted per study.</p>
<p><i>White</i>, 3/22/2022, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04303507 (history) (COPCOV).</p>	<p>4,652 patient RCT with results missing over 1.5 years.</p>
<p><i>Yadav (B)</i>, 7/11/2022, retrospective, India, peer-reviewed, mean age 34.1, 3 authors, study period 21 August, 2020 - 20 November, 2020.</p>	<p>risk of seropositive, 20.0% lower, OR 0.80, $p = 0.10$, treatment 1,255, control 969, adjusted per study, multivariable, RR approximated with OR.</p>
<p><i>Yadav (C)</i>, 9/30/2020, retrospective, India, preprint, 11 authors.</p>	<p>risk of hospitalization, 82.4% lower, RR 0.18, $p = 0.01$, treatment 2 of 279 (0.7%), control 9 of 221 (4.1%), NNT 30, PCR+.</p>
	<p>risk of IgG+, 41.8% lower, RR 0.58, $p = 0.049$, treatment 17 of 178 (9.6%), control 27 of 221 (12.2%), odds ratio converted to relative risk, multivariate logistic regression.</p>
	<p>risk of IgG+, 79.0% lower, RR 0.21, $p = 0.09$, treatment 1 of 39</p>

	(2.6%), control 27 of 221 (12.2%), NNT 10, HCQ >10 weeks.
	risk of IgG+, 52.4% lower, RR 0.48, $p = 0.14$, treatment 5 of 86 (5.8%), control 27 of 221 (12.2%), NNT 16, HCQ 6-10 weeks.
	risk of IgG+, 69.9% higher, RR 1.70, $p = 0.12$, treatment 11 of 53 (20.8%), control 27 of 221 (12.2%), HCQ <6 weeks.
<i>Zhong</i> , 7/3/2020, retrospective, database analysis, China, peer-reviewed, 20 authors.	risk of case, 91.0% lower, RR 0.09, $p = 0.04$, treatment 7 of 16 (43.8%), control 20 of 27 (74.1%), NNT 3.3, adjusted per study.

Post-Exposure Prophylaxis

Effect extraction follows pre-specified rules as detailed above and gives priority to more serious outcomes. Only the first (most serious) outcome is used in pooled analysis, which may differ from the effect a paper focuses on. Other outcomes are used in outcome specific analyses.

<i>Abu-Helalah</i> , 1/31/2021, Randomized Controlled Trial, trial NCT04597775 (history) (APCC-19).	Estimated 93 patient RCT with results missing over 2.5 years.
<i>Al Ansari</i> , 12/31/2021, Double Blind Randomized Controlled Trial, trial NCT04437693 (history) (HCQ-COVID19).	Estimated 500 patient RCT with results missing over 1.5 years.
<i>Barnabas</i> , 12/7/2020, Randomized Controlled Trial, USA, peer-reviewed, 30 authors, study period 31 March, 2020 - 21 August, 2020, trial NCT04328961 (history) (HCQ COVID-19 PEP).	risk of hospitalization, 3.7% higher, RR 1.04, $p = 1.00$, treatment 1 of 407 (0.2%), control 1 of 422 (0.2%).
	risk of case, 27.0% higher, HR 1.27, $p = 0.33$, treatment 43 of 353 (12.2%), control 33 of 336 (9.8%), adjusted per study, day 14 symptomatic mITT PCR+ AIM.
	risk of case, 23.0% higher, HR 1.23, $p = 0.41$, treatment 40 of 317 (12.6%), control 32 of 309 (10.4%), adjusted per study, day 14 symptomatic mITT PCR+ IDWeek.
	risk of case, 10.0% higher, HR 1.10, $p = 0.66$, treatment 53 of 353 (15.0%), control 45 of 336 (13.4%), adjusted per study, day 14 PCR+ mITT AIM.
	risk of case, 1.0% lower, HR 0.99, $p = 0.97$, treatment 46 of 317 (14.5%), control 43 of 309 (13.9%), adjusted per study, day 14 PCR+ mITT IDWeek.
	risk of case, 19.0% lower, HR 0.81, $p = 0.23$, treatment 82 of 387 (21.2%), control 99 of 393 (25.2%), NNT 25, adjusted per study, day 14 PCR+ ITT AIM.
<i>Borrie</i> , 4/30/2021, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04397328 (history).	Estimated 336 patient RCT with results missing over 2 years.
<i>Boulware (B)</i> , 6/3/2020, Randomized Controlled	risk of case, 17.0% lower, RR 0.83, $p = 0.35$, treatment 49 of

Trial, USA, peer-reviewed, 24 authors, study period 17 March, 2020 - 6 May, 2020, this trial compares with another treatment - results may be better when compared to placebo.	414 (11.8%), control 58 of 407 (14.3%), NNT 41.
	risk of case, 25.1% lower, RR 0.75, $p = 0.22$, treatment 32 of 414 (7.7%), control 42 of 407 (10.3%), NNT 39, probable COVID-19 cases.
<i>Dhibar</i> , 1/7/2023, Double Blind Randomized Controlled Trial, placebo-controlled, India, peer-reviewed, mean age 35.0, 14 authors, study period 22 March, 2021 - 17 June, 2021, trial NCT04858633 (history).	risk of symptomatic case, 26.7% lower, RR 0.73, $p = 0.32$, treatment 17 of 574 (3.0%), control 24 of 594 (4.0%), NNT 93.
	risk of case, 21.2% lower, RR 0.79, $p = 0.21$, treatment 16 of 574 (2.8%), control 21 of 594 (3.5%), NNT 134, PCR+.
	risk of case, 8.0% lower, RR 0.92, $p = 0.21$, treatment 24 of 574 (4.2%), control 27 of 594 (4.5%), NNT 275.
<i>Dhibar (B)</i> , 11/6/2020, prospective, India, peer-reviewed, 13 authors, trial NCT04408456 (history).	risk of symptomatic case, 43.9% lower, RR 0.56, $p = 0.21$, treatment 6 of 132 (4.5%), control 15 of 185 (8.1%), NNT 28, adjusted per study.
	risk of case, 50.0% lower, RR 0.50, $p = 0.04$, treatment 10 of 132 (7.6%), control 28 of 185 (15.1%), NNT 13, adjusted per study, PCR+.
	risk of case, 41.0% lower, RR 0.59, $p = 0.03$, treatment 14 of 132 (10.6%), control 36 of 185 (19.5%), NNT 11, adjusted per study.
<i>Ghanem-Zoubi</i> , 6/30/2022, Randomized Controlled Trial, trial NCT04438837 (history).	Estimated 582 patient RCT with results missing over 1 year.
<i>González</i> , 10/31/2021, Double Blind Randomized Controlled Trial, placebo-controlled, Spain, peer-reviewed, trial NCT04410562 (history).	129 patient RCT with results missing over 1.5 years.
<i>Mitjà (B)</i> , 7/26/2020, Randomized Controlled Trial, Spain, peer-reviewed, 12 authors, study period 17 March, 2020 - 28 April, 2020, BCN-PEP-CoV2 trial.	risk of death, 45.6% lower, RR 0.54, $p = 0.39$, treatment 4 of 1,196 (0.3%), control 8 of 1,301 (0.6%), NNT 357, per supplemental appendix table S7, excluding patient that did not take any study medication and had an unknown cause of death.
	risk of hospitalization, 16.8% lower, RR 0.83, $p = 0.71$, treatment 13 of 1,196 (1.1%), control 17 of 1,301 (1.3%), NNT 455, per supplemental appendix table S7, excluding patient that did not take any study medication and had an unknown cause of death.
	baseline PCR- risk of cases, 32.0% lower, RR 0.68, $p = 0.27$, treatment 29 of 958 (3.0%), control 45 of 1,042 (4.3%), NNT 77.
<i>Polat</i> , 9/30/2020, prospective, Turkey, peer-reviewed, 3 authors.	risk of case, 57.0% lower, RR 0.43, $p = 0.03$, treatment 12 of 138 (8.7%), control 14 of 70 (20.0%), NNT 8.8.
<i>Sarwar (B)</i> , 8/30/2020, Double Blind Randomized Controlled Trial, placebo-controlled, trial NCT04346667 (history) (PEACE).	125 patient RCT with results missing over 3 years.

Shabani, 8/10/2021, prospective, Iran, peer-reviewed, 16 authors.	risk of symptomatic case, 19.0% lower, RR 0.81, $p = 1.00$, treatment 2 of 51 (3.9%), control 3 of 62 (4.8%), NNT 109, day 7.
	risk of case, 6.4% higher, RR 1.06, $p = 1.00$, treatment 7 of 51 (13.7%), control 8 of 62 (12.9%), day 7, PCR+ and symptomatic.
	risk of case, 21.6% higher, RR 1.22, $p = 0.78$, treatment 7 of 51 (13.7%), control 7 of 62 (11.3%), day 7, PCR+ only.
Simova (B), 11/12/2020, retrospective, Bulgaria, peer-reviewed, 5 authors.	risk of case, 92.7% lower, RR 0.07, $p = 0.01$, treatment 0 of 156 (0.0%), control 3 of 48 (6.2%), NNT 16, relative risk is not 0 because of continuity correction due to zero events (with reciprocal of the contrasting arm).

References

1. **AbdelGhaffar** et al., *Prediction of mortality in hospitalized Egyptian patients with Coronavirus disease-2019: A multicenter retrospective study*, PLOS ONE, doi:10.1371/journal.pone.0262348.
2. **Abdulrahman** et al., *The efficacy and safety of hydroxychloroquine in COVID19 patients : a multicenter national retrospective cohort*, medRxiv, doi:10.1101/2020.11.25.20234914.
3. **Abella** et al., *Efficacy and Safety of Hydroxychloroquine vs Placebo for Pre-exposure SARS-CoV-2 Prophylaxis Among Health Care Workers*, JAMA Internal Medicine, doi:10.1001/jamainternmed.2020.6319.
4. **Aboulenain** et al., *The Effect of Hydroxychloroquine on In-Hospital Mortality in COVID-19*, HCA Healthcare Journal of Medicine, doi:10.36518/2689-0216.1169.
5. **Abu-Helalah** et al., *Chemoprevention Clinical Trial of COVID-19: Hydroxychloroquine Post Exposure Prophylaxis (APCC-19)*, NCT04597775, clinicaltrials.gov/study/NCT04597775.
6. **Ader** et al., *An open-label randomized, controlled trial of the effect of lopinavir/ritonavir, lopinavir/ritonavir plus IFN-beta-1a and hydroxychloroquine in hospitalized patients with COVID-19 - Final results from the DisCoVeRy trial*, medRxiv, doi:10.1101/2022.02.16.22271064.
7. **AFP**, *India backs hydroxychloroquine for virus prevention*, www.msn.com/en-ph/news/world/india-backs-hydroxychloroquine-for-virus-prevention/ar-BB14EloP?ocid=st2.
8. **AfricaFeeds**, *Kenya approve the use of Chloroquine to treat COVID-19 patients*, africafeeds.com/2020/04/01/ghana-kenya-approve-use-of-chloroquine-to-treat-covid-19-patients/.
9. **Africanews**, *Coronavirus patients on chloroquine heal faster - Senegalese medic*, www.africanews.com/2020/04/06/coronavirus-patients-on-chloroquine-heal-faster-senegalese-medic/.
10. **Afrik.com**, *Edouard Philippe emporté par le Covid, Didier Raoult, l'hydroxychloroquine et le... remdésivir*, www.afrik.com/edouard-philippe-emporte-par-le-covid-didier-raoult-l-hydroxychloroquine-et-le-remdesivir.
11. **Afşin** et al., *Factors affecting prognosis and mortality in severe COVID-19 pneumonia patients*, Acta Clinica Croatica, doi:10.20471/acc.2023.62.01.13.
12. **Agarwal** et al., *Low dose hydroxychloroquine prophylaxis for COVID-19 - a prospective study*, medRxiv, doi:10.1101/2021.09.13.21262971.
13. **Aghajani** et al., *Decreased In-Hospital Mortality Associated with Aspirin Administration in Hospitalized Patients Due to Severe COVID-19*, Journal of Medical Virology, doi:10.1002/jmv.27053.

14. **Águila-Gordo** et al., *Mortality and associated prognostic factors in elderly and very elderly hospitalized patients with respiratory disease COVID-19*, *Revista Española de Geriátría y Gerontología*, doi:10.1016/j.regg.2020.09.006.
15. **Agusti** et al., *Efficacy and safety of hydroxychloroquine in healthcare professionals with mild SARS-CoV-2 infection: prospective, non-randomized trial*, *Enfermedades Infecciosas y Microbiología Clínica*, doi:10.1016/j.eimc.2020.10.023.
16. **Ahmed** et al., *Factors Affecting the Incidence, Progression, and Severity of COVID-19 in Type 1 Diabetes Mellitus*, *BioMed Research International*, doi:10.1155/2021/1676914.
17. **Ajili** et al., *A Study of Hydroxychloroquine and Zinc in the Prevention of COVID-19 Infection in Military Healthcare Workers (COVID-Milit)*, NCT04377646, clinicaltrials.gov/study/NCT04377646.
18. **Akram** et al., *Pakistan Randomized and Observational Trial to Evaluate Coronavirus Treatment (PROTECT) of Hydroxychloroquine, Oseltamivir and Azithromycin to treat newly diagnosed patients with COVID-19 infection who have no comorbidities like diabetes mellitus: A structured summary of a study protocol for a randomized controlled trial*, *Trials*, doi:10.1186/s13063-020-04616-4.
19. **Al Ansari** et al., *Post Exposure Prophylaxis in Healthcare Workers Exposed to COVID-19 Patients (HCQ-COVID19)*, NCT04437693, clinicaltrials.gov/study/NCT04437693.
20. **Al Arabia**, *Bahrain among first countries to use Hydroxychloroquine to treat coronavirus*, english.alarabiya.net/en/News/gulf/2020/03/26/Bahrain-one-of-the-first-countries-to-use-Hydroxychloroquine-to-treat-coronavirus.
21. **Al-bab**, *Covid-19: Algeria and Morocco continue using chloroquine despite concerns*, al-bab.com/blog/2020/05/covid-19-algeria-and-morocco-continue-using-chloroquine-despite-concerns.
22. **Alamdari** et al., *Mortality Risk Factors among Hospitalized COVID-19 Patients in a Major Referral Center in Iran*, *Tohoku J. Exp. Med.*, 2020, 252, 73-84, doi:10.1620/tjem.252.73.
23. **Albanghali** et al., *Clinical Characteristics and Treatment Outcomes of Mild to Moderate Covid-19 Patients in Saudi Arabia: A Single Centre Study*, *Journal of Infection and Public Health*, doi:10.1016/j.jiph.2022.02.001.
24. **Albani** et al., *Impact of Azithromycin and/or Hydroxychloroquine on Hospital Mortality in COVID-19*, *J. Clinical Medicine*, doi:10.3390/jcm9092800.
25. **Alberici** et al., *A report from the Brescia Renal COVID Task Force on the clinical characteristics and short-term outcome of hemodialysis patients with SARS-CoV-2 infection*, *Kidney Int.*, 98:1, 20-26, July 1, 2020, doi:10.1016/j.kint.2020.04.030.
26. **Alegiani** et al., *Risk of COVID-19 hospitalization and mortality in rheumatic patients treated with hydroxychloroquine or other conventional DMARDs in Italy*, *Rheumatology*, doi:10.1093/rheumatology/keab348.
27. **Alghamdi** et al., *Clinical characteristics and treatment outcomes of severe (ICU) COVID-19 patients in Saudi Arabia: A single centre study*, *Saudi Pharmaceutical Journal*, doi:10.1016/j.jsps.2021.08.008.
28. **Alghamdi (B)** et al., *Clinical Efficacy of Hydroxychloroquine in Patients with COVID-19: Findings from an Observational Comparative Study in Saudi Arabia*, *Antibiotics*, doi:10.3390/antibiotics10040365.
29. **Alhamlan** et al., *Epidemiology and Clinical Characteristics in Individuals with Confirmed SARS-CoV-2 Infection During the Early COVID-19 Pandemic in Saudi Arabia*, *medRxiv*, doi:10.1101/2021.07.13.21260428.
30. **Almazrou** et al., *Comparing the impact of Hydroxychloroquine based regimens and standard treatment on COVID-19 patient outcomes: A retrospective cohort study*, *Saudi Pharmaceutical Journal*, doi:10.1016/j.jsps.2020.09.019.
31. **Alosaimi** et al., *Analyzing the Difference in the Length of Stay (LOS) in Moderate to Severe COVID-19 Patients Receiving Hydroxychloroquine or Favipiravir*, *Pharmaceuticals*, doi:10.3390/ph15121456.
32. **Alotaibi** et al., *Effectiveness and Safety of Favipiravir Compared to Hydroxychloroquine for Management of Covid-19: A Retrospective Study*, *International Journal of General Medicine*, 2021:14, www.dovepress.com/getfile.php?fileID=73585.
33. **AlQadheeb** et al., *Impact of common comorbidities on antimicrobial consumption and mortality amongst critically ill COVID-19 patients: A retrospective two center study in Saudi Arabia*, *Clinical Infection in Practice*, doi:10.1016/j.clinpr.2023.100229.
34. **AlQahtani** et al., *Randomized controlled trial of favipiravir, hydroxychloroquine, and standard care in patients with mild/moderate COVID-19 disease*, *Scientific Reports*, doi:10.1038/s41598-022-08794-w.
35. **Alqassieh** et al., *Clinical characteristics and predictors of the duration of hospital stay in COVID-19 patients in Jordan*, *F1000Research*, Preprint, f1000research.com/articles/9-1439.

36. **Alqatari** et al., *COVID-19 in patients with rheumatological diseases in the Eastern Province of Saudi Arabia*, Journal of Medicine and Life, doi:10.25122/jml-2023-0037.
37. **Alsaidi** et al., *Griffithsin and Carrageenan Combination Results in Antiviral Synergy against SARS-CoV-1 and 2 in a Pseudoviral Model*, Marine Drugs, doi:10.3390/md19080418.
38. **Alshamrani** et al., *Comprehensive evaluation of six interventions for hospitalized patients with COVID-19: A propensity score matching study*, Saudi Pharmaceutical Journal, doi:10.1016/j.jsps.2023.02.004.
39. **Alsmadi** et al., *The In Vitro, In Vivo, and PBPK Evaluation of a Novel Lung-Targeted Cardiac-Safe Hydroxychloroquine Inhalation Aerogel*, AAPS PharmSciTech, doi:10.1208/s12249-023-02627-3.
40. **Altman**, D., *How to obtain the P value from a confidence interval*, BMJ, doi:10.1136/bmj.d2304.
41. **Altman (B)** et al., *How to obtain the confidence interval from a P value*, BMJ, doi:10.1136/bmj.d2090.
42. **Alwafi** et al., *Negative Nasopharyngeal SARS-CoV-2 PCR Conversion in Response to Different Therapeutic Interventions*, Cureus, doi:10.7759/cureus.21442.
43. **Alzahrani** et al., *Clinical characteristics and outcome of COVID-19 in patients with rheumatic diseases*, Rheumatology International, doi:10.1007/s00296-021-04857-9.
44. **Amaravadi** et al., *Hydroxychloroquine for SARS-CoV-2 positive patients quarantined at home: The first interim analysis of a remotely conducted randomized clinical trial*, medRxiv, doi:10.1101/2021.02.22.21252228.
45. **An** et al., *Treatment Response to Hydroxychloroquine and Antibiotics for mild to moderate COVID-19: a retrospective cohort study from South Korea*, medRxiv, doi:10.1101/2020.07.04.20146548.
46. **Anadolu Agency**, *Nigeria goes on with hydroxychloroquine clinical trial*, www.aa.com.tr/en/africa/nigeria-goes-on-with-hydroxychloroquine-clinical-trials/1854814.
47. **Anadolu Agency (B)**, *Cuba: Early hydroxychloroquine potent against COVID-19*, www.aa.com.tr/en/americas/cuba-early-hydroxychloroquine-potent-against-covid-19/1905650.
48. **Andreani** et al., *In vitro testing of combined hydroxychloroquine and azithromycin on SARS-CoV-2 shows synergistic effect*, Microbial Pathogenesis, doi:10.1016/j.micpath.2020.104228.
49. **Anglemyer** et al., *Healthcare outcomes assessed with observational study designs compared with those assessed in randomized trials*, Cochrane Database of Systematic Reviews 2014, Issue 4, doi:10.1002/14651858.MR000034.pub2.
50. **Annie** et al., *Hydroxychloroquine in hospitalized COVID-19 patients: Real world experience assessing mortality*, Pharmacotherapy, doi:10.1002/phar.2467.
51. **Aparisi** et al., *Low-density lipoprotein cholesterol levels are associated with poor clinical outcomes in COVID-19*, medRxiv, doi:10.1101/2020.10.06.20207092.
52. **Arabi** et al., *Lopinavir-ritonavir and hydroxychloroquine for critically ill patients with COVID-19: REMAP-CAP randomized controlled trial*, Intensive Care Medicine, link.springer.com/article/10.1007/s00134-021-06448-5.
53. **Archyde**, *China approves chloroquine (instead of hydroxychloroquine) against covid-19*, www.archyde.com/china-approves-chloroquine-instead-of-hydroxychloroquine-against-covid-19/.
54. **Arleo** et al., *Clinical Course and Outcomes of coronavirus disease 2019 (COVID-19) in Rheumatic Disease Patients on Immunosuppression: A case Cohort Study at a Single Center with a Significantly Diverse Population*, medRxiv, doi:10.1101/2020.10.26.20219154.
55. **Arshad** et al., *Treatment with Hydroxychloroquine, Azithromycin, and Combination in Patients Hospitalized with COVID-19*, Int. J. Infect. Dis., July 1 2020, doi:10.1016/j.ijid.2020.06.099.
56. **Ashinyo** et al., *Clinical characteristics, treatment regimen and duration of hospitalization among COVID-19 patients in Ghana: a retrospective cohort study*, Pan African Medical Journal, 37:1, doi:10.11604/pamj.supp.2020.37.1.25718.
57. **Ashraf** et al., *COVID-19 in Iran, a comprehensive investigation from exposure to treatment outcomes*, medRxiv doi:10.1101/2020.04.20.20072421.t, www.researchgate.net/publication/341197843_COVID-19_in_Iran_a_comprehensive_investigation_from_exposure_to_treatment_outcomes.

58. **Assad, H.**, *Pharmacotherapy prescribing pattern and outcome for hospitalized patients with severe and critical COVID-19*, Current Issues in Pharmacy and Medical Sciences, doi:10.2478/cipms-2022-0020.
59. **Aston et al.**, *Hydroxychloroquine vs. Azithromycin for Outpatients in Utah With COVID-19 (HyAzOUT)*, NCT04334382, clinicaltrials.gov/study/NCT04334382.
60. **Atipornwanich et al.**, *Various Combinations of Favipiravir, Lopinavir-Ritonavir, Darunavir-Ritonavir, High-Dose Oseltamivir, and Hydroxychloroquine for the Treatment of COVID-19: A Randomized Controlled Trial (FIGHT-COVID-19 Study)*, SSRN Electronic Journal, doi:10.2139/ssrn.3936499.
61. **Auld et al.**, *ICU and ventilator mortality among critically ill adults with COVID-19*, Critical Care Medicine, doi:10.1097/ccm.0000000000004457.
62. **Avezum et al.**, *Hydroxychloroquine versus placebo in the treatment of non-hospitalised patients with COVID-19 (COPE – Coalition V): A double-blind, multicentre, randomised, controlled trial*, The Lancet Regional Health - Americas, doi:10.1016/j.lana.2022.100243.
63. **Awad et al.**, *Impact of hydroxychloroquine on disease progression and ICU admissions in patients with SARS-CoV-2 infection*, American Journal of Health-System Pharmacy, doi:10.1093/ajhp/zxab056.
64. **Aweimer et al.**, *Mortality rates of severe COVID-19-related respiratory failure with and without extracorporeal membrane oxygenation in the Middle Ruhr Region of Germany*, Scientific Reports, doi:10.1038/s41598-023-31944-7.
65. **Axfors et al.**, *Mortality outcomes with hydroxychloroquine and chloroquine in COVID-19 from an international collaborative meta-analysis of randomized trials*, Nature, doi:10.1038/s41467-021-22446-z.
66. **Ayerbe et al.**, *The association of treatment with hydroxychloroquine and hospital mortality in COVID-19 patients*, Internal and Emergency Medicine, doi:10.1007/s11739-020-02505-x.
67. **Azaña Gómez et al.**, *Mortality risk factors in patients with SARS-CoV-2 infection and atrial fibrillation: Data from the SEMI-COVID-19 registry*, Medicina Clínica, doi:10.1016/j.medcli.2022.01.008.
68. **Babalola et al.**, *A Randomized Controlled Trial of Ivermectin Monotherapy Versus Hydroxychloroquine, Ivermectin, and Azithromycin Combination Therapy in Covid-19 Patients in Nigeria*, Journal of Infectious Diseases and Epidemiology, doi:10.23937/2474-3658/1510233.
69. **Babayigit et al.**, *The association of antiviral drugs with COVID-19 morbidity: The retrospective analysis of a nationwide COVID-19 cohort*, Frontiers in Medicine, doi:10.3389/fmed.2022.894126.
70. **Badyal et al.**, *Hydroxychloroquine for SARS CoV2 Prophylaxis in Healthcare Workers – A Multicentric Cohort Study Assessing Effectiveness and Safety*, Journal of the Association of Physicians of India, 69:6, June 2021, www.japi.org/x284d434/hydroxychloroquine-for-sars-cov2-prophylaxis-in-healthcare-workers-ndash-a-multicentric-cohort-study-asses-sing-effectiveness-and-safety.
71. **Bae et al.**, *Recent Hydroxychloroquine Use Is Not Significantly Associated with Positive PCR Results for SARS-CoV-2: A Nationwide Observational Study in South Korea*, Viruses 2021, doi:10.3390/v13020329.
72. **Baildya et al.**, *Inhibitory capacity of Chloroquine against SARS-COV-2 by effective binding with Angiotensin converting enzyme-2 receptor: An insight from molecular docking and MD-simulation studies*, Journal of Molecular Structure, doi:10.1016/j.molstruc.2021.129891.
73. **Barbosa et al.**, *Clinical outcomes of hydroxychloroquine in hospitalized patients with COVID-19: a quasi-randomized comparative study*, Preprint, www.sefq.es/_pdfs/NEJM_Hydroxychloroquine.pdf.
74. **Barnabas et al.**, *Hydroxychloroquine for Post-exposure Prophylaxis to Prevent Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infection: A Randomized Trial*, Annals of Internal Medicine, doi:10.7326/M20-6519.
75. **Barra et al.**, *COVID-19 in hospitalized patients in 4 hospitals in San Isidro, Buenos Aires, Argentina*, medRxiv, doi:10.1101/2021.07.30.21261220.
76. **Barrat-Due et al.**, *Evaluation of the Effects of Remdesivir and Hydroxychloroquine on Viral Clearance in COVID-19*, Annals of Internal Medicine, doi:10.7326/M21-0653.
77. **Barron's**, *Hydroxychloroquine: A Drug Dividing The World*, www.barrons.com/news/hydroxychloroquine-a-drug-dividing-the-world-01591006809.

78. **Barron's (B)**, *Amid Global Controversy, Greece Moves Forward With Chloroquine*, www.barrons.com/news/amid-global-controversy-greece-moves-forward-with-chloroquine-01591781707.
79. **Barry** et al., *Clinical Characteristics and Outcomes of Hospitalized COVID-19 Patients in a MERS-CoV Referral Hospital during the Peak of the Pandemic*, *International Journal of Infectious Diseases*, doi:10.1016/j.ijid.2021.03.058.
80. **Bassets-Bosch** et al., *Negativización de PCR a SARS-CoV-2 en muestra respiratoria en pacientes con necesidad de asistencia recurrente*, *Anales de Pediatría*, doi:10.1016/j.anpedi.2021.01.006.
81. **BBC**, *Coronavirus: How Turkey took control of Covid-19 emergency*, www.bbc.com/news/world-europe-52831017.
82. **Beaumont** et al., *Factors associated with hospital admission and adverse outcome for COVID-19: role of social factors and medical care*, *Infectious Diseases Now*, doi:10.1016/j.idnow.2022.02.001.
83. **Becetti** et al., *Prevalence of coronavirus disease 2019 in a multiethnic cohort of patients with autoimmune rheumatic diseases in Qatar*, *Qatar Medical Journal*, doi:10.5339/qmj.2022.37.
84. **Behera** et al., *Role of ivermectin in the prevention of SARS-CoV-2 infection among healthcare workers in India: A matched case-control study*, *PLoS ONE*, doi:10.1371/journal.pone.0247163.
85. **Belayneh, A.**, *Off-Label Use of Chloroquine and Hydroxychloroquine for COVID-19 Treatment in Africa Against WHO Recommendation*, www.dovepress.com/off-label-use-of-chloroquine-and-hydroxychloroquine-for-covid-19-treat-peer-reviewed-fulltext-article-RRTM.
86. **Belmont** et al., *COVID-19 PrEP HCW HCQ Study*, *ClinicalTrials.gov*, NCT04354870, clinicaltrials.gov/ct2/show/results/NCT04354870.
87. **Beltran Gonzalez** et al., *Efficacy and Safety of Ivermectin and Hydroxychloroquine in Patients with Severe COVID-19: A Randomized Controlled Trial*, *Infectious Disease Reports*, doi:10.3390/idr14020020.
88. **Berenguer** et al., *Characteristics and predictors of death among 4035 consecutively hospitalized patients with COVID-19 in Spain*, *Clinical Microbiology and Infection*, doi:10.1016/j.cmi.2020.07.024.
89. **Bernabeu-Wittel** et al., *Effectiveness of a On-Site Medicalization Program for Nursing Homes with COVID-19 Outbreaks*, *J. Gerontol. A Biol. Sci. Med. Sci.*, doi:10.1093/gerona/glaa192.
90. **Bernaola** et al., *Observational Study of the Efficiency of Treatments in Patients Hospitalized with Covid-19 in Madrid*, *medRxiv*, doi:10.1101/2020.07.17.20155960.
91. **Berry** et al., *Unfavorable Hydroxychloroquine COVID-19 Research Associated with Authors Having a History of Political Party Donations*, *SSRN, Berry*, doi:10.2139/ssrn.3707327.
92. **Bhatt** et al., *Hydroxychloroquine Prophylaxis against Coronavirus Disease-19: Practice Outcomes among Health-Care Workers*, *medRxiv*, doi:10.1101/2021.08.02.21260750.
93. **Bhattacharya** et al., *Pre exposure Hydroxychloroquine use is associated with reduced COVID19 risk in healthcare workers*, *medRxiv*, doi:10.1101/2020.06.09.20116806.
94. **Biancatelli** et al., *Quercetin and Vitamin C: An Experimental, Synergistic Therapy for the Prevention and Treatment of SARS-CoV-2 Related Disease (COVID-19)*, *Frontiers in Immunology*, doi:10.3389/fimmu.2020.01451.
95. **Bianet**, *Turkey begins distributing hydroxychloroquine to homes in capital city amid bed shortage*, bianet.org/english/health/230676-turkey-begins-distributing-hydroxychloroquine-to-homes-in-capital-city-amid-bed-shortage.
96. **Bielza** et al., *Clinical characteristics, frailty and mortality of residents with COVID-19 in nursing homes of a region of Madrid*, *Journal of the American Medical Directors Association*, doi:10.1016/j.jamda.2020.12.003.
97. **Boari** et al., *Prognostic factors and predictors of outcome in patients with COVID-19 and related pneumonia: a retrospective cohort study*, *Biosci. Rep.*, doi:10.1042/BSR20203455.
98. **Borba** et al., *Chloroquine diphosphate in two different dosages as adjunctive therapy of hospitalized patients with severe respiratory syndrome in the context of coronavirus (SARS-CoV-2) infection: Preliminary safety results of a randomized, double-blinded, phase IIb clinical trial (CloroCovid-19 Study)*, *JAMA Network Open*, doi:10.1001/jamanetworkopen.2020.8857.
99. **Borrie** et al., *COVID-19 PEP- High-risk Individuals in Long-term and Specialized Care - Canada*, NCT04397328, clinicaltrials.gov/study/NCT04397328.

100. **Bosaee** et al., *Favipiravir and Hydroxychloroquine Combination Therapy in Patients with Moderate to Severe COVID19 (FACCT Trial): An Open-Label, Multicenter, Randomized, Controlled Trial*, Infect. Dis. Ther., doi:10.1007/s40121-021-00496-6.
101. **Boulware**, D., *Comments regarding paper rejection*, twitter.com/boulware_dr/status/1311331372884205570.
102. **Boulware (B)** et al., *A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19*, NEJM, June 3 2020, doi:10.1056/NEJMoa2016638.
103. **Bousquet** et al., *ADL-dependency, D-Dimers, LDH and absence of anticoagulation are independently associated with one-month mortality in older inpatients with Covid-19*, Aging, 12:12, 11306-11313, doi:10.18632/aging.103583.
104. **Bowen** et al., *Reduction in risk of death among patients admitted with COVID-19 between first and second epidemic waves in New York City*, Open Forum Infectious Diseases, doi:10.1093/ofid/ofac436.
105. **Bubenek-Turconi** et al., *Clinical characteristics and factors associated with ICU mortality during the first year of the SARS-Cov-2 pandemic in Romania*, European Journal of Anaesthesiology, doi:10.1097/EJA.0000000000001776.
106. **Budhiraja** et al., *Clinical Profile of First 1000 COVID-19 Cases Admitted at Tertiary Care Hospitals and the Correlates of their Mortality: An Indian Experience*, medRxiv, doi:10.1101/2020.11.16.20232223.
107. **Burdick** et al., *Is Machine Learning a Better Way to Identify COVID-19 Patients Who Might Benefit from Hydroxychloroquine Treatment?—The IDENTIFY Trial*, Journal of Clinical Medicine, doi:10.3390/jcm9123834.
108. **Burney** et al., *Hydroxychloroquine Chemoprophylaxis for COVID-19 Infection in High-risk Healthcare Workers*, NCT04370015, clinicaltrials.gov/study/NCT04370015.
109. **Butler** et al., *PRINCIPLE: A clinical trial evaluating treatments for suspected and confirmed COVID-19 for recovery at home*, PRINCIPLE, www.isrctn.com/ISRCTN86534580.
110. **Byakika-Kibwika** et al., *Safety and Efficacy of Hydroxychloroquine for Treatment of Non-Severe COVID-19 in Adults in Uganda: A Randomized Open Label Phase II Clinical Trial*, Research Square, doi:10.21203/rs.3.rs-506195/v1.
111. **c19early.org**, c19early.org/timeline.html.
112. **Cadegiani** et al., *Early COVID-19 Therapy with azithromycin plus nitazoxanide, ivermectin or hydroxychloroquine in Outpatient Settings Significantly Improved COVID-19 outcomes compared to Known outcomes in untreated patients*, New Microbes and New Infections, doi:10.1016/j.nmni.2021.100915.
113. **Calderón** et al., *Treatment with hydroxychloroquine vs nitazoxanide in patients with COVID-19: brief report*, PAMJ - Clinical Medicine, doi:10.11604/pamj-cm.2021.7.15.30981.
114. **Cangiano** et al., *Mortality in an Italian nursing home during COVID-19 pandemic: correlation with gender, age, ADL, vitamin D supplementation, and limitations of the diagnostic tests*, Aging, doi:10.18632/aging.202307.
115. **Capsoni** et al., *CPAP Treatment In COVID-19 Patients: A Retrospective Observational Study In The Emergency Department*, Research Square, doi:10.21203/rs.3.rs-113418/v1.
116. **Cárdenas-Jaén** et al., *Gastrointestinal symptoms and complications in patients hospitalized due to COVID-19, an international multicentre prospective cohort study (TIVURON project)*, Gastroenterología y Hepatología (English Edition), doi:10.1016/j.gastre.2023.05.002.
117. **Cassione** et al., *COVID-19 infection in a northern-Italian cohort of systemic lupus erythematosus assessed by telemedicine*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-217717.
118. **Catteau** et al., *Low-dose Hydroxychloroquine Therapy and Mortality in Hospitalized Patients with COVID-19: A Nationwide Observational Study of 8075 Participants*, Int. J. Antimicrobial Agents, doi:10.1016/j.ijantimicag.2020.106144.
119. **Cavalcanti** et al., *Hydroxychloroquine with or without Azithromycin in Mild-to-Moderate Covid-19*, NEJM, doi:10.1056/NEJMoa2019014.
120. **CBS News**, *Turkey claims success treating virus with drug touted by Trump*, www.msn.com/en-au/news/world/turkey-claims-success-treating-virus-with-drug-touted-by-trump/ar-BB13oMXS.
121. **Challenge**, *Coronavirus : ce que le Maroc a réussi*, www.challenge.ma/coronavirus-ce-que-le-maroc-a-reussi-144484/.
122. **Chari** et al., *Clinical features associated with COVID-19 outcome in multiple myeloma: first results from the International Myeloma Society data set*, Blood, doi:10.1182/blood.202008150.

123. **Chatterjee** et al., *Healthcare workers & SARS-CoV-2 infection in India: A case-control investigation in the time of COVID-19*, Indian J. Med. Res., June 20, 2020, doi:10.4103/ijmr.IJMR_2234_20.
124. **Chaudhary** et al., *Impact of prophylactic hydroxychloroquine on ultrastructural impairment and cellular SARS-CoV-2 infection in different cells of bronchoalveolar lavage fluids of COVID-19 patients*, Scientific Reports, doi:10.1038/s41598-023-39941-6.
125. **Chauffe** et al., *Hydroxychloroquine as Prophylaxis for COVID-19 in Healthcare Workers (HCQPreP)*, NCT04363450, clinicaltrials.gov/study/NCT04363450.
126. **Chechter** et al., *Evaluation of patients treated by telemedicine in the beginning of the COVID-19 pandemic in São Paulo, Brazil: A non-randomized clinical trial preliminary study*, Heliyon, doi:10.1016/j.heliyon.2023.e15337.
127. **Chen** et al., *A Multicenter, randomized, open-label, controlled trial to evaluate the efficacy and tolerability of hydroxychloroquine and a retrospective study in adult patients with mild to moderate Coronavirus disease 2019 (COVID-19)*, PLoS ONE, doi:10.1371/journal.pone.0242763.
128. **Chen (B)** et al., *A Multicenter, randomized, open-label, controlled trial to evaluate the efficacy and tolerability of hydroxychloroquine and a retrospective study in adult patients with mild to moderate Coronavirus disease 2019 (COVID-19)*, PLoS ONE, doi:10.1371/journal.pone.0242763.
129. **Chen (C)** et al., *Efficacy and safety of chloroquine or hydroxychloroquine in moderate type of COVID-19: a prospective open-label randomized controlled study*, medRxiv, doi:10.1101/2020.06.19.20136093.
130. **Chen (D)** et al., *Efficacy of hydroxychloroquine in patients with COVID-19: results of a randomized clinical trial*, medRxiv doi:10.1101/2020.03.22.20040758, www.medrxiv.org/content/10.1101/2020.03.22.20040758v3.
131. **Chen (E)** et al., *A pilot study of hydroxychloroquine in treatment of patients with common coronavirus disease-19 (COVID-19)*, J. Zhejiang University (Med Sci), doi:10.3785/j.issn.1008-9292.2020.03.03.
132. **Chevalier** et al., *CovAID: Identification of factors associated with severe COVID-19 in patients with inflammatory rheumatism or autoimmune diseases*, Frontiers in Medicine, doi:10.3389/fmed.2023.1152587.
133. **Choi** et al., *Comparison of antiviral effect for mild-to-moderate COVID-19 cases between lopinavir/ritonavir versus hydroxychloroquine: A nationwide propensity score-matched cohort study*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2020.10.062.
134. **Çivriiz Bozdağ** et al., *Clinical Characteristics and Outcome of COVID-19 in Turkish Hematological Malignancy Patients*, Turk. J. Haematol., doi:10.4274/tjh.galenos.2021.2021.0287.
135. **Çiyiltepe** et al., *The Effect of Pre-admission Hydroxychloroquine Treatment on COVID-19-Related Intensive Care Follow-up in Geriatric Patients*, South. Clin. Ist. Euras., doi:10.14744/scie.2021.89847.
136. **Clementi** et al., *Combined Prophylactic and Therapeutic Use Maximizes Hydroxychloroquine Anti-SARS-CoV-2 Effects in vitro*, Front. Microbiol., 10 July 2020, doi:10.3389/fmicb.2020.01704.
137. **Coll** et al., *Covid-19 in transplant recipients: the spanish experience*, American Journal of Transplantation, doi:10.1111/ajt.16369.
138. **Concato** et al., NEJM, 342:1887-1892, doi:10.1056/NEJM200006223422507.
139. **Connor** et al., *HEalth Care Worker pROphylaxis Against COVID-19: The HERO Trial (HERO)*, NCT04352946, clinicaltrials.gov/study/NCT04352946.
140. **Cordtz** et al., *Incidence of COVID-19 Hospitalisation in Patients with Systemic Lupus Erythematosus: A Nationwide Cohort Study from Denmark*, Journal of Clinical Medicine, doi:10.3390/jcm10173842.
141. **Cordtz (B)** et al., *Incidence and severeness of COVID-19 hospitalisation in patients with inflammatory rheumatic disease: a nationwide cohort study from Denmark*, Rheumatology, doi:10.1093/rheumatology/keaa897.
142. **Corradini** et al., *Clinical factors associated with death in 3044 COVID-19 patients managed in internal medicine wards in Italy: results from the SIMI-COVID-19 study of the Italian Society of Internal Medicine (SIMI)*, Internal and Emergency Medicine, doi:10.1007/s11739-021-02742-8.
143. **Cortez** et al., *Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines*, Western Pacific Surveillance and Response Journal, doi:10.5365/wpsar.2021.12.4.852.

144. **Cravedi** et al., *COVID-19 and kidney transplantation: Results from the TANGO International Transplant Consortium*, American Journal of Transplantation, doi:10.1111/ajt.16185.
145. **Crawford**, M., *Rapid Censorship of Highly Positive Hydroxychloroquine Research Chart*, Rounding the Earth, roundingtheearth.substack.com/p/rapid-censorship-of-highly-positive.
146. **D'Arminio Monforte** et al., *Effectiveness of Hydroxychloroquine in COVID-19 disease: A done and dusted situation?*, Int. J. Infectious Diseases, doi:10.1016/j.ijid.2020.07.056.
147. **Dang** et al., *Structural basis of anti-SARS-CoV-2 activity of hydroxychloroquine: specific binding to NTD/CTD and disruption of LLPS of N protein*, bioRxiv, doi:10.1101/2021.03.16.435741.
148. **Datta** et al., *No Role of HCQ in COVID-19 Prophylaxis: A Survey amongst Indian Doctors*, Journal of Vaccines & Vaccination, S6:1000002, www.longdom.org/open-access/no-role-of-hcq-in-covid19-prophylaxis-a-survey-amongst-indian-doctors.pdf.
149. **Davido** et al., *Impact of medical care including anti-infective agents use on the prognosis of COVID-19 hospitalized patients over time*, Int. J. Antimicrobial Agents, 2020, doi:10.1016/j.ijantimicag.2020.106129.
150. **De Forni** et al., *Synergistic drug combinations designed to fully suppress SARS-CoV-2 in the lung of COVID-19 patients*, PLoS ONE, doi:10.1371/journal.pone.0276751.
151. **de Gonzalo-Calvo** et al., *A blood microRNA classifier for the prediction of ICU mortality in COVID-19 patients: a multicenter validation study*, Respiratory Research, doi:10.1186/s12931-023-02462-x.
152. **de la Iglesia** et al., *Hydroxycloquine for pre-exposure prophylaxis for SARS-CoV-2*, medRxiv, doi:10.1101/2020.08.31.20185314.
153. **De Luna** et al., *Clinical and Demographic Characteristics of COVID-19 Patients Admitted in a Tertiary Care Hospital in the Dominican Republic*, medRxiv, doi:10.1101/2020.12.11.20247437.
154. **De Rosa** et al., *Risk Factors for Mortality in COVID-19 Hospitalized Patients in Piedmont, Italy: Results from the Multicenter, Regional, CORACLE Registry*, J. Clin. Med., doi:10.3390/jcm10091951.
155. **Deaton** et al., *Understanding and misunderstanding randomized controlled trials*, Social Science & Medicine, 210, doi:10.1016/j.socscimed.2017.12.005.
156. **Delandre** et al., *Antiviral Activity of Repurposing Ivermectin against a Panel of 30 Clinical SARS-CoV-2 Strains Belonging to 14 Variants*, Pharmaceuticals, doi:10.3390/ph15040445.
157. **Delgado** et al., *Investigational medications in 9,638 hospitalized patients with severe COVID-19: lessons from the “fail-and-learn” strategy during the first two waves of the pandemic in 2020*, Research Square, doi:10.21203/rs.3.rs-2596201/v1.
158. **Deng**, H., *PyMeta, Python module for meta-analysis*, www.pymeta.com/.
159. **Derwand** et al., *COVID-19 Outpatients – Early Risk-Stratified Treatment with Zinc Plus Low Dose Hydroxychloroquine and Azithromycin: A Retrospective Case Series Study*, International Journal of Antimicrobial Agents, doi:10.1016/j.ijantimicag.2020.106214.
160. **Desbois** et al., *Prevalence and clinical features of COVID-19 in a large cohort of 199 patients with sarcoidosis*, Research Square, doi:10.21203/rs.3.rs-41653/v1.
161. **Dev** et al., *Risk factors and frequency of COVID-19 among healthcare workers at a tertiary care centre in India: a case-control study*, Transactions of The Royal Society of Tropical Medicine and Hygiene, doi:10.1093/trstmh/tra047.
162. **Dhibar** et al., *The ‘myth of Hydroxychloroquine (HCQ) as post-exposure prophylaxis (PEP) for the prevention of COVID-19’ is far from reality*, Scientific Reports, doi:10.1038/s41598-022-26053-w.
163. **Dhibar (B)** et al., *Post Exposure Prophylaxis with Hydroxychloroquine (HCQ) for the Prevention of COVID-19, a Myth or a Reality? The PEP-CQ Study*, International Journal of Antimicrobial Agents, doi:10.1016/j.ijantimicag.2020.106224.
164. **Di Castelnovo** et al., *Disentangling the Association of Hydroxychloroquine Treatment with Mortality in Covid-19 Hospitalized Patients through Hierarchical Clustering*, Journal of Healthcare Engineering, doi:10.1155/2021/5556207.
165. **Di Castelnovo (B)** et al., *Use of hydroxychloroquine in hospitalised COVID-19 patients is associated with reduced mortality: Findings from the observational multicentre Italian CORIST study*, European J. Internal Medicine, doi:10.1016/j.ejim.2020.08.019.

166. **Dr. Goldin**, *Summary of HCQ usage in India from an MD in India*, www.facebook.com/groups/hydroxychloroquine/permalink/2367454293560817/.
167. **Dubee** et al., *Hydroxychloroquine in mild-to-moderate COVID-19: a placebo-controlled double blind trial*, *Clinical Microbiology and Infection*, doi:10.1016/j.cmi.2021.03.005.
168. **Dubernet** et al., *A comprehensive strategy for the early treatment of COVID-19 with azithromycin/hydroxychloroquine and/or corticosteroids: results of a retrospective observational study in the French overseas department of Reunion Island*, *J. Global Antimicrobial Resistance*, doi:10.1016/j.jgar.2020.08.001.
169. **Dulcey** et al., *Long-Term Hydroxychloroquine and Its Association with Covid-19 Infection, a Cohort Study from a South American Hospital*, *Journal of Clinical Rheumatology*, doi:10.1097/RHU.0000000000001986.
170. **Ebongue** et al., *Factors predicting in-hospital all-cause mortality in COVID 19 patients at the Laquintinie Hospital Douala, Cameroon*, *Travel Medicine and Infectious Disease*, doi:10.1016/j.tmaid.2022.102292.
171. **Efecto Cocuyo**, *Venezuela empieza a usar la cloroquina para tratar COVID-19, anuncia Jorge Rodríguez*, efectococuyo.com/coronavirus/venezuela-empieza-a-usar-la-cloroquina-para-tratar-covid-19-anuncia-jorge-rodriguez/.
172. **Egger** et al., *Bias in meta-analysis detected by a simple, graphical test*, *BMJ*, doi:10.1136/bmj.315.7109.629.
173. **El-Sherbiny** et al., *Development and Validation of "Ready-to-Use" Inhalable Forms of Hydroxychloroquine for Treatment of COVID-19*, NCT04477083, clinicaltrials.gov/study/NCT04477083.
174. **Erden** et al., *COVID-19 outcomes in patients with antiphospholipid syndrome: a retrospective cohort study*, *Bratislava Medical Journal*, doi:10.4149/BLL_2022_018.
175. **Esper** et al., *Empirical treatment with hydroxychloroquine and azithromycin for suspected cases of COVID-19 followed-up by telemedicine*, Prevent Senior Institute, São Paulo, Brazil, www.dropbox.com/s/5qm58cd4fneeci2/2020.04.15%20journal%20manuscript%20final.pdf.
176. **Expats.cz**, *Czech Health Ministry permits temporary use of hydroxychloroquine to treat COVID-19*, news.expats.cz/weekly-czech-news/czech-health-ministry-permits-temporary-use-of-hydroxychloroquine-in-hospitals-to-treat-covid-19/.
177. **Face 2 Face Africa**, *Djibouti, others warned about chloroquine despite big COVID-19 recoveries*, face2faceafrica.com/article/djibouti-others-warned-about-chloroquine-despite-big-covid-19-recoveries.
178. **Faíco-Filho** et al., *No benefit of hydroxychloroquine on SARS-CoV-2 viral load reduction in non-critical hospitalized patients with COVID-19*, *Braz J Microbiol*, doi:10.1007/s42770-020-00395-x.
179. **Faísca** et al., *Enhanced In Vitro Antiviral Activity of Hydroxychloroquine Ionic Liquids against SARS-CoV-2*, *Pharmaceutics*, doi:10.3390/pharmaceutics14040877.
180. **Falcone** et al., *Role of low-molecular weight heparin in hospitalized patients with SARS-CoV-2 pneumonia: a prospective observational study*, *Open Forum Infectious Diseases*, doi:10.1093/ofid/ofaa563.
181. **Faria** et al., *Genomics and epidemiology of the P.1 SARS-CoV-2 lineage in Manaus, Brazil*, *Science*, doi:10.1126/science.abh2644.
182. **Farooq** et al., *Effectiveness of Hydroxychloroquine in Covid-19 Patients (Covid)*, NCT04328272, clinicaltrials.gov/study/NCT04328272.
183. **Fernández-Cruz** et al., *Higher mortality of hospitalized haematologic patients with COVID-19 compared to non-haematologic is driven by thrombotic complications and development of ARDS: An age-matched cohorts study*, *Clinical Infection in Practice*, doi:10.1016/j.clinpr.2022.100137.
184. **Ferreira** et al., *Outcomes associated with Hydroxychloroquine and Ivermectin in hospitalized patients with COVID-19: a single-center experience*, *Revista da Associação Médica Brasileira*, doi:10.1590/1806-9282.20210661.
185. **Ferreira (B)** et al., *Chronic treatment with hydroxychloroquine and SARS-CoV-2 infection*, *J. Medical Virology*, July 9, 2020, doi:10.1002/jmv.26286.
186. **Ferri** et al., *COVID-19 and rheumatic autoimmune systemic diseases: report of a large Italian patients series*, *Clinical Rheumatology*, doi:10.1007/s10067-020-05334-7.

187. **Filipova** et al., *Is there a Correlation between Changes in Hydroxychloroquine Use and Mortality Rates from COVID-19?*, Health Science Journal, www.hs-j.gr/medicine/is-there-a-correlation-between-changes-in-hydroxychloroquine-use-and-mortality-rates-from-covid19.pdf.
188. **Finkelstein** et al., *The Efficacy of Long-Term Hydroxychloroquine Use in the Prevention of COVID-19: A Retrospective Cohort Study*, Studies in Health Technology and Informatics, doi:10.3233/SHTI230489.
189. **Fitzgerald** et al., *Risk Factors for Infection and Health Impacts of the COVID-19 Pandemic in People with Autoimmune Diseases*, medRxiv, doi:10.1101/2021.02.03.21251069.
190. **Fontana** et al., *SARS-CoV-2 infection in dialysis patients in northern Italy: a single-centre experience*, Clinical Kidney Journal, 13:3, 334–339, doi:10.1093/ckj/sfaa084.
191. **France 24**, *Covid-19: In Cameroon, chloroquine therapy hailed by French expert becomes state protocol*, www.france24.com/en/20200503-covid-19-in-cameroon-a-chloroquine-therapy-hailed-by-french-expert-becomes-state-protocol.
192. **France 24 (B)**, *Covid-19 : au Cameroun, la méthode Raoult érigée en protocole d'État*, www.france24.com/fr/20200502-covid-19-au-cameroun-la-m%C3%A9thode-raoult-%C3%A9rig%C3%A9e-en-protocole-d-%C3%A9tat.
193. **Franceinfo**, *Ces pays africains qui ont décidé de continuer à soigner le Covid-19 avec l'hydroxychloroquine*, www.francetvinfo.fr/monde/afrique/senegal/ces-pays-africains-qui-ont-decide-de-continuer-a-soigner-le-covid-19-avec-l-hydroxychloroquine_3983239.html.
194. **Fried** et al., *Patient Characteristics and Outcomes of 11,721 Patients with COVID19 Hospitalized Across the United States*, Clinical Infectious Disease, doi:10.1093/cid/ciaa1268.
195. **Frontera** et al., *Treatment with Zinc is Associated with Reduced In-Hospital Mortality Among COVID-19 Patients: A Multi-Center Cohort Study*, Research Square, doi:10.21203/rs.3.rs-94509/v1.
196. **Fung** et al., *Effect of common maintenance drugs on the risk and severity of COVID-19 in elderly patients*, PLoS ONE, doi:10.1371/journal.pone.0266922.
197. **Gadhiya** et al., *Clinical characteristics of hospitalised patients with COVID-19 and the impact on mortality: a single-network, retrospective cohort study from Pennsylvania state*, BMJ Open, doi:10.1136/bmjopen-2020-042549.
198. **Gagneux-Brunon** et al., *Acceptability of a COVID-19 pre-exposure prophylaxis trial with hydroxychloroquine in French healthcare workers during the first wave of COVID-19 pandemic*, Trials, doi:10.1186/s13063-021-05329-y.
199. **García-Albéniz** et al., *Systematic review and meta-analysis of randomized trials of hydroxychloroquine for the prevention of COVID-19*, European Journal of Epidemiology, doi:10.1007/s10654-022-00891-4.
200. **Gasmi** et al., *Quercetin in the Prevention and Treatment of Coronavirus Infections: A Focus on SARS-CoV-2*, Pharmaceuticals, doi:10.3390/ph15091049.
201. **Gautret** et al., *Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial*, Int. J. of Antimicrobial Agents, doi:10.1016/j.ijantimicag.2020.105949.
202. **Geleris** et al., *Observational Study of Hydroxychloroquine in Hospitalized Patients with Covid-19*, NEJM, May 7, 2020, doi:10.1056/NEJMoa2012410.
203. **Gendebien** et al., *Systematic analysis of COVID-19 infection and symptoms in a systemic lupus erythematosus population: correlation with disease characteristics, hydroxychloroquine use and immunosuppressive treatments*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-218244.
204. **Gendelman** et al., *Continuous Hydroxychloroquine or Colchicine Therapy Does Not Prevent Infection With SARS-CoV-2: Insights From a Large Healthcare Database Analysis*, Autoimmunity Reviews, 19:7, July 2020, doi:10.1016/j.autrev.2020.102566.
205. **Genton** et al., *#StayHome: Early Hydroxychloroquine to Reduce Secondary Hospitalisation and Household Transmission in COVID-19 (#StayHome)*, NCT04385264, clinicaltrials.gov/study/NCT04385264.
206. **Gentry** et al., *Long-term hydroxychloroquine use in patients with rheumatic conditions and development of SARS-CoV-2 infection: a retrospective cohort study*, Lancet Rheumatology, doi:10.1016/S2665-9913(20)30305-2.

207. **Gerlovin** et al., *Pharmacoepidemiology, Machine Learning and COVID-19: An intent-to-treat analysis of hydroxychloroquine, with or without azithromycin, and COVID-19 outcomes amongst hospitalized US Veterans*, American Journal of Epidemiology, doi:10.1093/aje/kwab183.
208. **Ghanem-Zoubi** et al., *Hydroxychloroquine Post-Exposure Prophylaxis for Coronavirus Disease (COVID-19) Among Health-Care Workers*, NCT04438837, clinicaltrials.gov/study/NCT04438837.
209. **Gianfrancesco** et al., *Characteristics associated with hospitalisation for COVID-19 in people with rheumatic disease: data from the COVID-19 Global Rheumatology Alliance physician-reported registry*, Annals of the Rheumatic Diseases, 79:7, 859-866, doi:10.1136/annrheumdis-2020-217871.
210. **Global Times**, *Chinese medical expert decorated by Djibouti for COVID-19 prevention*, www.globaltimes.cn/content/1189839.shtml.
211. **Go** et al., *Hydroxychloroquine, azithromycin and methylprednisolone and in hospital survival in severe COVID-19 pneumonia*, Frontiers in Pharmacology, doi:10.3389/fphar.2022.935370.
212. **Goenka** et al., *Seroprevalence of COVID-19 Amongst Health Care Workers in a Tertiary Care Hospital of a Metropolitan City from India*, SSRN, doi:10.2139/ssrn.3689618.
213. **Goldman** et al., *Remdesivir for 5 or 10 Days in Patients with Severe Covid-19*, NEJM, doi:10.1056/NEJMoa2015301.
214. **Gómez** et al., *Mortality risk factors in patients with SARS-CoV-2 infection and atrial fibrillation: Data from the SEMI-COVID-19 registry*, Medicina Clínica (English Edition), doi:10.1016/j.medcle.2022.01.020.
215. **Gönenli** et al., *Analysis of the Prophylactic use of Hydroxychloroquine at the Beginning of the COVID-19 Pandemic Among Physicians*, Infectious Diseases and Clinical Microbiology, doi:10.36519/idcm.2022.111.
216. **Gonzalez** et al., *The Prognostic Value of Eosinophil Recovery in COVID-19: A Multicentre, Retrospective Cohort Study on Patients Hospitalised in Spanish Hospitals*, medRxiv, doi:10.1101/2020.08.18.20172874.
217. **González** et al., *Hydroxychloroquine efficacy and safety in preventing SARS-CoV-2 infection and COVID-19 disease severity during pregnancy (COVID-Preg): a structured summary of a study protocol for a randomised placebo controlled trial*, Trials, doi:10.1186/s13063-020-04557-y.
218. **Gotzsche**, P., *Bias in double-blind trials*, Doctoral Thesis, University of Copenhagen, www.scientificfreedom.dk/2023/05/16/bias-in-double-blind-trials-doctoral-thesis/.
219. **Government of China**, *关于印发新型冠状病毒肺炎诊疗方案（试行第八版）的通知*, www.nhc.gov.cn/yzygj/s7653p/202008/0a7bdf12bd4b46e5bd28ca7f9a7f5e5a.shtml.
220. **Government of India**, *The caregiver and all close contacts of such cases should take HCQ prophylaxis*, www.mohfw.gov.in/pdf/RevisedHomelSolationGuidelines.pdf.
221. **Government of Venezuela**, *THERAPEUTIC MANAGEMENT GUIDE FOR COVID-19 PATIENTS AND CONTACTS*, www.mpps.gob.ve/index.php/sistemas/descargas.
222. **Granados-Montiel** et al., *New prophylaxis regimen for SARS-CoV-2 infection in health professionals with low doses of hydroxychloroquine and bromhexine: a randomised, double-blind placebo clinical trial (ELEVATE Trial)*, BMJ Open, doi:10.1136/bmjopen-2020-045190.
223. **Grau-Pujol** et al., *Pre-exposure prophylaxis with hydroxychloroquine for COVID-19: a double-blind, placebo-controlled randomized clinical trial*, Trials, doi:10.1186/s13063-021-05758-9.
224. **Guérin** et al., *Azithromycin and Hydroxychloroquine Accelerate Recovery of Outpatients with Mild/Moderate COVID-19*, Asian J. Medicine and Health, July 15, 2020, doi:10.9734/ajmah/2020/18i730224.
225. **Guglielmetti** et al., *Treatment for COVID-19—a cohort study from Northern Italy*, Scientific Reports, doi:10.1038/s41598-021-00243-4.
226. **Guglielmetti (B)** et al., *Severe COVID-19 pneumonia in Piacenza, Italy – a cohort study of the first pandemic wave*, Journal of Infection and Public Health, doi:10.1016/j.jiph.2020.11.012.
227. **Guillaume** et al., *Antirheumatic Drug Intake Influence on Occurrence of COVID-19 Infection in Ambulatory Patients with Immune-Mediated Inflammatory Diseases: A Cohort Study*, Rheumatology and Therapy, doi:10.1007/s40744-021-00373-1.

228. **Guísado-Vasco**, *Clinical characteristics and outcomes among hospitalized adults with severe COVID-19 admitted to a tertiary medical center and receiving antiviral, antimalarials, glucocorticoids, or immunomodulation with tocilizumab or cyclosporine: A retrospective observational study (COQUIMA cohort)*, www.sciencedirect.com/science/article/pii/S2589537020303357.
229. **Guísado-Vasco (B)**, *Clinical characteristics and outcomes among hospitalized adults with severe COVID-19 admitted to a tertiary medical center and receiving antiviral, antimalarials, glucocorticoids, or immunomodulation with tocilizumab or cyclosporine: A retrospective observational study (COQUIMA cohort)*, www.sciencedirect.com/science/article/pii/S2589537020303357.
230. **Gül** et al., *Clinical Trial For Early SARS-CoV-2 (COVID-19) Treatment*, NCT04981379, clinicaltrials.gov/study/NCT04981379.
231. **GulfInsider**, *Coronavirus: Bahrain's Therapeutic Medication Proved Effective*, www.gulf-insider.com/coronavirus-bahrains-therapeutic-medication-proved-effective/.
232. **Güner** et al., *Comparing ICU Admission Rates of Mild/Moderate COVID-19 Patients Treated with Hydroxychloroquine, Favipiravir, and Hydroxychloroquine plus Favipiravir*, *Journal of Infection and Public Health*, doi:10.1016/j.jiph.2020.12.017.
233. **Gupta** et al., *Factors Associated With Death in Critically Ill Patients With Coronavirus Disease 2019 in the US*, *JAMA Intern. Med.*, doi:10.1001/jamainternmed.2020.3596.
234. **Hafez** et al., *Antiviral Used among Non-Severe COVID-19 Cases in Relation to Time till Viral Clearance: A Retrospective Cohort Study*, *Antibiotics*, doi:10.3390/antibiotics11040498.
235. **Haji Aghajani** et al., *Decreased in-hospital mortality associated with aspirin administration in hospitalized patients due to severe COVID-19*, *Journal of Medical Virology*, doi:10.1002/jmv.27053.
236. **Hall** et al., *Multi-institutional Analysis of 505 COVID-19 Patients Supported with ECMO: Predictors of Survival*, *The Annals of Thoracic Surgery*, doi:10.1016/j.athoracsur.2022.01.043.
237. **Harbord** et al., *A modified test for small-study effects in meta-analyses of controlled trials with binary endpoints*, *Statistics in Medicine*, doi:10.1002/sim.2380.
238. **Hawari** et al., *The Potential Use of Nebulized Hydroxychloroquine for the Treatment of COVID-19*, NCT05113810, clinicaltrials.gov/study/NCT05113810.
239. **Hayden** et al., *Baloxavir Marboxil for Uncomplicated Influenza in Adults and Adolescents*, *New England Journal of Medicine*, doi:10.1056/NEJMoa1716197.
240. **Heberto** et al., *Implications of myocardial injury in Mexican hospitalized patients with coronavirus disease 2019 (COVID-19)*, *IJC Heart & Vasculature*, doi:10.1016/j.ijcha.2020.100638.
241. **Heras** et al., *COVID-19 mortality risk factors in older people in a long-term care center*, *European Geriatric Medicine*, doi:10.1007/s41999-020-00432-w.
242. **Hernandez-Cardenas** et al., *Hydroxychloroquine for the treatment of severe respiratory infection by COVID-19: a randomized controlled trial*, *medRxiv*, doi:10.1101/2021.02.01.21250371.
243. **Higgins** et al., *Long-term (180-Day) Outcomes in Critically Ill Patients With COVID-19 in the REMAP-CAP Randomized Clinical Trial*, *JAMA*, doi:10.1001/jama.2022.23257.
244. **Ho** et al., *Hydroxychloroquine for COVID-19: A Single Center, Retrospective Cohort Study*, *Malaysian Journal of Medicine and Health Sciences*, doi:10.47836/mjmhs19.2.3.
245. **Hong** et al., *Early Hydroxychloroquine Administration for Rapid Severe Acute Respiratory Syndrome Coronavirus 2 Eradication*, *Infect. Chemother.*, 2020, doi:10.3947/ic.2020.52.e43.
246. **Hong (B)** et al., *Use of combined treatment of 3rd-generation cephalosporin, azithromycin and antiviral agents on moderate SARS-CoV-2 patients in South Korea: A retrospective cohort study*, *PLOS ONE*, doi:10.1371/journal.pone.0267645.
247. **Hraiech** et al., *Lack of viral clearance by the combination of hydroxychloroquine and azithromycin or lopinavir and ritonavir in SARS-CoV-2-related acute respiratory distress syndrome*, *Ann. Intensive Care*, doi:10.1186/s13613-020-00678-4.
248. **Huang** et al., *Clinical characteristics of 17 patients with COVID-19 and systemic autoimmune diseases: a retrospective study*, *Annals of the Rheumatic Diseases* 2020:79, 1163-1169, doi:10.1136/annrheumdis-2020-217425.

249. **Huang (B)** et al., *Preliminary evidence from a multicenter prospective observational study of the safety and efficacy of chloroquine for the treatment of COVID-19*, National Science Review, nwa113, doi:10.1093/nsr/nwa113.
250. **Huang (C)** et al., *Preliminary evidence from a multicenter prospective observational study of the safety and efficacy of chloroquine for the treatment of COVID-19*, National Science Review, nwa113, doi:10.1093/nsr/nwa113.
251. **Huh** et al., *Association of prescribed medications with the risk of COVID-19 infection and severity among adults in South Korea*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2020.12.041.
252. **Hussein** et al., *Molecular Docking Identification for the efficacy of Some Zinc Complexes with Chloroquine and Hydroxychloroquine against Main Protease of COVID-19*, Journal of Molecular Structure, doi:10.1016/j.molstruc.2021.129979.
253. **IHU Marseille**, *Meta-analysis on chloroquine derivatives and COVID-19 mortality*, www.mediterranee-infection.com/meta-analysis-on-chloroquine-derivatives-and-covid-19-mortality-october20-2020-update/.
254. **Ikematsu** et al., *Baloxavir Marboxil for Prophylaxis against Influenza in Household Contacts*, New England Journal of Medicine, doi:10.1056/NEJMoa1915341.
255. **Ip** et al., *Hydroxychloroquine in the treatment of outpatients with mildly symptomatic COVID-19: A multi-center observational study*, BMC Infectious Diseases, doi:10.1186/s12879-021-05773-w.
256. **Ip (B)** et al., *Hydroxychloroquine and Tocilizumab Therapy in COVID-19 Patients - An Observational Study*, PLoS ONE, doi:10.1371/journal.pone.0237693.
257. **Isnardi** et al., *Sociodemographic and clinical factors associated with poor COVID-19 outcomes in patients with rheumatic diseases: data from the SAR-COVID Registry*, Clinical Rheumatology, doi:10.1007/s10067-022-06393-8.
258. **Izoulet**, *Countries which Primarily Use Antimalarial Drugs As COVID-19 Treatment See Slower Dynamic of Daily Deaths M.*, SSRN, doi:10.2139/ssrn.3575899.
259. **Jacobs** et al., *Multi-institutional Analysis of 200 COVID-19 Patients treated with ECMO: Outcomes and Trends*, The Annals of Thoracic Surgery, doi:10.1016/j.athoracsur.2021.06.026.
260. **Jadad** et al., *Randomized Controlled Trials: Questions, Answers, and Musings, Second Edition*, doi:10.1002/9780470691922.
261. **James** et al., *PROLIFIC Chemoprophylaxis Trial (COVID-19)*, NCT04352933, clinicaltrials.gov/study/NCT04352933.
262. **Jeffreys** et al., *Remdesivir-ivermectin combination displays synergistic interaction with improved in vitro activity against SARS-CoV-2*, International Journal of Antimicrobial Agents, doi:10.1016/j.ijantimicag.2022.106542.
263. **Jitobaom** et al., *Favipiravir and Ivermectin Showed in Vitro Synergistic Antiviral Activity against SARS-CoV-2*, Research Square, doi:10.21203/rs.3.rs-941811/v1.
264. **Jitobaom (B)** et al., *Synergistic anti-SARS-CoV-2 activity of repurposed anti-parasitic drug combinations*, BMC Pharmacology and Toxicology, doi:10.1186/s40360-022-00580-8.
265. **Johnston** et al., *Hydroxychloroquine with or Without Azithromycin for Treatment of Early SARS-CoV-2 Infection Among High-Risk Outpatient Adults: A Randomized Clinical Trial*, EClinicalMedicine, doi:10.1016/j.eclinm.2021.100773.
266. **Juneja** et al., *Hydroxychloroquine pre-exposure prophylaxis provides no protection against COVID-19 among health care workers: a cross-sectional study in a tertiary care hospital in North India*, Journal of Basic and Clinical Physiology and Pharmacology, doi:10.1515/jbcpp-2021-0221.
267. **Jung** et al., *Effect of hydroxychloroquine pre-exposure on infection with SARS-CoV-2 in rheumatic disease patients: A population-based cohort study*, Clinical Microbiology and Infection, doi:10.1016/j.cmi.2020.12.003.
268. **Kadnur** et al., *Hydroxychloroquine pre-exposure prophylaxis for COVID-19 among healthcare workers: Initial experience from India*, Journal of Family Medicine and Primary Care, doi:10.4103/jfmpc.jfmpc_1177_21.
269. **Kalligeros** et al., *Hydroxychloroquine use in hospitalised patients with COVID-19: An observational matched cohort study*, Journal of Global Antimicrobial Resistance, doi:10.1016/j.jgar.2020.07.018.
270. **Kamga Kapchoup** et al., *In vitro effect of hydroxychloroquine on pluripotent stem cells and their cardiomyocytes derivatives*, Frontiers in Pharmacology, doi:10.3389/fphar.2023.1128382.
271. **Kamran** et al., *Clearing the fog: Is HCQ effective in reducing COVID-19 progression: A randomized controlled trial*, medRxiv, doi:10.1101/2020.07.30.20165365.

272. **Kamstrup** et al., *Hydroxychloroquine as a primary prophylactic agent against sars-cov-2 infection: a cohort study*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2021.05.076.
273. **Kara** et al., *Efficacy and Safety of Hydroxychloroquine and Favipiravir in the Treatment of Mild to Moderate COVID-19*, NCT04411433, clinicaltrials.gov/study/NCT04411433.
274. **Karita** et al., *Trajectory of viral load in a prospective population-based cohort with incident SARS-CoV-2 G614 infection*, medRxiv, doi:10.1101/2021.08.27.21262754.
275. **Karruli** et al., *Multidrug-Resistant Infections and Outcome of Critically Ill Patients with Coronavirus Disease 2019: A Single Center Experience*, Microbial Drug Resistance, doi:10.1089/mdr.2020.0489.
276. **Kavanagh** et al., *Inhaled hydroxychloroquine to improve efficacy and reduce harm in the treatment of COVID-19*, Med. Hypotheses, doi:10.1016/j.mehy.2020.110110.
277. **Kelly** et al., *Clinical outcomes and adverse events in patients hospitalised with COVID-19, treated with off-label hydroxychloroquine and azithromycin*, British Journal of Clinical Pharmacology, doi:10.1111/bcp.14482.
278. **Khoubnasabjafari** et al., *Prevalence of COVID-19 in patients with rheumatoid arthritis (RA) already treated with hydroxychloroquine (HCQ) compared with HCQ-naïve patients with RA: a multicentre cross-sectional study*, Postgraduate Medical Journal, doi:10.1136/postgradmedj-2020-139561.
279. **Khurana** et al., *Prevalence and clinical correlates of COVID-19 outbreak among healthcare workers in a tertiary level hospital*, medRxiv, doi:10.1101/2020.07.21.20159301.
280. **Kim** et al., *Comparison of Lopinavir/Ritonavir or Hydroxychloroquine in Patients With Mild Coronavirus Disease (COVID-19)*, NCT04307693, clinicaltrials.gov/study/NCT04438837.
281. **Kim (B)** et al., *Treatment Response to Hydroxychloroquine, Lopinavir/Ritonavir, and Antibiotics for Moderate COVID 19: A First Report on the Pharmacological Outcomes from South Korea*, medRxiv, doi:10.1101/2020.05.13.20094193.
282. **Kirenga** et al., *Characteristics and outcomes of admitted patients infected with SARS-CoV-2 in Uganda*, BMJ Open Respiratory Research, doi:10.1136/bmjresp-2020-000646.
283. **Klebanov** et al., *Antimalarials are not Effective as Pre-Exposure Prophylaxis for COVID-19: A Retrospective Matched Control Study*, Journal of Drugs in Dermatology, doi:10.36849/jdd.6593.
284. **Klimke** et al., *Hydroxychloroquine as an aerosol might markedly reduce and even prevent severe clinical symptoms after SARS-CoV-2 infection*, Med. Hypotheses, doi:10.1016/j.mehy.2020.109783.
285. **Kokturk** et al., *The predictors of COVID-19 mortality in a nationwide cohort of Turkish patients*, Respiratory Medicine, doi:10.1016/j.rmed.2021.106433.
286. **Komissarov** et al., *Hydroxychloroquine has no effect on SARS-CoV-2 load in nasopharynx of patients with mild form of COVID-19*, medRxiv, doi:10.1101/2020.06.30.20143289.
287. **Konig** et al., *Baseline use of hydroxychloroquine in systemic lupus erythematosus does not preclude SARS-CoV-2 infection and severe COVID-19*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-217690.
288. **Korkmaz** et al., *The effect of Hydroxychloroquine use due to rheumatic disease on the risk of Covid-19 infection and its course*, Authorea, doi:10.22541/au.162257516.68665404/v1.
289. **Kowatsch** et al., *Hydroxychloroquine reduces T cells activation recall antigen responses*, PLOS ONE, doi:10.1371/journal.pone.0287738.
290. **Krishnan** et al., *Clinical comorbidities, characteristics, and outcomes of mechanically ventilated patients in the State of Michigan with SARS-CoV-2 pneumonia*, J Clin Anesth., doi:10.1016/j.jclinane.2020.110005.
291. **Krishnan (B)** et al., *Predictors of Mortality among Patients Hospitalized with COVID-19 during the First Wave in India: A Multisite Case-Control Study*, The American Journal of Tropical Medicine and Hygiene, doi:10.4269/ajtmh.22-0705.
292. **Küçükakkaş** et al., *The effect of hydroxychloroquine against SARS-CoV-2 infection in rheumatoid arthritis patients*, Research Square, doi:10.21203/rs.3.rs-43812/v1.
293. **Kuderer** et al., *Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study*, Lancet, June 20, 2020, doi:10.1016/S0140-6736(20)31187-9.

294. **Kumar** et al., *Combining baloxavir marboxil with standard-of-care neuraminidase inhibitor in patients hospitalised with severe influenza (FLAGSTONE): a randomised, parallel-group, double-blind, placebo-controlled, superiority trial*, The Lancet Infectious Diseases, doi:10.1016/S1473-3099(21)00469-2.
295. **Ladapo** et al., *Randomized Controlled Trials of Early Ambulatory Hydroxychloroquine in the Prevention of COVID-19 Infection, Hospitalization, and Death: Meta-Analysis*, medRxiv, doi:10.1101/2020.09.30.20204693.
296. **Lagier** et al., *Outcomes of 2,111 COVID-19 hospitalised patients treated with 2 hydroxychloroquine/azithromycin and other regimens in Marseille, France: a 3 monocentric retrospective analysis*, Therapeutics and Clinical Risk Management, doi:10.2147/TCRM.S364022.
297. **Lagier (B)** et al., *Outcomes of 3,737 COVID-19 patients treated with hydroxychloroquine/azithromycin and other regimens in Marseille, France: A retrospective analysis*, Travel Med. Infect. Dis. 101791, Jun 25, 2020, doi:10.1016/j.tmaid.2020.101791.
298. **Lamback** et al., *Hydroxychloroquine with azithromycin in patients hospitalized for mild and moderate COVID-19*, The Brazilian Journal of Infectious Diseases, doi:10.1016/j.bjid.2021.101549.
299. **Lambermont** et al., *Predictors of Mortality and Effect of Drug Therapies in Mechanically Ventilated Patients With Coronavirus Disease 2019: A Multicenter Cohort Study*, Critical Care Explorations, doi:10.1097/CCE.0000000000000305.
300. **Lammers** et al., *Early hydroxychloroquine but not chloroquine use reduces ICU admission in COVID-19 patients*, Int. J. Infectious Diseases, doi:10.1016/j.ijid.2020.09.1460.
301. **Landsteiner de Sampaio Amêndola** et al., *COVID-19 Infection in Rheumatic Patients on Chronic Antimalarial Drugs: A Systematic Review and Meta-Analysis*, Journal of Clinical Medicine, doi:10.3390/jcm11226865.
302. **Lano** et al., *Risk factors for severity of COVID-19 in chronic dialysis patients from a multicentre French cohort*, Clinical Kidney Journal, 13:5, October 2020, 878–888, doi:10.1093/ckj/sfaa199.
303. **Laplana** et al., *Lack of protective effect of chloroquine derivatives on COVID-19 disease in a Spanish sample of chronically treated patients*, PLOS ONE, doi:10.1371/journal.pone.0243598.
304. **Lauriola** et al., *Effect of combination therapy of hydroxychloroquine and azithromycin on mortality in COVID-19 patients*, Clinical and Translational Science, doi:10.1111/cts.12860.
305. **Lavilla Olleros** et al., *Use of glucocorticoids megadoses in SARS-CoV-2 infection in a spanish registry: SEMI-COVID-19*, PLOS ONE, doi:10.1371/journal.pone.0261711.
306. **Le Nouvel Afrik**, *Covid-19 : pourquoi les Marocains décèdent plus en Europe qu'au Maroc*, www.afrik.com/covid-19-pourquoi-les-marocains-decedent-plus-en-europe-qu-au-maroc.
307. **Lecronier** et al., *Comparison of hydroxychloroquine, lopinavir/ritonavir, and standard of care in critically ill patients with SARS-CoV-2 pneumonia: an opportunistic retrospective analysis*, Critical Care, 24:418, 2020, doi:10.1186/s13054-020-03117-9.
308. **Lee** et al., *Analysis of Overall Level of Evidence Behind Infectious Diseases Society of America Practice Guidelines*, Arch Intern Med., 2011, 171:1, 18-22, doi:10.1001/archinternmed.2010.482.
309. **Levi** et al., *Open Label Study to Compare Efficacy, Safety and Tolerability of Hydroxychloroquine Combined With Azithromycin Compared to Hydroxychloroquine Combined With Camostat Mesylate and to "no Treatment" in SARS CoV 2 Virus (COSTA)*, NCT04355052, clinicaltrials.gov/study/NCT04355052.
310. **Li** et al., *Evaluation of the efficacy and safety of hydroxychloroquine in comparison with chloroquine in moderate and severe patients with COVID-19*, Science China Life Sciences, doi:10.1007/s11427-020-1871-4.
311. **Li (B)** et al., *Treatment of COVID-19 patients with hydroxychloroquine or chloroquine: A retrospective analysis*, Research Square, doi:10.21203/rs.3.rs-119202/v1.
312. **LifeSiteNews**, *Doctors insist this cheap, safe drug is "key to preventing huge loss of life" from Wuhan virus*, www.lifesitenews.com/news/doctors-insist-this-drug-is-a-proven-safe-inexpensive-key-to-returning-society-toward-normal-functioning-and-to-preventing-huge-loss-of-life-from-covid-virus.
313. **Liu** et al., *Hydroxychloroquine, a less toxic derivative of chloroquine, is effective in inhibiting SARS-CoV-2 infection in vitro*, Cell Discovery 6, 16 (2020), doi:10.1038/s41421-020-0156-0.

314. **Llanos-Cuentas** et al., *Hydroxychloroquine to prevent SARS-CoV-2 infection among healthcare workers: early termination of a phase 3, randomised, open-label, controlled clinical trial*, BMC Research Notes, doi:10.1186/s13104-023-06281-7.
315. **López** et al., *Telemedicine follow-ups for COVID-19: experience in a tertiary hospital*, Annals of Pediatrics, doi:10.1016/j.anpedi.2020.10.017.
316. **López-Medina** et al., *Effect of Ivermectin on Time to Resolution of Symptoms Among Adults With Mild COVID-19: A Randomized Clinical Trial*, JAMA, doi:10.1001/jama.2021.3071.
317. **Lora-Tamayo** et al., *Early Lopinavir/ritonavir does not reduce mortality in COVID-19 patients: results of a large multicenter study*, J. Infection, doi:10.1016/j.jinf.2021.02.011.
318. **Lotfy** et al., *Use of Hydroxychloroquine in Patients with COVID-19: A Retrospective Observational Study*, Turk. Thorac. J., doi:10.5152/TurkThoracJ.2021.20180.
319. **Loucera** et al., *Real-world evidence with a retrospective cohort of 15,968 Andalusian COVID-19 hospitalized patients suggests 21 new effective treatments and one drug that increases death risk*, medRxiv, doi:10.1101/2022.08.14.22278751.
320. **Luo** et al., *COVID-19 in patients with lung cancer*, Annals of Oncology, 31:10, 1386-1396, doi:10.1016/j.annonc.2020.06.007.
321. **Luo (B)** et al., *Metformin Treatment Was Associated with Decreased Mortality in COVID-19 Patients with Diabetes in a Retrospective Analysis*, The American Journal of Tropical Medicine and Hygiene, doi:10.4269/ajtmh.20-0375.
322. **Ly** et al., *Pattern of SARS-CoV-2 infection among dependant elderly residents living in retirement homes in Marseille, France, March-June 2020*, International Journal of Antimicrobial Agents, doi:10.1016/j.ijantimicag.2020.106219.
323. **Lyashchenko** et al., *Systemic Exposure to Hydroxychloroquine and its relationship with outcome in severely ill COVID-19 patients in New York City*, British Journal of Clinical Pharmacology, doi:10.1111/bcp.15489.
324. **Lyngbakken** et al., *A pragmatic randomized controlled trial reports lack of efficacy of hydroxychloroquine on coronavirus disease 2019 viral kinetics*, Nature Communications, doi:10.1038/s41467-020-19056-6.
325. **Macaskill** et al., *A comparison of methods to detect publication bias in meta-analysis*, Statistics in Medicine, doi:10.1002/sim.698.
326. **MacFadden** et al., *Screening Large Population Health Databases for Potential COVID-19 Therapeutics: A Pharmacopeia-Wide Association Study (PWAS) of Commonly Prescribed Medications*, Open Forum Infectious Diseases, doi:10.1093/ofid/ofac156.
327. **Macias** et al., *Similar incidence of Coronavirus Disease 2019 (COVID-19) in patients with rheumatic diseases with and without hydroxychloroquine therapy*, medRxiv, 10.1101/2020.05.16.20104141, www.medrxiv.org/content/10.1101/2020.05.16.20104141v1.
328. **Magagnoli** et al., *Outcomes of hydroxychloroquine usage in United States veterans hospitalized with Covid-19*, Med (2020), doi:10.1016/j.medj.2020.06.001.
329. **Mahale** et al., *A Retrospective Observational Study of Hypoxic COVID-19 Patients Treated with Immunomodulatory Drugs in a Tertiary Care Hospital*, Indian Journal of Critical Care Medicine, doi:10.5005/jp-journals-10071-23599.
330. **Mahévas** et al., *Clinical efficacy of hydroxychloroquine in patients with covid-19 pneumonia who require oxygen: observational comparative study using routine care data*, BMJ 2020, 369, doi: https://doi.org/10.1136/bmj.m1844, www.bmj.com/content/369/bmj.m1844.
331. **Mahto** et al., *Seroprevalence of IgG against SARS-CoV-2 and its determinants among healthcare workers of a COVID-19 dedicated hospital of India*, American Journal of Blood Research, 11:1, www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC8010601/.
332. **Maldonado** et al., *COVID-19 incidence and outcomes in a home dialysis unit in Madrid (Spain) at the height of the pandemic*, Nefrología, doi:10.1016/j.nefro.2020.09.002.
333. **Mallat** et al., *Hydroxychloroquine is associated with slower viral clearance in clinical COVID-19 patients with mild to moderate disease: A retrospective study*, Medicine (Baltimore), doi:10.1097/MD.00000000000023720.
334. **Malundo** et al., *Predictors of Mortality among inpatients with COVID-19 Infection in a Tertiary Referral Center in the Philippines*, IJID Regions, doi:10.1016/j.ijregi.2022.07.009.
335. **Martin-Vicente** et al., *Absent or insufficient anti-SARS-CoV-2 S antibodies at ICU admission are associated to higher viral loads in plasma, antigenemia and mortality in COVID-19 patients*, medRxiv, doi:10.1101/2021.03.08.21253121.

336. **Martinez-Lopez** et al., *Multiple Myeloma and SARS-CoV-2 Infection: Clinical Characteristics and Prognostic Factors of Inpatient Mortality*, Blood Cancer Journal, doi:10.1038/s41408-020-00372-5.
337. **Matangila** et al., *Clinical characteristics of COVID-19 patients hospitalized at Clinique Ngaliema, a public hospital in Kinshasa, in the Democratic Republic of Congo: A retrospective cohort study*, PLoS ONE, doi:10.1371/journal.pone.0244272.
338. **Mathai** et al., *Hydroxychloroquine as pre-exposure prophylaxis against COVID-19 in health-care workers: A single-center experience*, J. Marine Medical Society, doi:10.4103/jmms.jmms_115_20.
339. **Mathew** et al., *Predictors of COVID-19 severity and outcomes in Indian patients with rheumatic diseases: a prospective cohort study*, Rheumatology Advances in Practice, doi:10.1093/rap/rkad025.
340. **McCullough** et al., *Hydroxychloroquine in the Prevention of COVID-19 Infection in Healthcare Workers*, NCT04333225, clinicaltrials.gov/study/NCT04333225.
341. **McGrail** et al., *COVID-19 Case Series at UnityPoint Health St. Luke's Hospital in Cedar Rapids, IA*, medRxiv, doi:10.1101/2020.07.17.20156521.
342. **McKinnon** et al., *Safety and Tolerability of Hydroxychloroquine in healthcare workers and first responders for the prevention of COVID-19: WHIP COVID-19 Study*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2021.12.343.
343. **McLean** et al., *Impact of Late Oseltamivir Treatment on Influenza Symptoms in the Outpatient Setting: Results of a Randomized Trial*, Open Forum Infect. Dis. September 2015, 2:3, doi:10.1093/ofid/ofv100.
344. **Medical World Nigeria**, *Chloroquine potent for COVID-19 prevention, says NAFDAC*, medicalworldnigeria.com/post/Chloroquine-Potent-For-COVID-19-Prevention-Says-NAFDAC?pid=45479.
345. **Medical Xpress**, *Senegal says hydroxychloroquine virus treatment is promising*, medicalxpress.com/news/2020-04-senegal-hydroxychloroquine-virus-treatment.html.
346. **Medical Xpress (B)**, *Amid global controversy, Greece moves forward with chloroquine*, medicalxpress.com/news/2020-06-global-controversy-greece-chloroquine.html.
347. **medicospelavidacovid19.com.br**, medicospelavidacovid19.com.br/editoriais/folha-de-s-paulo-revela-numeros-de-david-uip-veja-a-comparacao-com-medicos-que-fazem-tratamento-precoce/.
348. **Meeus**, G., *Online Comment*, twitter.com/gertmeeus_MD/status/1386636373889781761.
349. **Membrillo de Novales** et al., *Early Hydroxychloroquine Is Associated with an Increase of Survival in COVID-19 Patients: An Observational Study*, Preprints 2020, 2020050057, doi:10.20944/preprints202005.0057.v1.
350. **Menardi** et al., *A retrospective analysis on pharmacological approaches to COVID-19 patients in an Italian hub hospital during the early phase of the pandemic*, PharmAdvances, doi:10.36118/pharmadvances.2021.15.
351. **Meneguesso**, A., *Médica defende tratamento precoce da Covid-19*, www.youtube.com/watch?v=X5FCrlm_19U.
352. **Mežnar** et al., *Use of Bromhexine and Hydroxychloroquine for Treatment of COVID-19 Pneumonia*, NCT04355026, clinicaltrials.gov/study/NCT04355026.
353. **Middle East Eye**, *Coronavirus: Turkey says hydroxychloroquine dramatically reduces pneumonia cases*, www.middleeasteye.net/news/coronavirus-turkey-hydroxychloroquine-malaria-treatment-progress.
354. **Mikami** et al., *Risk Factors for Mortality in Patients with COVID-19 in New York City*, J. Gen. Intern. Med., doi:10.1007/s11606-020-05983-z.
355. **Milan Bonotto** et al., *Cathepsin inhibitors nitroxoline and its derivatives inhibit SARS-CoV-2 infection*, Antiviral Research, doi:10.1016/j.antiviral.2023.105655.
356. **Million** et al., *Cardiovascular Safety of Hydroxychloroquine-Azithromycin in 424 COVID-19 Patients*, MDPI AG, doi:10.20944/preprints202303.0325.v1.
357. **Million (B)** et al., *Early Treatment with Hydroxychloroquine and Azithromycin in 10,429 COVID-19 Outpatients: A Monocentric Retrospective Cohort Study*, Reviews in Cardiovascular Medicine, doi:10.31083/j.rcm2203116.
358. **Ministerstva Zdravotnictví**, *Rozhodnutí o dočasném povolení neregistrovaného humánního léčivého přípravku HYDROXYCHLOROQUINE SULFATE TABLETS*,

359. **Ministry of Health of Ukraine**, ПРОТОКОЛ «НАДАННЯ МЕДИЧНОЇ ДОПОМОГИ ДЛЯ ЛІКУВАННЯ КОРОНАВІРУСНОЇ ХВОРОБИ (COVID-19)», www.dec.gov.ua/wp-content/uploads/2020/04/2020_762_protokol_covid19-f.pdf.
360. **Ministry of Health of Ukraine (B)**, «НАДАННЯ МЕДИЧНОЇ ДОПОМОГИ ДЛЯ ЛІКУВАННЯ КОРОНАВІРУСНОЇ ХВОРОБИ (COVID-19)», moz.gov.ua/uploads/5/26129-dn_2106_17_09_2020_dod_1.pdf.
361. **Mitchell** et al., *Markedly Lower Rates of Coronavirus Infection and Fatality in Malaria-Endemic Regions – A Clue As to Treatment?*, SSRN, doi:10.2139/ssrn.3586954.
362. **Mitjà** et al., *Hydroxychloroquine for Early Treatment of Adults with Mild Covid-19: A Randomized-Controlled Trial*, *Clinical Infectious Diseases*, ciae1009, doi:10.1093/cid/ciae1009.
363. **Mitjà (B)** et al., *A Cluster-Randomized Trial of Hydroxychloroquine as Prevention of Covid-19 Transmission and Disease*, *NEJM*, doi:10.1056/NEJMoa2021801.
364. **Modrák** et al., *Detailed disease progression of 213 patients hospitalized with Covid-19 in the Czech Republic: An exploratory analysis*, *medRxiv*, doi:10.1101/2020.12.03.20239863.
365. **Mohandas** et al., *Clinical review of COVID-19 patients presenting to a quaternary care private hospital in South India: A retrospective study*, www.sciencedirect.com/science/article/pii/S2213398421000555.
366. **Mokhtari** et al., *Clinical outcomes of patients with mild COVID-19 following treatment with hydroxychloroquine in an outpatient setting*, *International Immunopharmacology*, doi:10.1016/j.intimp.2021.107636.
367. **Moraes** et al., *Comparative Study of Hydroxychloroquine and Ivermectin in COVID-19 Prophylaxis*, NCT04384458, clinicaltrials.gov/study/NCT04384458.
368. **Morales-Asencio** et al., *Prevention of COVID19 Infection in Nursing Homes by Chemoprophylaxis With Hydroxychloroquine*, NCT04400019, clinicaltrials.gov/study/NCT04400019.
369. **Mordmüller** et al., *Hydroxychloroquine for COVID-19 (COV-HCQ)*, NCT04342221, clinicaltrials.gov/study/NCT04342221.
370. **Moreno** et al., *Assessment of regression-based methods to adjust for publication bias through a comprehensive simulation study*, *BMC Medical Research Methodology*, doi:10.1186/1471-2288-9-2.
371. **Morocco World News**, *Moroccan Scientist: Morocco's Chloroquine Success Reveals European Failures*, www.moroccoworldnews.com/2020/06/306587/moroccan-scientist-moroccos-chloroquine-success-reveals-european-failures/.
372. **Mosaïque Guinée**, *Traitement des malades de covid19 en Guinée: « nous continuons avec l'hydroxychloroquine » (ANSS)*, mosaiequeguinee.com/traitement-des-malades-de-covid19-en-guinee-nous-continuons-avec-lhydroxychloroquine-anss/.
373. **Mulhem** et al., *3219 hospitalised patients with COVID-19 in Southeast Michigan: a retrospective case cohort study*, *BMJ Open*, doi:10.1136/bmjopen-2020-042042.
374. **Nachega** et al., *Clinical Characteristics and Outcomes of Patients Hospitalized for COVID-19 in Africa: Early Insights from the Democratic Republic of the Congo*, *The American Journal of Tropical Medicine and Hygiene*, doi:10.4269/ajtmh.20-1240.
375. **Naggie** et al., *Hydroxychloroquine for pre-exposure prophylaxis of COVID-19 in health care workers: A randomized, multicenter, placebo-controlled trial (HERO-HCQ)*, *International Journal of Infectious Diseases*, doi:10.1016/j.ijid.2023.01.019.
376. **Ñamendys-Silva** et al., *Outcomes of patients with COVID-19 in the Intensive Care Unit in Mexico: A multicenter observational study*, *Heart & Lung*, doi:10.1016/j.hrtlng.2020.10.013.
377. **Nanni** et al., *PROTECT Trial: A cluster-randomized study with hydroxychloroquine versus observational support for prevention or early-phase treatment of Coronavirus disease (COVID-19): A structured summary of a study protocol for a randomized controlled trial*, *Trials*, doi:10.1186/s13063-020-04527-4.
378. **Naseem** et al., *Predicting mortality in SARS-COV-2 (COVID-19) positive patients in the inpatient setting using a Novel Deep Neural Network*, *medRxiv*, doi:10.1101/2020.12.13.20247254.
379. **Nasri** et al., *Efficacy of hydroxychloroquine in pre-exposure severe acute respiratory syndrome coronavirus 2 prophylaxis among high-risk healthcare workers: A multicenter study*, *Advanced Biomedical Research*, doi:10.4103/abr.abr_104_21.
380. **Navya** et al., *A computational study on hydroxychloroquine binding to target proteins related to SARS-COV-2 infection*, *Informatics in Medicine Unlocked*, doi:10.1016/j.imu.2021.100714.

381. **Nichol** et al., *Challenging issues in randomised controlled trials*, Injury, 2010, doi: 10.1016/j.injury.2010.03.033, [www.injuryjournal.com/article/S0020-1383\(10\)00233-0/fulltext](http://www.injuryjournal.com/article/S0020-1383(10)00233-0/fulltext).
382. **Nigeria News World**, *COVID-19: Jigawa govt reveals secret behind mass recovery of patients*, nigerianewsworld.com/news/covid-19-jigawa-govt-reveals-secret-behind-mass-recovery-of-patients/.
383. **Niriella** et al., *Hydroxychloroquine for post-exposure prophylaxis of COVID-19 among naval personnel in Sri Lanka: study protocol for a randomized, controlled trial*, Trials, doi:10.1186/s13063-020-04659-7.
384. **Niwas** et al., *Clinical outcome, viral response and safety profile of chloroquine in COVID-19 patients — initial experience*, Advances in Respiratory Medicine, doi:10.5603/ARM.a2020.0139.
385. **Nonaka** et al., *SARS-CoV-2 variant of concern P.1 (Gamma) infection in young and middle-aged patients admitted to the intensive care units of a single hospital in Salvador, Northeast Brazil, February 2021*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2021.08.003.
386. **Noureddine** et al., *Quantum chemical studies on molecular structure, AIM, ELF, RDG and antiviral activities of hybrid hydroxychloroquine in the treatment of COVID-19: molecular docking and DFT calculations*, Journal of King Saud University - Science, doi:10.1016/j.jksus.2020.101334.
387. **Novartis**, *Hydroxychloroquine Monotherapy and in Combination With Azithromycin in Patients With Moderate and Severe COVID-19 Disease*, NCT04358081, clinicaltrials.gov/study/NCT04358081.
388. **NPR News**, *Senegal pledges a bed for every coronavirus patient*, wfuw.org/content/senegal-pledges-bed-every-coronavirus-patient-%E2%80%94-and-their-contacts-too.
389. **Núñez-Gil** et al., *Hydroxychloroquine and Mortality in SARS-Cov-2 Infection; The HOPE- Covid-19 Registry.*, Anti-Infective Agents, doi:10.2174/2211352520666220514112951.
390. **Núñez-Gil (B)** et al., *Mortality risk assessment in Spain and Italy, insights of the HOPE COVID-19 registry*, Intern. Emerg. Med., doi:10.1007/s11739-020-02543-5.
391. **Obrișcă** et al., *Characteristics of SARS-CoV-2 Infection in an Actively Monitored Cohort of Patients with Lupus Nephritis*, Biomedicines, doi:10.3390/biomedicines10102423.
392. **Okasha** et al., *Hydroxychloroquine and Nitazoxanide Combination Therapy for COVID-19*, NCT04361318, clinicaltrials.gov/study/NCT04361318.
393. **Oku** et al., *Risk factors for hospitalization or mortality for COVID-19 in patients with rheumatic diseases: Results of a nation-wide JCR COVID-19 registry in Japan*, Modern Rheumatology, doi:10.1093/mr/roac104.
394. **Omma** et al., *Hydroxychloroquine shortened hospital stay and reduced intensive care unit admissions in hospitalized COVID-19 patients*, The Journal of Infection in Developing Countries, doi:10.3855/jidc.14933.
395. **Omrani** et al., *Randomized double-blinded placebo-controlled trial of hydroxychloroquine with or without azithromycin for virologic cure of non-severe Covid-19*, EclinicalMedicine, doi:10.1016/j.eclinm.2020.100645.
396. **Oneindia**, *No COVID-19 death in Manipur, Mizoram, Nagaland, Sikkim so far: Govt*, www.oneindia.com/india/no-covid-19-death-in-manipur-mizoram-nagaland-sikkim-so-far-health-ministry-3111048.html.
397. **Opdam** et al., *Identification of Risk Factors for COVID-19 Hospitalization in Patients with Anti-Rheumatic Drugs: Results from a Multicenter Nested Case Control Study*, Clinical Pharmacology & Therapeutics, doi:10.1002/cpt.2551.
398. **Orioli** et al., *Clinical characteristics and short-term prognosis of in-patients with diabetes and COVID-19: A retrospective study from an academic center in Belgium*, Diabetes & Metabolic Syndrome: Clinical Research & Reviews, doi:10.1016/j.dsx.2020.12.020.
399. **Osawa** et al., *Characteristics and risk factors for mortality in critically ill patients with COVID-19 receiving invasive mechanical ventilation: the experience of a private network in Sao Paulo, Brazil*, The Journal of Critical Care Medicine, doi:10.2478/jccm-2022-0015.
400. **Ostrov** et al., *Highly Specific Sigma Receptor Ligands Exhibit Anti-Viral Properties in SARS-CoV-2 Infected Cells*, Pathogens, doi:10.3390/pathogens10111514.

401. **Ou** et al., *Hydroxychloroquine-mediated inhibition of SARS-CoV-2 entry is attenuated by TMPRSS2*, PLOS Pathogens, doi:10.1371/journal.ppat.1009212.
402. **Ouedraogo** et al., *Factors associated with the occurrence of acute respiratory distress and death in patients with COVID-19 in Burkina Faso*, Revue des Maladies Respiratoires, doi:10.1016/j.rmr.2021.02.001.
403. **Oztas** et al., *Frequency and Severity of COVID-19 in Patients with Various Rheumatic Diseases Treated Regularly with Colchicine or Hydroxychloroquine*, Journal of Medical Virology, doi:10.1002/jmv.27731.
404. **Ozturk** et al., *Mortality analysis of COVID-19 infection in chronic kidney disease, haemodialysis and renal transplant patients compared with patients without kidney disease: a nationwide analysis from Turkey*, Nephrology Dialysis Transplantation, doi:10.1093/ndt/gfaa271.
405. **Pablos** et al., *Clinical outcomes of hospitalised patients with COVID-19 and chronic inflammatory and autoimmune rheumatic diseases: a multicentric matched cohort study*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-218296.
406. **Paccoud** et al., *Compassionate use of hydroxychloroquine in clinical practice for patients with mild to severe Covid-19 in a French university hospital*, Clinical Infectious Diseases, doi:10.1093/cid/ciaa791.
407. **Pan African Medical Journal**, *Clinical characteristics, treatment regimen and duration of hospitalization among COVID-19 patients in Ghana: a retrospective cohort study*, www.panafrican-med-journal.com/content/series/37/1/9/full/.
408. **Panda** et al., *Antiviral Combination Clinically Better Than Standard Therapy in Severe but Not in Non-Severe COVID-19*, Clinical Pharmacology: Advances and Applications, doi:10.2147/CPAA.S325083.
409. **Parola** et al., *COVID-19 in Africa: What else?*, www.mediterranee-infection.com/wp-content/uploads/2020/09/COVIDAfricaJOUmII.pdf.
410. **Pasquini** et al., *Effectiveness of remdesivir in patients with COVID-19 under mechanical ventilation in an Italian ICU*, Journal of Antimicrobial Chemotherapy, doi:10.1093/jac/dkaa321.
411. **Patel** et al., *Factors Associated with COVID-19 Breakthrough Infection in the Pre-Omicron Era Among Vaccinated Patients with Rheumatic Diseases: A Cohort Study*, medRxiv, doi:10.1101/2022.07.13.22277606.
412. **Patil** et al., *A Prospective Longitudinal Study Evaluating The Influence of Immunosuppressives and Other Factors On COVID-19 in Autoimmune Rheumatic Diseases*, Research Square, doi:10.21203/rs.3.rs-805748/v1.
413. **Peacock** et al., *The SARS-CoV-2 variant, Omicron, shows rapid replication in human primary nasal epithelial cultures and efficiently uses the endosomal route of entry*, bioRxiv, doi:10.1101/2021.12.31.474653.
414. **Pellegrini** et al., *Effectiveness of Prophylactic Hydroxychloroquine on incidence of COVID-19 infection in Front-line Health and Allied Health Care Workers: The COVID-SHIELD Trial*, COVID-SHIELD, ACTRN12620000501943, www.anzctr.org.au/TrialSearch.aspx#&conditionCode=&dateOfRegistrationFrom=&interventionDescription=&interventionCodeOperator=OR&primarySponsorType=&gender=&distance=&postcode=&pageSize=20&ageGroup=&recruitmentCountryOperator=OR&recruitmentRegion=δicsReview=&countryOfRecruitment=Australia%7cNew+Zealand&istry=&searchTxt=ACTRN12620000501943.
415. **Peng** et al., *Early versus late acute kidney injury among patients with COVID-19—a multicenter study from Wuhan, China*, Nephrology Dialysis Transplantation, doi:10.1093/ndt/gfaa288.
416. **Peters** et al., *Outcomes of Persons With COVID-19 in Hospitals With and Without Standard Treatment With (Hydroxy)chloroquine*, Clinical Microbiology and Infection, doi:10.1016/j.cmi.2020.10.004.
417. **Peters (B)**, J., *Comparison of Two Methods to Detect Publication Bias in Meta-analysis*, JAMA, doi:10.1001/jama.295.6.676.
418. **Pham** et al., *Failure of chronic hydroxychloroquine in preventing severe complications of COVID-19 in patients with rheumatic diseases*, Rheumatology Advances in Practice, 10.1093/rap/rkab014, academic.oup.com/rheumap/advance-article/doi/10.1093/rap/rkab014/6156645.
419. **Pilot News**, *Chloroquine Can Treat Coronavirus at Early Stage – NAFDAC DG*, www.westafricanpilotnews.com/2020/08/26/chloroquine-cqb-treat-coronavirus-at-early-stage-nafdac-dg/.
420. **Pinato** et al., *Clinical portrait of the SARS-CoV-2 epidemic in European cancer patients*, Cancer Discovery, doi:10.1158/2159-8290.CD-20-0773.
421. **Pineda** et al., *Prevention and Treatment With Hydroxychloroquine + Azithromycin of Acute Respiratory Syndrome Induced by COVID-19 (AMBUCOV)*, NCT04954040, clinicaltrials.gov/study/NCT04954040.

422. **PledgeTimes**, Russian Ministry of Health has updated recommendations for the treatment of COVID-19, pledgetimes.com/russian-ministry-of-health-has-updated-recommendations-for-the-treatment-of-covid-19/.
423. **Pleno.News**, Cuba stands out in combating Covid with hydroxychloroquine, pleno.news/saude/coronavirus/cuba-se-destaca-no-combate-a-covid-com-hidroxiclороquina.html.
424. **Polat et al.**, Hydroxychloroquine Use on Healthcare Workers Exposed to COVID-19 - A Pandemic Hospital Experience, *Medical Journal of Bakirkoy*, 16:3, 280-6, doi:10.5222/BMJ.2020.50469.
425. **Polo et al.**, Daily tenofovir disoproxil fumarate/emtricitabine and hydroxychloroquine for pre-exposure prophylaxis of COVID-19: a double-blind placebo controlled randomized trial in healthcare workers, *Clinical Microbiology and Infection*, doi:10.1016/j.cmi.2022.07.006.
426. **Prodromos et al.**, Hydroxychloroquine is effective, and consistently so used early, for Covid-19: A systematic review, *New Microbes and New Infections*, doi:10.1016/j.nmni.2020.100776.
427. **Pseudos et al.**, Corona Virus Disease-19 (COVID-19) in a Veterans Affairs Hospital at Suffolk County, Long Island, New York, *Open Forum Infectious Diseases*, doi:10.1093/ofid/ofaa439.721.
428. **Purwati et al.**, An in vitro study of dual drug combinations of anti-viral agents, antibiotics, and/or hydroxychloroquine against the SARS-CoV-2 virus isolated from hospitalized patients in Surabaya, Indonesia, *PLOS One*, doi:10.1371/journal.pone.0252302.
429. **Purwati (B) et al.**, A Randomized, Double-Blind, Multicenter Clinical Study Comparing the Efficacy and Safety of a Drug Combination of Lopinavir/Ritonavir-Azithromycin, Lopinavir/Ritonavir-Doxycycline, and Azithromycin-Hydroxychloroquine for Patients Diagnosed with Mild to Moderate COVID-19 Infections, *Biochemistry Research International*, doi:10.1155/2021/6685921.
430. **Q Costa Rica**, Hydroxychloroquine: The Drug Costa Rica Uses Successfully To Fight Covid-19, qcostarica.com/hydroxychloroquine-the-drug-costa-rica-uses-successfully-to-fight-covid-19/.
431. **Qin et al.**, Low molecular weight heparin and 28-day mortality among patients with coronavirus disease 2019: A cohort study in the early epidemic era, *Thrombosis Research*, doi:10.1016/j.thromres.2020.11.020.
432. **Raabe et al.**, Hydroxychloroquine pre-exposure prophylaxis to prevent SARS-CoV-2 among health care workers at risk for SARS-CoV-2 exposure: A nonrandomized controlled trial, *medRxiv*, doi:10.1101/2022.07.01.22277058.
433. **Rajasingham et al.**, Hydroxychloroquine as pre-exposure prophylaxis for COVID-19 in healthcare workers: a randomized trial, *medRxiv*, doi:10.1101/2020.09.18.20197327.
434. **Ramírez-García et al.**, Hydroxychloroquine and Tocilizumab in the Treatment of COVID-19: A Longitudinal Observational Study, *Archivos de Medicina Universitaria*, digibug.ugr.es/handle/10481/69170.
435. **Rangel et al.**, Chronic Hydroxychloroquine Therapy and COVID-19 Outcomes: A Retrospective Case-Control Analysis, *Journal of the American Academy of Dermatology*, doi:10.1016/j.jaad.2020.10.098.
436. **Rao et al.**, Hydroxychloroquine as pre-exposure prophylaxis against COVID-19 infection among healthcare workers: a prospective cohort study, *Expert Review of Anti-infective Therapy*, doi:10.1080/14787210.2022.2015326.
437. **Rathi et al.**, Hydroxychloroquine prophylaxis for COVID-19 contacts in India *Lancet Infect. Dis.* doi:10.1016/S1473-3099(20)30313-3, [www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30313-3/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30313-3/fulltext).
438. **Rathod et al.**, Risk Factors associated with COVID-19 Patients in India: A Single Center Retrospective Cohort Study, *The Journal of the Association of Physicians of India*, doi:10.5005/japi-11001-0263.
439. **Rathod (B) et al.**, Association of vitamin D with the severity of disease and mortality in COVID-19: Prospective study in central India, *Annals of African Medicine*, doi:10.4103/aam.aam_21_22.
440. **Réa-Neto et al.**, An open-label randomized controlled trial evaluating the efficacy of chloroquine/hydroxychloroquine in severe COVID-19 patients, *Scientific Reports*, doi:10.1038/s41598-021-88509-9.
441. **RECOVERY**, Effect of Hydroxychloroquine in Hospitalized Patients with COVID-19: Preliminary results from a multi-centre, randomized, controlled trial Collaborative Group, *NEJM*, doi:10.1056/NEJMoa2022926.
442. **Reis et al.**, Effect of Early Treatment With Hydroxychloroquine or Lopinavir and Ritonavir on Risk of Hospitalization Among Patients With COVID-19 The TOGETHER Randomized Clinical Trial, *JAMA Network Open*, doi:10.1001/jamanetworkopen.2021.6468.

443. **Rentsch** et al., *Effect of pre-exposure use of hydroxychloroquine on COVID-19 mortality: a population-based cohort study in patients with rheumatoid arthritis or systemic lupus erythematosus using the OpenSAFELY platform*, *The Lancet Rheumatology*, doi:10.1016/S2665-9913(20)30378-7.
444. **Revollo** et al., *Hydroxychloroquine pre-exposure prophylaxis for COVID-19 in healthcare workers*, *Journal of Antimicrobial Chemotherapy*, doi:10.1093/jac/dkaa477.
445. **Risch**, H., *Early Outpatient Treatment of Symptomatic, High-Risk Covid-19 Patients that Should be Ramped-Up Immediately as Key to the Pandemic Crisis*, *American Journal of Epidemiology*, kwaa093, 27 May 2020, doi:10.1093/aje/kwaa093.
446. **Risch (B)**, H., *Response to: "Early Outpatient Treatment of Symptomatic, High-Risk Covid-19 Patients" and "Re: Early Outpatient Treatment of Symptomatic, High-Risk Covid-19 Patients that Should be Ramped-Up Immediately as Key to the Pandemic Crisis"*, *American Journal of Epidemiology*, July 20, 2020, doi:10.1093/aje/kwaa152.
447. **Rivera** et al., *Utilization of COVID-19 Treatments and Clinical Outcomes among Patients with Cancer: A COVID-19 and Cancer Consortium (CCC19) Cohort Study*, *Cancer Discovery*, doi:10.1158/2159-8290.CD-20-0941.
448. **Rivera-Izquierdo** et al., *Agentes terapéuticos utilizados en 238 pacientes hospitalizados por COVID-19 y su relación con la mortalidad*, *Medicina Clínica*, doi:10.1016/j.medcli.2020.06.025.
449. **Rodrigues** et al., *Hydroxychloroquine plus azithromycin early treatment of mild COVID-19 in outpatient setting: a randomized, double-blinded, placebo-controlled clinical trial evaluating viral clearance*, *International Journal of Antimicrobial Agents*, doi:10.1016/j.ijantimicag.2021.106428.
450. **Rodriguez** et al., *Severe infection due to the SARS-CoV-2 coronavirus: Experience of a tertiary hospital with COVID-19 patients during the 2020 pandemic*, *Medicina Intensiva*, doi:10.1016/j.medine.2020.05.005.
451. **Rodriguez-Gonzalez** et al., *COVID-19 in hospitalized patients in Spain: a cohort study in Madrid*, *International Journal of Antimicrobial Agents*, doi:10.1016/j.ijantimicag.2020.106249.
452. **Rodriguez-Nava** et al., *Clinical characteristics and risk factors for mortality of hospitalized patients with COVID-19 in a community hospital: A retrospective cohort study*, *Mayo Clinic Proceedings: Innovations, Quality & Outcomes*, www.sciencedirect.com/science/article/pii/S2542454820302071.
453. **Rogado** et al., *Covid-19 and lung cancer: A greater fatality rate?*, *Lung Cancer*, doi:10.1016/j.lungcan.2020.05.034.
454. **Roger** et al., *French Multicentre Observational Study on SARS-CoV-2 infections Intensive care initial management: the FRENCH CORONA Study*, *Anaesthesia Critical Care & Pain Medicine*, doi:10.1016/j.accpm.2021.100931.
455. **Roig** et al., *Clinical and pharmacological data in COVID-19 hospitalized nonagenarian patients*, *Revista Espanola de Quimioterapia*, doi:10.37201/req/130.2020.
456. **Rojas-Serrano** et al., *Hydroxychloroquine for prophylaxis of COVID-19 in health workers: A randomized clinical trial*, *PLOS ONE*, doi:10.1371/journal.pone.0261980.
457. **Roomi** et al., *Efficacy of hydroxychloroquine and tocilizumab in patients with COVID-19: A single-center retrospective chart review*, *J. Medical Internet Research*, doi:10.2196/21758.
458. **Rosenberg** et al., *Association of Treatment With Hydroxychloroquine or Azithromycin With In-Hospital Mortality in Patients With COVID-19 in New York State*, *JAMA*, May 11, 2020, doi:10.1001/jama.2020.8630.
459. **Rosenthal** et al., *Risk Factors Associated With In-Hospital Mortality in a US National Sample of Patients With COVID-19*, *JAMA Network Open*, doi:10.1001/jamanetworkopen.2020.29058.
460. **Rothstein**, H., *Publication Bias in Meta-Analysis: Prevention, Assessment and Adjustments*, www.wiley.com/en-ae/Publication+Bias+in+Meta+Analysis:+Prevention,+Assessment+and+Adjustments-p-9780470870143.
461. **Rouamba** et al., *Assessment of Recovery Time, Worsening and Death, among COVID-19 inpatients and outpatients, under treatment with Hydroxychloroquine or Chloroquine plus Azithromycin Combination in Burkina Faso*, *International Journal of Infectious Diseases*, doi:10.1016/j.ijid.2022.02.034.
462. **Roy** et al., *Outcome of Different Therapeutic Interventions in Mild COVID-19 Patients in a Single OPD Clinic of West Bengal: A Retrospective study*, *medRxiv*, doi:10.1101/2021.03.08.21252883.

463. **Roy-García** et al., *Efficacy and Safety of Fixed Combination of Hydroxychloroquine with Azithromycin Versus Hydroxychloroquine and Placebo in Patients with Mild COVID-19: Randomized, double blind, Placebo controlled trial*, medRxiv, doi:10.1101/2022.04.06.22273531.
464. **Rubio-Sánchez** et al., *Prognostic factors for the severity of SARS-CoV-2 infection*, *Advances in Laboratory Medicine / Avances en Medicina de Laboratorio*, doi:10.1515/almed-2021-0017.
465. **Rücker** et al., *Arcsine test for publication bias in meta-analyses with binary outcomes*, *Statistics in Medicine*, doi:10.1002/sim.2971.
466. **Ruiz** et al., *Hydroxychloroquine lung pharmacokinetics in critically ill patients infected with COVID-19*, *International Journal of Antimicrobial Agents*, doi:10.1016/j.ijantimicag.2020.106247.
467. **Russian Government**, *ВРЕМЕННЫЕ МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПРОФИЛАКТИКА, ДИАГНОСТИКА И ЛЕЧЕНИЕ НОВОЙ КОРОНАВИРУСНОЙ ИНФЕКЦИИ (COVID-19)*, static-0.minzdrav.gov.ru/system/attachments/attaches/000/052/548/original/%D0%9C%D0%A0_COVID-19_%28v.9%29.pdf.
468. **Russian Government (B)**, *Распоряжение Правительства Российской Федерации от 16.04.2020 № 1030-р*, publication.pravo.gov.ru/DocumentView/0001202004160037#print.
469. **Sahebari** et al., *Influence of biologic and conventional disease-modifying antirheumatic drugs on COVID-19 incidence among rheumatic patients during the first and second wave of the pandemic in Iran*, *Reumatologia/Rheumatology*, doi:10.5114/reum.2022.119039.
470. **Saib** et al., *Lack of efficacy of hydroxychloroquine and azithromycin in patients hospitalized for COVID-19 pneumonia: A retrospective study*, *PLOS ONE*, doi:10.1371/journal.pone.0252388.
471. **Said** et al., *Profiles of Independent-Comorbidity Groups in Senior COVID-19 Patients Reveal Low Fatality Associated with Standard Care and Low-Dose Hydroxychloroquine over Antivirals*, *Journal of Multidisciplinary Healthcare*, doi:10.2147/JMDH.S403700.
472. **Salazar** et al., *Significantly Decreased Mortality in a Large Cohort of Coronavirus Disease 2019 (COVID-19) Patients Transfused Early with Convalescent Plasma Containing High-Titer Anti-Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Spike Protein IgG*, *The American Journal of Pathology*, doi:10.1016/j.ajpath.2020.10.008.
473. **Saleemi** et al., *Time to negative PCR from symptom onset in COVID-19 patients on Hydroxychloroquine and Azithromycin - A real world experience*, medRxiv, doi:10.1101/2020.08.05.20151027.
474. **Salehi** et al., *Risk factors of death in mechanically ventilated COVID-19 patients: a retrospective multi-center study*, *Research Square*, doi:10.21203/rs.3.rs-1362678/v1.
475. **Salvador** et al., *Clinical Features and Prognostic Factors of 245 Portuguese Patients Hospitalized With COVID-19*, *Cureus*, doi:10.7759/cureus.13687.
476. **Salvarani** et al., *Susceptibility to COVID-19 in Patients Treated With Antimalarials: A Population-Based Study in Emilia-Romagna, Northern Italy*, *Arthritis & Rheumatology*, doi:10.1002/art.41475.
477. **Samajdar** et al., *Ivermectin and Hydroxychloroquine for Chemo-Prophylaxis of COVID-19: A Questionnaire Survey of Perception and Prescribing Practice of Physicians vis-a-vis Outcomes*, *Journal of the Association of Physicians India*, 69:11, japi.org/x2a464b4/ivermectin-and-hydroxychloroquine-for-chemo-prophylaxis-of-covid-19-a-questionnaire-survey-of-perception-and-prescribing-practice-of-physicians-vis-vis-outcomes.
478. **Sammartino** et al., *Predictors for inpatient mortality during the first wave of the SARS-CoV-2 pandemic: A retrospective analysis*, *PLOS One*, doi:10.1371/journal.pone.0251262.
479. **Sánchez-Álvarez** et al., *Status of SARS-CoV-2 infection in patients on renal replacement therapy. Report of the COVID-19 Registry of the Spanish Society of Nephrology (SEN)*, *Nefrología*, doi:10.1016/j.nefro.2020.04.002.
480. **Sands** et al., *No clinical benefit in mortality associated with hydroxychloroquine treatment in patients with COVID-19*, *International Journal of Infectious Diseases*, doi:10.1016/j.ijid.2020.12.060.
481. **Santos** et al., *Determinants of COVID-19 disease severity in patients with underlying rheumatic disease*, *Clinical Rheumatology*, doi:10.1007/s10067-020-05301-2.
482. **Sarfaraz** et al., *Determinants of in-hospital mortality in COVID-19; a prospective cohort study from Pakistan*, medRxiv, doi:10.1101/2020.12.28.20248920.

483. **Sarhan** et al., *Efficacy of the early treatment with tocilizumab-hydroxychloroquine and tocilizumab-remdesivir in severe COVID-19 Patients*, Journal of Infection and Public Health, doi:10.1016/j.jiph.2021.10.024.
484. **Sarwar** et al., *Prophylaxis of Exposed COVID-19 Individuals With Mild Symptoms Using chloroquine Compounds (PRECISE)*, NCT04351191, clinicaltrials.gov/study/NCT04351191.
485. **Sarwar (B)** et al., *Post-Exposure Prophylaxis for Asymptomatic SARS-CoV-2 COVID-19 Patients With chloroquine Compounds (PEACE)*, NCT04346667, clinicaltrials.gov/study/NCT04346667.
486. **Satti** et al., *Characteristics and Obstetric Outcomes in Women With Autoimmune Rheumatic Disease During the COVID-19 Pandemic in Qatar*, Cureus, doi:10.7759/cureus.24382.
487. **Sawanpanyalert** et al., *Assessment of outcomes following implementation of antiviral treatment guidelines for COVID-19 during the first wave in Thailand*, Southeast Asian Journal of Tropical Medicine and Public Health, 52:4, journal.seameotropmednetwork.org/index.php/jtropmed/article/view/490.
488. **Sbidian** et al., *Hydroxychloroquine with or without azithromycin and in-hospital mortality or discharge in patients hospitalized for COVID-19 infection: a cohort study of 4,642 in-patients in France*, medRxiv, doi:10.1101/2020.06.16.20132597.
489. **Schmidt** et al., *Association Between Androgen Deprivation Therapy and Mortality Among Patients With Prostate Cancer and COVID-19*, JAMA Network Open, doi:10.1001/jamanetworkopen.2021.34330.
490. **Schwartz** et al., *Assessing the efficacy and safety of hydroxychloroquine as outpatient treatment of COVID-19: a randomized controlled trial*, CMAJ Open, doi:10.9778/cmajo.20210069.
491. **Seet** et al., *Positive impact of oral hydroxychloroquine and povidone-iodine throat spray for COVID-19 prophylaxis: an open-label randomized trial*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2021.04.035.
492. **Self** et al., *Effect of Hydroxychloroquine on Clinical Status at 14 Days in Hospitalized Patients With COVID-19: A Randomized Clinical Trial*, JAMA, doi:10.1001/jama.2020.22240.
493. **Sen** et al., *Post-COVID-19 condition in patients with autoimmune rheumatic diseases: the COVID-19 Vaccination in Autoimmune Diseases (COVAD) study*, The Lancet Rheumatology, doi:10.1016/S2665-9913(23)00066-8.
494. **Serrano** et al., *COVID-19 and lung cancer: What do we know?*, Ann. Oncol., 2020, Sep, 31, S1026, doi:10.1016/j.annonc.2020.08.1830.
495. **Shabani** et al., *Evaluation of the Prophylactic Effect of Hydroxychloroquine on People in Close-Contact with Patients with Covid-19*, Pulmonary Pharmacology & Therapeutics, doi:10.1016/j.pupt.2021.102069.
496. **Shabrawishi** et al., *Negative nasopharyngeal SARS-CoV-2 PCR conversion in response to different therapeutic interventions*, medRxiv, doi:10.1101/2020.05.08.20095679.
497. **Shahrin** et al., *Hospital-Based Quasi-Experimental Study on Hydroxychloroquine Pre-Exposure Prophylaxis for COVID-19 in Healthcare Providers with Its Potential Side-Effects*, Life, doi:10.3390/life12122047.
498. **Shamsi** et al., *Survival and Mortality in Hospitalized Children with COVID-19: A Referral Center Experience in Yazd, Iran*, Canadian Journal of Infectious Diseases and Medical Microbiology, doi:10.1155/2023/5205188.
499. **Shang** et al., *Inhibitors of endosomal acidification suppress SARS-CoV-2 replication and relieve viral pneumonia in hACE2 transgenic mice*, Virology Journal, doi:10.1186/s12985-021-01515-1.
500. **Shaw** et al., *COVID-19 in Individuals Treated With Long-Term Hydroxychloroquine: A Propensity Score-Matched Analysis of Cicatricial Alopecia Patients*, Journal of Drugs in Dermatology, doi:10.36849/JDD.5843.
501. **Sheaff**, R., *A New Model of SARS-CoV-2 Infection Based on (Hydroxy)Chloroquine Activity*, bioRxiv, doi:10.1101/2020.08.02.232892.
502. **Sheshah** et al., *Prevalence of Diabetes, Management and Outcomes among Covid-19 Adult Patients Admitted in a Specialized Tertiary Hospital in Riyadh, Saudi Arabia*, Diabetes Research and Clinical Practice, doi:10.1016/j.diabres.2020.108538.
503. **Shoaibi** et al., *Comparative Effectiveness of Famotidine in Hospitalized COVID-19 Patients*, medRxiv, doi:10.1101/2020.09.23.20199463.
504. **Shu-Han Lin** et al., *Inhalable Chitosan-Based Hydrogel as a Mucosal Adjuvant for Hydroxychloroquine in the Treatment for SARS-CoV-2 Infection in a Hamster Model*, Journal of Microbiology, Immunology and Infection, doi:10.1016/j.jmii.2023.08.001.

505. **Shukla** et al., *An observational multi-centric COVID-19 sequelae study among health care workers*, The Lancet Regional Health - Southeast Asia, doi:10.1016/j.lansea.2022.100129.
506. **Signes-Costa** et al., *Prevalence and 30-day mortality in hospitalized patients with COVID-19 and prior lung diseases*, Archivos de Bronconeumología, doi:10.1016/j.arbres.2020.11.012.
507. **Silva** et al., *Clinical-Epidemiology Aspect of Inpatients With Moderate or Severe COVID-19 in a Brazilian Macroregion: Disease and Countermeasures*, Frontiers in Cellular and Infection Microbiology, doi:10.3389/fcimb.2022.899702.
508. **Simova** et al., *Hydroxychloroquine for prophylaxis and treatment of COVID-19 in health care workers*, New Microbes and New Infections, doi:10.1016/j.nmni.2020.100813.
509. **Simova (B)** et al., *Hydroxychloroquine for prophylaxis and treatment of COVID-19 in health care workers*, New Microbes and New Infections, doi:10.1016/j.nmni.2020.100813.
510. **Singer** et al., *Hydroxychloroquine ineffective for COVID-19 prophylaxis in lupus and rheumatoid arthritis*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-218500.
511. **Singh** et al., *Outcomes of Hydroxychloroquine Treatment Among Hospitalized COVID-19 Patients in the United States- Real-World Evidence From a Federated Electronic Medical Record Network*, medRxiv, doi:10.1101/2020.05.12.20099028.
512. **Singh (B)** et al., *Safety and efficacy of antiviral therapy alone or in combination in COVID-19 - a randomized controlled trial (SEV COVID Trial)*, medRxiv, doi:10.1101/2021.06.06.21258091.
513. **Sivapalan** et al., *Azithromycin and hydroxychloroquine in hospitalised patients with confirmed COVID-19—a randomised double-blinded placebo-controlled trial*, European Respiratory Journal, doi:10.1183/13993003.00752-2021.
514. **Skipper** et al., *Hydroxychloroquine in Nonhospitalized Adults With Early COVID-19: A Randomized Trial*, Annals of Internal Medicine, doi:10.7326/M20-4207.
515. **Smith** et al., *Observational Study on 255 Mechanically Ventilated Covid Patients at the Beginning of the USA Pandemic*, medRxiv, doi:10.1101/2021.05.28.21258012.
516. **Smith (B)** et al., *Evaluating the Efficacy of Hydroxychloroquine and Azithromycin to Prevent Hospitalization or Death in Persons With COVID-19*, NCT04358068, clinicaltrials.gov/study/NCT04358068.
517. **Sobngwi** et al., *Doxycycline vs Hydroxychloroquine + Azithromycin in the Management of COVID-19 Patients: An Open-Label Randomized Clinical Trial in Sub-Saharan Africa (DOXYCOV)*, Cureus, doi:10.7759/cureus.45619.
518. **Solh** et al., *Clinical course and outcome of COVID-19 acute respiratory distress syndrome: data from a national repository*, medRxiv, doi:10.1101/2020.10.16.20214130.
519. **SOLIDARITY**, *Repurposed antiviral drugs for COVID-19; interim WHO SOLIDARITY trial results* Trial Consortium, NEJM, doi:10.1056/NEJMoa2023184.
520. **Sosa-García** et al., *Experience in the management of severe COVID-19 patients in an intensive care unit*, Cir Cir. 2020, 88:5, 569-575, doi:10.24875/CIRU.20000675.
521. **Soto** et al., *Mortality and associated risk factors in patients hospitalized due to COVID-19 in a Peruvian reference hospital*, PLOS ONE, doi:10.1371/journal.pone.0264789.
522. **Soto (B)** et al., *Mortality and associated risk factors in patients hospitalized due to COVID-19 in a Peruvian reference hospital*, PLOS ONE, doi:10.1371/journal.pone.0264789.
523. **Soto-Becerra** et al., *Real-World Effectiveness of hydroxychloroquine, azithromycin, and ivermectin among hospitalized COVID-19 patients: Results of a target trial emulation using observational data from a nationwide Healthcare System in Peru*, medRxiv, doi:10.1101/2020.10.06.20208066.
524. **Sow** et al., *Phytomedicines Versus Hydroxychloroquine as an Add on Therapy to Azythromycin in Asymptomatic Covid-19 Patients (PHYTCOVID-19)*, NCT04501965, clinicaltrials.gov/study/NCT04501965.
525. **Spivak** et al., *A Randomized Clinical Trial Testing Hydroxychloroquine for Reduction of SARS-CoV-2 Viral Shedding and Hospitalization in Early Outpatient COVID-19 Infection*, Microbiology Spectrum, doi:10.1128/spectrum.04674-22.
526. **Stanley** et al., *Meta-regression approximations to reduce publication selection bias*, Research Synthesis Methods, doi:10.1002/jrsm.1095.

527. **Stewart** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
528. **Stewart (B)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
529. **Stewart (C)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
530. **Stewart (D)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
531. **Stewart (E)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
532. **Stewart (F)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
533. **Stewart (G)** et al., COVID-19 Evidence Accelerator: A parallel analysis to describe the use of Hydroxychloroquine with or without Azithromycin among hospitalized COVID-19 patients, PLoS ONE, doi:10.1371/journal.pone.0248128.
534. **Strangfeld** et al., Factors associated with COVID-19-related death in people with rheumatic diseases: results from the COVID-19 Global Rheumatology Alliance physician-reported registry, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2020-219498.
535. **Stricker** et al., Hydroxychloroquine Pre-Exposure Prophylaxis for COVID-19 in Healthcare Workers from India: A Meta-Analysis, Journal of Infection and Public Health, doi:10.1016/j.jiph.2021.08.001.
536. **Su** et al., Efficacy of early hydroxychloroquine treatment in preventing COVID-19 pneumonia aggravation, the experience from Shanghai, China, BioScience Trends, doi:10.5582/bst.2020.03340.
537. **Sukumar** et al., The Frontline War: A Case-control study of risk factors for COVID-19 among health care workers, F1000Research, doi:10.12688/f1000research.109023.1.
538. **Sulaiman** et al., The Effect of Early Hydroxychloroquine-based Therapy in COVID-19 Patients in Ambulatory Care Settings: A Nationwide Prospective Cohort Study, medRxiv, doi:10.1101/2020.09.09.20184143.
539. **Sweeting** et al., What to add to nothing? Use and avoidance of continuity corrections in meta-analysis of sparse data, Statistics in Medicine, doi:10.1002/sim.1761.
540. **Syed** et al., Pre-exposure Prophylaxis With Various Doses of Hydroxychloroquine Among Healthcare Personnel With High-Risk Exposure to COVID-19: A Randomized Controlled Trial, Cureus, doi:10.7759/cureus.20572.
541. **Synolaki** et al., The Activin/Follistatin-axis is severely deregulated in COVID-19 and independently associated with in-hospital mortality, medRxiv, doi:10.1101/2020.09.05.20184655.
542. **Szente Fonseca** et al., Risk of Hospitalization for Covid-19 Outpatients Treated with Various Drug Regimens in Brazil: Comparative Analysis, Travel Medicine and Infectious Disease, doi:10.1016/j.tmaid.2020.101906.
543. **Tacccone** et al., The role of organizational characteristics on the outcome of COVID-19 patients admitted to the ICU in Belgium, The Lancet Regional Health - Europe, doi:10.1016/j.lanepe.2020.100019.
544. **Taieb** et al., Hydroxychloroquine and Azithromycin Treatment of Hospitalized Patients Infected with SARS-CoV-2 in Senegal from March to October 2020, J. Clin. Med. 2021, doi:10.3390/jcm10132954.
545. **Tamura** et al., Outcome and death risk of diabetes patients with Covid-19 receiving pre-hospital and in-hospital metformin therapies, Diabetology & Metabolic Syndrome, doi:10.1186/s13098-021-00695-8.
546. **Tamura (B)** et al., Outcome and death risk of diabetes patients with Covid-19 receiving pre-hospital and in-hospital metformin therapies, Diabetology & Metabolic Syndrome, doi:10.1186/s13098-021-00695-8.
547. **Tan** et al., A retrospective comparison of drugs against COVID-19, Virus Research, doi:10.1016/j.virusres.2020.198262.
548. **Tang** et al., Hydroxychloroquine in patients with mainly mild to moderate coronavirus disease 2019: open label, randomised controlled trial, BMJ 2020, 369, doi:10.1136/bmj.m1849.
549. **Tarek** et al., Pharmacokinetic Basis of the Hydroxychloroquine Response in COVID-19: Implications for Therapy and Prevention,

550. **Tchounga** et al., *Composition analysis of falsified chloroquine phosphate samples seized during the COVID-19 pandemic*, Journal of Pharmaceutical and Biomedical Analysis, doi:10.1016/j.jpba.2020.113761.
551. **Tehrani** et al., *Risk factors for mortality in adult COVID-19 patients: frailty predicts fatal outcome in older patients*, International Journal of Infectious Diseases, doi:10.1016/j.ijid.2020.10.071.
552. **Teller Report**, *Coronavirus: a study in Senegal confirms the effectiveness of hydroxychloroquine*, www.tellerreport.com/news/2020-05-02-coronavirus-a-study-in-senegal-confirms-the-effectiveness-of-hydroxychloroquine.BJeet4Kst8.html.
553. **Texeira** et al., *Characteristics and outcomes of COVID-19 patients admitted to a regional health system in the southeast*, Open Forum Infectious Diseases, doi:10.1093/ofid/ofaa439.560.
554. **Thairu** et al., *A Comparison of Ivermectin and Non Ivermectin Based Regimen for COVID-19 in Abuja: Effects on Virus Clearance, Days-to-discharge and Mortality*, Journal of Pharmaceutical Research International, doi:10.9734/jpri/2022/v34i44A36328.
555. **The Africa Report**, *Coronavirus: Didier Raoult the African and chloroquine, from Dakar to Brazzaville*, www.theafricareport.com/26264/coronavirus-didier-raoult-the-african-and-chloroquine-from-dakar-to-brazzaville/.
556. **The Australian**, *India and Indonesia stand by antimalarials*, www.theaustralian.com.au/world/coronavirus-india-and-indonesia-stand-by-antimalarials/news-story/d7856d1371697fe69e4fcc39d7f1f97c.
557. **The BL**, *Russia supports the use of hydroxychloroquine, the drug to treat the CCP Virus suggested by Trump*, thebl.com/world-news/russia-supports-hydroxychloroquine-drug-ccp-virus-trump.html.
558. **The East African**, *Algeria backs use of malaria drug despite WHO dropping trials*, www.theeastafrican.co.ke/news/africa/Algeria-backs-hydroxychloroquine-use/4552902-5564930-duphp6/index.html.
559. **The Guardian**, *Chloroquine potent for COVID-19 prevention, says NAFDAC*, guardian.ng/news/nigeria/national/chloroquine-potent-for-covid-19-prevention-says-nafdac/.
560. **The Indian Express**, *Vadodara administration drive: HCQ helping in containing Covid-19 cases, say docs as analysis begins*, indianexpress.com/article/india/vadodara-administration-drive-hcq-helping-in-containing-covid-19-cases-say-docs-as-analysis-begins-6486049/.
561. **The Moscow Times**, *Russia Approves Unproven Malaria Drug to Treat Coronavirus*, www.themoscowtimes.com/2020/04/17/russia-approves-unproven-malaria-drug-to-treat-coronavirus-a70025.
562. **The New York Times**, *Malaria Drug Taken by Trump Is Tied to Increased Risk of Heart Problems and Death in New Study*, www.nytimes.com/2020/05/22/health/malaria-drug-trump-coronavirus.html.
563. **The New York Times (B)**, *Small Chloroquine Study Halted Over Risk of Fatal Heart Complications*, www.nytimes.com/2020/04/12/health/chloroquine-coronavirus-trump.html?smid=em-share.
564. **The New York Times (C)**, *Malaria Drug Promoted by Trump Did Not Prevent Covid Infections, Study Finds*, www.nytimes.com/2020/06/03/health/hydroxychloroquine-coronavirus-trump.html.
565. **The New York Times (D)**, *Coronavirus Can Be Deadly for Young Adults, Too, Study Finds*, www.nytimes.com/2020/09/10/world/covid-19-coronavirus.html.
566. **The North Africa Post**, *Morocco continues use of Chloroquine despite controversy*, northafricapost.com/41247-morocco-continues-use-of-chloroquine-despite-controversy.html.
567. **The Tico Times**, *News briefs: Reopening plans on-track, hydroxychloroquine use to continue, partnership with Coursera*, ticotimes.net/2020/06/15/news-briefs-reopening-plans-on-track-hydroxychloroquine-use-to-continue-partnership-with-coursera.
568. **Tirupakuzhi Vijayaraghavan** et al., *Hydroxychloroquine plus personal protective equipment versus personal protective equipment alone for the prevention of laboratory-confirmed COVID-19 infections among healthcare workers: a multicentre, parallel-group randomised controlled trial from India*, BMJ Open, doi:10.1136/bmjopen-2021-059540.
569. **Treanor** et al., *Efficacy and Safety of the Oral Neuraminidase Inhibitor Oseltamivir in Treating Acute Influenza: A Randomized Controlled Trial*, JAMA, 2000, 283:8, 1016-1024, doi:10.1001/jama.283.8.1016.

570. **Trefond** et al., *Effet d'un traitement par hydroxychloroquine prescrit comme traitement de fond de rhumatismes inflammatoires chroniques ou maladies auto-immunes systémiques sur les tests diagnostiques et l'évolution de l'infection à SARS CoV-2: étude de 871 patients*, Revue du Rhumatisme, doi:10.1016/j.rhum.2021.09.004.
571. **Treluyer** et al., *Prevention of SARS-CoV-2 in Hospital Workers s Exposed to the Virus (PREP-COVID)*, PREP-COVID, NCT04344379, clinicaltrials.gov/study/NCT04344379.
572. **Trullàs** et al., *High in-hospital mortality due to COVID-19 in a community hospital in Spain: a prospective observational study*, Research Square, doi:10.21203/rs.3.rs-39421/v1.
573. **Tsanovska** et al., *Hydroxychloroquine (HCQ) treatment for hospitalized patients with COVID-19*, Infectious Disorders - Drug Targets, doi:10.2174/1871526522666220303121209.
574. **Tu** et al., *Risk Factors for Severity and Mortality in Adult Patients Confirmed with COVID-19 in Sierra Leone: A Retrospective Study*, Infectious Diseases & Immunity, doi:10.1097/ID9.000000000000037.
575. **Turrini** et al., *Clinical Course and Risk Factors for In-Hospital Mortality of 205 Patients with SARS-CoV-2 Pneumonia in Como, Lombardy Region, Italy*, Vaccines, 10.3390/vaccines9060640, www.mdpi.com/2076-393X/9/6/640.
576. **Ubaldo** et al., *COVID-19: A Single-Center ICU Experience of the First Wave in the Philippines*, Critical Care Research and Practice, 10.1155/2021/7510306, www.hindawi.com/journals/ccrp/2021/7510306/.
577. **Ugarte-Gil** et al., *Characteristics associated with poor COVID-19 outcomes in individuals with systemic lupus erythematosus: data from the COVID-19 Global Rheumatology Alliance*, Annals of the Rheumatic Diseases, doi:10.1136/annrheumdis-2021-221636.
578. **Ukrinform**, *Ukraine receives batch of hydroxychloroquine tablets from India*, www.ukrinform.net/rubric-economy/3019049-uber-eats-to-close-down-in-ukraine-on-june-3.html.
579. **Ulrich** et al., *Treating Covid-19 With Hydroxychloroquine (TEACH): A Multicenter, Double-Blind, Randomized Controlled Trial in Hospitalized Patients*, Open Forum Infectious Diseases, doi:10.1093/ofid/ofaa446.
580. **United States National Institutes of Health**, *Chloroquine or Hydroxychloroquine With or Without Azithromycin*, www.covid19treatmentguidelines.nih.gov/antiviral-therapy/chloroquine-or-hydroxychloroquine-with-or-without-azithromycin/.
581. **Uyaroğlu** et al., *Comparison of Favipiravir to Hydroxychloroquine Plus Azithromycin in the Treatment of Patients with Non-critical COVID-19: A Single-center, Retrospective, Propensity Score-matched Study*, Acta Medica, doi:10.32552/2022.ActaMedica.719.
582. **Uygen** et al., *Effect of Hydroxychloroquine Use on the Length Of Hospital Stay in Children Diagnosed With Covid 19*, Northern Clinics of Istanbul, doi:10.14744/nci.2021.65471.
583. **van Halem** et al., *Risk factors for mortality in hospitalized patients with COVID-19 at the start of the pandemic in Belgium: a retrospective cohort study*, BMC Infect Dis., doi:10.1186/s12879-020-05605-3.
584. **Vanguard**, *COVID-19: Nigerian study finds Chloroquine, Hydroxychloroquine effective as Prophylaxis*, www.vanguardngr.com/2020/06/covid-19-nigerian-study-finds-chloroquine-hydroxychloroquine-effective-as-prophylaxis/.
585. **Vernaz** et al., *Early experimental COVID-19 therapies: associations with length of hospital stay, mortality and related costs*, Swiss Medical Weekly, doi:10.4414/smw.2020.20446.
586. **Vivanco-Hidalgo** et al., *Incidence of COVID-19 in patients exposed to chloroquine and hydroxychloroquine: results from a population-based prospective cohort in Catalonia, Spain, 2020*, Eurosurveillance, doi:10.2807/1560-7917.ES.2021.26.9.2001202.
587. **Voice of America**, *Cameroon Begins Large-scale Chloroquine Production*, www.voanews.com/science-health/coronavirus-outbreak/cameroon-begins-large-scale-chloroquine-production.
588. **Wang** et al., *Chloroquine and hydroxychloroquine as ACE2 blockers to inhibit viropexis of 2019-nCoV Spike pseudotyped virus*, Phytomedicine, doi:10.1016/j.phymed.2020.153333.
589. **Wang (B)** et al., *Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro*, Cell Res. 30, 269–271, doi:10.1038/s41422-020-0282-0.
590. **Wang (C)** et al., *Comorbidity and Sociodemographic determinants in COVID-19 Mortality in an US Urban Healthcare System*, medRxiv, doi:10.1101/2020.06.11.20128926.

591. **WellStar**, *Hydroxychloroquine Use in Hospitalized Patients With COVID-19: Impact on Progression to Severe or Critical Disease*, NCT04429867, clinicaltrials.gov/study/NCT04429867.
592. **Wen** et al., *Cholinergic $\alpha 7$ nAChR signaling suppresses SARS-CoV-2 infection and inflammation in lung epithelial cells*, *Journal of Molecular Cell Biology*, doi:10.1093/jmcb/mjad048.
593. **White** et al., *Chloroquine/ Hydroxychloroquine Prevention of Coronavirus Disease (COVID-19) in the Healthcare Setting (COPCOV)*, COPCOV, NCT04303507, classic.clinicaltrials.gov/ct2/show/study/NCT04303507.
594. **Willett** et al., *The hyper-transmissible SARS-CoV-2 Omicron variant exhibits significant antigenic change, vaccine escape and a switch in cell entry mechanism*, medRxiv, doi:10.1101/2022.01.03.21268111.
595. **Williams**, T., *Not All Ivermectin Is Created Equal: Comparing The Quality of 11 Different Ivermectin Sources*, Do Your Own Research, doyourownresearch.substack.com/p/not-all-ivermectin-is-created-equal.
596. **Xia** et al., *Efficacy of Chloroquine and Lopinavir/ Ritonavir in mild/general novel coronavirus (CoVID-19) infections: a prospective, open-label, multicenter randomized controlled clinical study*, ChiCTR2000029741, www.chictr.org.cn/showproj.aspx?proj=49263.
597. **Xu** et al., *A study of impurities in the repurposed COVID-19 drug hydroxychloroquine sulfate by UHPLC-Q/TOF-MS and LC-SPE-NMR*, *Rapid Communications in Mass Spectrometry*, doi:10.1002/rcm.9358.
598. **Yadav** et al., *Repurposing the Combination Drug of Favipiravir, Hydroxychloroquine and Oseltamivir as a Potential Inhibitor Against SARS-CoV-2: A Computational Study*, *Research Square*, doi:10.21203/rs.3.rs-628277/v1.
599. **Yadav (B)** et al., *Hydroxychloroquine/chloroquine prophylaxis among health-care workers: Was it really preventive? – Evidence from a multicentric cross-sectional study*, *Indian Journal of Community Medicine*, doi:10.4103/ijcm.ijcm_684_21.
600. **Yadav (C)** et al., *Sero-survey for health-care workers provides corroborative evidence for the effectiveness of Hydroxychloroquine prophylaxis against COVID-19 infection*, *ResearchGate*, doi:10.13140/RG.2.2.34411.77603.
601. **Yao** et al., *In Vitro Antiviral Activity and Projection of Optimized Dosing Design of Hydroxychloroquine for the Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)*, *Clin. Infect. Dis.*, 2020 Mar 9, doi:10.1093/cid/ciaa237.
602. **Yegerov** et al., *Epidemiological and Clinical Characteristics, and Virologic Features of COVID-19 Patients in Kazakhstan: a Nation-Wide, Retrospective, Cohort Study*, medRxiv, doi:10.1101/2021.01.06.20249091.
603. **Yilgwan** et al., *Clinical profile and Predictors of Outcomes of Hospitalized Patients with Laboratory-Confirmed Severe Acute Respiratory Syndrome Coronavirus 2 in Nigeria: A Retrospective Analysis of 13 High Burden States in Nigeria*, *Nigerian Medical Journal*, 64:2, nigerianmedjournal.org/index.php/nmj/article/view/174.
604. **Yu** et al., *Beneficial effects exerted by hydroxychloroquine in treating COVID-19 patients via protecting multiple organs*, *Science China Life Sciences*, 2020 Aug 3, doi:10.1007/s11427-020-1782-1.
605. **Yu (B)** et al., *Beneficial effects exerted by hydroxychloroquine in treating COVID-19 patients via protecting multiple organs*, *Science China Life Sciences*, 2020 Aug 3, doi:10.1007/s11427-020-1782-1.
606. **Yu (C)** et al., *Low Dose of Hydroxychloroquine Reduces Fatality of Critically Ill Patients With COVID-19*, *Science China Life Sciences*, 2020 May 15, 1-7, doi:10.1007/s11427-020-1732-2.
607. **Yuan** et al., *Hydroxychloroquine blocks SARS-CoV-2 entry into the endocytic pathway in mammalian cell culture*, *Communications Biology*, doi:10.1038/s42003-022-03841-8.
608. **Zavascki** et al., *Advanced ventilatory support and mortality in hospitalized patients with COVID-19 caused by Gamma (P.1) variant of concern compared to other lineages: cohort study at a reference center in Brazil*, *Research Square*, doi:10.21203/rs.3.rs-910467/v1.
609. **Zelenko**, Z., *Nebulized Hydroxychloroquine for COVID-19 Treatment: 80x Improvement in Breathing*, Preprint, faculty.utrgv.edu/eleftherios.gkioulekas/zelenko/Zelenko-nebulized-hcq.pdf.
610. **Zhang** et al., *What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes*, *JAMA*, 80:19, 1690, doi:10.1001/jama.280.19.1690.
611. **Zhong** et al., *COVID-19 in patients with rheumatic disease in Hubei province, China: a multicentre retrospective observational study*, *Lancet Rheumatology*, doi:10.1016/S2665-9913(20)30227-7.