**Supplementary Appendix**

: ‘Efficacy of corticosteroids in SARS, MERS and COVID-19: A systematic review and meta-analysis’

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1. PRISMA Checklist

Table S1. Checklist summarizing compliance with PRISMA guidelines [1].

| Section/Topic                  | # | Checklist Item                                                                                                                                                                                                 | Reported on Page |
|-------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| TITLE                         |   |                                                                                                                                                                                                                                                                     | Title            |
| Title                         | 1 | Identify the report as a systematic review, meta-analysis, or both.                                                                                                                                                                                                  |                  |
| ABSTRACT                      |   |                                                                                                                                                                                                                                                                     |                  |
| Structured summary            | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.                       | 2                |
| INTRODUCTION                  |   |                                                                                                                                                                                                                                                                     |                  |
| Rationale                    | 3 | Describe the rationale for the review in the context of what is already known.                                                                                                                                                                                       | 2-3              |
| Objectives                   | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).                                                                                                           | 2-3              |
| METHODS                       |   |                                                                                                                                                                                                                                                                     |                  |
| Protocol and registration     | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.                                                                                   | N/A              |
| Eligibility criteria          | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.                                                                                      | 3-4              |
| Information sources           | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.                                                                                                   | 3-4              |
| Search                        | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.                                                                                                                                             | 3-4              |
| Study selection               | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).                                                                                                                   | 3-4, (Figure1)   |
| Data collection process       | 10| Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.                                                                                                                | 3-4              |
| Data items                    | 11| List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.                                                                                                                                      | 3-4              |
| Risk of bias in individual studies | 12| Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.                                                            | 3-4, suppl 7-8   |
| Section/Topic                      | Page | Checklist Item                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Summary measures                  | 3-5  | State the principal summary measures (e.g., risk ratio, difference in means).                                                                                                                                                                                                                                                                   |
| Synthesis of results              | 5    | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I²) for each meta-analysis.                                                                                                                                                                                                 |
| Risk of bias across studies       | 9    | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).                                                                                                                                                                                                     |
| Additional analyses               | N/A  | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.                                                                                                                                                                                                 |
| Study selection                   | 5-11 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.                                                                                                                                                                                        |
| Study characteristics             | 5-11 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.                                                                                                                                                                                                       |
| Risk of bias within studies       | 9    | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).                                                                                                                                                                                                                                       |
| Results of individual studies     | 5-11 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.                                                                                                                                                       |
| Synthesis of results              | 5-11 | Present results of each meta-analysis done, including confidence intervals and measures of consistency.                                                                                                                                                                                                                                       |
| Risk of bias across studies       | 9    | Present results of any assessment of risk of bias across studies (see Item 15).                                                                                                                                                                                                                                                           |
| Additional analysis               | N/A  | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).                                                                                                                                                                                                                           |
| Summary of evidence               | 11-13| Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).                                                                                                                                                             |
| Limitations                       | 11-13| Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).                                                                                                                                                                                |
| Conclusions                       | 13   | Provide a general interpretation of the results in the context of other evidence, and implications for future research.                                                                                                                                                                                                                      |
| Funding                           | Title page | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.                                                                                                                                              |
2. Search strategy
We searched PubMed, MEDLINE, Embase, Web of Science for reports published in any language until 25 April 2020, that assessed the association between steroids and SARS/MERS. We searched all fields for coronavirus (search terms:"coronavirus", "SARS","severe acute respiratory syndrome","MERS","middle east respiratory syndrome","Coronavirus 19", “COVID-19”, “SARS-CoV-2”, “2019-nCoV”) and terms of various kinds of steroids (search terms:"steroid*", “corticosteroid*”, "glucocorticoid", "cortisone","hydrocortisone", "prednisone","prednisolone", "dexamethasone","triamcinolone"). Full search strategies for each database are given in Table S2.

| Database          | Number of Studies | Search Terms                                                                 |
|-------------------|-------------------|------------------------------------------------------------------------------|
| PubMed            | 356               | ("MERS" OR "middle east respiratory syndrome" OR 'SARS' OR "severe acute respiratory syndrome" OR "Coronavirus 19" OR "COVID-19" OR "SARS-CoV-2" OR "2019-nCoV" OR "coronavirus") AND ("steroid*" OR "corticosteroid*" OR "glucocorticoid" OR "cortisone" OR "hydrocortisone" OR "prednisone" OR "prednisolone" OR "dexamethasone" OR "triamcinolone") |
| Medline           | 359               | ("MERS" OR "middle east respiratory syndrome" OR 'SARS' OR "severe acute respiratory syndrome" OR "Coronavirus 19" OR "COVID-19" OR "SARS-CoV-2" OR "2019-nCoV" OR "coronavirus") AND ("steroid*" OR "corticosteroid*" OR "glucocorticoid" OR "cortisone" OR "hydrocortisone" OR "prednisone" OR "prednisolone" OR "dexamethasone" OR "triamcinolone") |
| Embase            | 1146              | (MERS OR 'middle east respiratory syndrome' OR SARS OR 'severe acute respiratory syndrome' OR 'Coronavirus 19' OR 'COVID-19' OR 'SARS-CoV-2' OR '2019-nCoV' OR coronavirus) AND (steroid* OR corticosteroid* OR glucocorticoid OR cortisone OR hydrocortisone OR prednisone OR prednisolone OR dexamethasone OR triamcinolone) |
| Web of Science    | 248               | ((TS = MERS) OR (TS = middle east respiratory syndrome) OR (TS = SARS) OR (TS = severe acute respiratory syndrome) OR (TS = Coronavirus 19) OR (TS = COVID-19) OR (TS = SARS-CoV-2) OR (TS = 2019-nCoV) OR (TS = coronavirus)) AND ((TS = steroid*)OR (TS = corticosteroid*) OR (TS = glucocorticoid) OR (TS = cortisone) OR (TS = hydrocortisone) OR (TS = prednisone) OR (TS = prednisolone) OR (TS = dexamethasone) OR (TS = triamcinolone)) |
3. Reasons for study exclusion

We manually screened the retrieved articles which were met inclusion criteria. After excluding studies by examining titles and abstracts, full texts of 140 studies were eligible for inclusion. 132 studies were retrieved following reasons:

Table S3. Reason for exclusion during full text screening.

| Number of Studies | Reason                                                                 |
|-------------------|------------------------------------------------------------------------|
| 81                | Missing data on death or complication according to the use of steroids |
| 28                | Reviews or comments                                                    |
| 11                | Not accessible full paper even from the homepage of journal or authors  |
| 7                 | In vivo or in vitro studies                                            |
| 2                 | Not for outcomes of interest                                           |
| 1                 | Systematic review [2]                                                  |
| 1                 | Meta-analysis [3]                                                      |
| 1                 | Irrelevant topics *                                                    |

* Not study for coronavirus including SARS, MERS and COVID-19 (SARS: Severe acute respiratory syndrome, MERS: Middle East respiratory syndrome, COVID-19: Coronavirus disease 19).
### 4. Quality Assessment for systematic review (Table S4–5)

Table S4. AMSTAR2 checklist- Quality assessment† for systematic review of Lancet article [4] *

| Title                  | Checklist items                                                                                                                                                                                                 | Russell et al. (2020) [4] * | Our study Score | Our study Score |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|-----------------|
| 1. Question and Inclusion | Did the research questions and inclusion criteria for the review include the components of PICO?‡                                                                                                           | 0                           | 1               |                 |
| 2. Protocol            | Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?                                       | 0                           | 1               |                 |
| 3. Study Design        | Did the review authors explain their selection of the study designs for inclusion in the review?                                                                                                                 | 0                           | 1               |                 |
| 4. Comprehensive Search | Did the review authors use a comprehensive literature search strategy?                                                                                                                                           | 0                           | 1               |                 |
| 5. Study selection     | Did the review authors perform study selection in duplicate?                                                                                                                                                     | 0                           | 1               |                 |
| 6. Data Extraction     | Did the review authors perform data extraction in duplicate?                                                                                                                                                     | 0                           | 1               |                 |
| 7. Excluded Studies Justification | Did the review authors provide a list of excluded studies and justify the exclusions?                                                                                                                           | 0                           | 1               |                 |
| 8. Included Studies Details | Did the review authors describe the included studies in adequate detail?                                                                                                                                       | 0.5                         | 1               |                 |
| 9. RoB                 | Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?                                                               | 0                           | 1               |                 |
| 10. Funding Sources    | Did the review authors report on the sources of funding for the studies included in the review?                                                                                                               | 1                           | 1               |                 |
| 11. Statistical Methods | If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?                                                                                           | 0                           | 1               |                 |
| 12. RoB on meta – analysis | If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?                      | -                           | 1               |                 |
| 13. RoB in individual Studies | Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?                                                                 | 0                           | 1               |                 |
| 14. Explanation for Heterogeneity | Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? | 0 | 1 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----|----|
| 15. Publication Bias          | If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? | -  | 1 |
| 16. Conflict of Interest      | Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? | 1  | 1 |
| Total Score                   |                                                                                                                                | 2.5| 16 |

RoB: risk of bias, COVID-19: coronavirus 2019, WHO: World Health Organization, CDC: Centers for Disease Control and Prevention. *Russell et al. (2020) [4] is a recent systematic review which is against to use corticosteroids in COVID-19. WHO and CDC cited this article and made a current guidance about not-recommending to use steroids in COVID-19. † Quality assessment scoring: 1=study met the criteria (Yes); 0.5= study partially met the criteria (Partial Yes); 0=study did not meet the criteria, or not reported (No); (-) = Not meta-analysis conducted. Scores of 11-16 were considered high, moderate was scored range from 6 to 10 and were scores of 0–5 were graded low quality. ‡ PICO: Population, Intervention, Comparator group, Outcome.
Table S5. Summary of practical considerations from Table S4.

| Title of Checklist Items                  | Considerations                                                                 | Result                                                                                                                                 |
|------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Russell et al. (2020) [4]                |                                                                               |                                                                                                                                          |
| Comprehensive Search                    | There was no comprehensive literature search strategy in the manuscript       | Most of coronavirus studies were missing.                                                                                                                                                       |
| Question and Inclusion/ Excluded Studies | Did not mention inclusion/exclusion criteria                                   | Three of eight included studies were not about coronavirus but different types of viruses: influenza [5] and RSV [6,7]                  |
| Justification                            |                                                                               |                                                                                                                                          |
| Study design                             | Selection bias was developed because there was no study design in the manuscript | Three of eight included studies were only investigated among steroid used patients because the primary outcome were complications of steroids: psychosis [8], steroid induced diabetes mellitus [9] and osteonecrosis [10]. |
| Statistical Methods                      | There was no statistical process or summary about the data from all included studies | Weak evidence of the conclusion was developed. The results of all eight included studies deviated to negative effects of steroids but there was no explanation about heterogeneity and publication bias. |
| Our study                                |                                                                               |                                                                                                                                          |
| Comprehensive Search                    | Comprehensive literature search strategy was performed.                       | Most of coronavirus studies were reviewed during search process and included all studies about efficiency of steroids related to mortality.  |
| Question and Inclusion/ Excluded Studies | Precise Inclusion/exclusion criteria and selection of the study were described in methods. | Restricted all Included studies only about coronaviruses excluding other types of viruses.                                           |
| Justification                            |                                                                               |                                                                                                                                          |
| Study design                             | Study design was explained in the manuscript.                                 | All included studies had steroid group and non-steroid group (control) with the number of deaths as the primary outcome.               |
| Statistical Methods                      | There was a statistical process combining raw data from all included studies.   | Comprehensive meta-analyses were performed to combine study results to explain based on the statistical evidence. Heterogeneity and publication bias were also described. |

RSV: respiratory syncytial viruses.
5. Quality Assessment of the included Studies (Table S6–7)

We performed quality assessment of each included study based on an adapted version of Newcastle-Ottawa scale [11]. In each study, we divided the selection, the comparability, and outcome part to give scores for a total of 8 points. We ranked the studies according to the score (7 or more at high quality, moderate at 4 or more and less than 6, and Low quality 3 points or less. As a result, 2/9 (22.2%) of studies were high quality, 0/9 (0.0%) were moderate, and 7/9 (77.8%) were low quality. Bias was also assessed and higher scores indicate both higher study quality and lower risk of bias.

**Table S6.** Quality assessment * of the cohort studies included in the meta-analysis (selection part).

| Authors                  | Type of Study | Representativeness of the Exposed Cohort/Sample a (1) | Selection of the Non-Exposed Cohort b (1) | Ascertainment of Exposure c (1) |
|--------------------------|--------------|-------------------------------------------------------|------------------------------------------|---------------------------------|
| Li et al. (2003) [12]    | Retrospective Cohort | 1 | 1 | 1 |
| Yam et al. (2007) [13]   | Retrospective Cohort | 1 | 0 | 1 |
| Lau et al. (2009)_H † [14] | Retrospective Cohort | 1 | 0 | 1 |
| Lau et al. (2009)_T † [14] | Retrospective Cohort | 1 | 0 | 1 |
| Arabi et al. (2018) [15] | Retrospective Cohort | 1 | 1 | 1 |
| Chen et al. (2006) [16]  | Retrospective Cohort | 1 | 1 | 1 |
| Wu et al. (2020) [17]    | Retrospective Cohort | 1 | 1 | 1 |
| Al Ghamdi et al. (2016) [18] | Retrospective Cohort | 1 | 0 | 1 |
Zhou et al. (2020) [19] Retrospective Cohort

| Zhou et al. (2020) [19] | Retrospective Cohort | 1 | 0 | 1 |

* Quality assessment scoring: 1 = study met the criteria (one star); 0 = study did not meet the criteria, or not reported (no star). a A*-Representative of the steroid group (Intervention about only steroid-used group); B*-Somewhat representative of the steroid group (Intervention about not-only about steroids, Risk factor); C -Selected group, chance of bias; D- No description of the derivation of the steroid group. b A*-Reported numbers of control at baseline; B- Reported control as an exclusion criteria for steroid therapy; C-No demonstration of control at the baseline. c A*-Description about both the kind and dose of steroids was done for all steroid-used patients; B*-Description about one of the kind and dose of steroids (must 1 of 2); C-Only described as ‘corticosteroids’ or ‘steroids’ without explaining about the kind and dose. † These are the same paper (Lau, 2009) [14] which has the two subgroups: one study in Hong-Kong (H) and the other study in Toronto (T).
| Authors                        | Comparability on the basis of the design or analysis controlled for confounders (A/B, one star) | Assessment of outcome (1) | Was duration of follow up explicitly indicated? (1) | Adequacy of follow-up cohorts (1) | Statistical Test (1) | Total Score (All Studies = 8) | Quality   |
|-------------------------------|-----------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------|----------------------------------|----------------------|-------------------------------|-----------|
| Li et al. (2003)[12]          | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 3                             | Low       |
| Yam et al. (2007)[13]         | 0                                                                                              | 0                         | 1                                                   | 0                                | 0                    | 3                             | Low       |
| Lau et al. (2009)_H† [14]     | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 2                             | Low       |
| Lau et al. (2009)_T† [14]     | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 2                             | Low       |
| Arabi et al. (2018)[15]       | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 3                             | Low       |
| Chen et al. (2006)[16]        | 0                                                                                              | 1                         | 1                                                   | 1                                | 1                    | 7                             | High      |
| Wu et al. (2020)[17]          | 0                                                                                              | 1                         | 1                                                   | 1                                | 1                    | 7                             | High      |
| Al Ghamdi et al. (2016)[18]   | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 2                             | Low       |
| Zhou et al. (2020)[19]        | 0                                                                                              | 0                         | 0                                                   | 0                                | 0                    | 2                             | Low       |

* Quality assessment scoring: 1=study met the criteria (one star); 0=study did not meet the criteria, or not reported (no star). d A*-Prospective Cohort; B*-Adjusted odds ratio; C-Retrospective Cohort; D-Adjusted Odd Ratio not specified; E-nothing specified. e A*-Mortality variables were adjusted in steroid and control groups; B*-Mortality variables were not adjusted and only description about mortality with numbers; C-No description. f A*-Yes (time related steroids is described) after
exposure to patients; B-No (Information not provided). g A*-If prospective, all patients were evaluated for use of steroids during follow-up; B*-If prospective, <=10% of patients lost to follow up; C*-If retrospective, number of patients lost to follow-up or excluded is reported and <=10%; D-If retrospective or prospective, greater than 10% lost to follow up; E-If prospective or retrospective, number of patients lost to follow up not reported. h A*-Sufficient data and statistical test about steroids presented to support the primary outcome (mortality); B-The statistical test is not appropriate, not described or incomplete. † These are the same paper (Lau, 2009) [14] which has the two subgroups: one study in Hong-Kong (H) and the other study in Toronto (T).
### 6. Detailed description of included studies (Table S8–9)

**Table S8.** Detailed description about basal characteristics of included studies.

| Authors                  | Type of Disease | Number of Hospital | Location/Nationality | Type of Case                                                                 | Subgroup Case                  | Subgroup Control |
|--------------------------|-----------------|--------------------|----------------------|------------------------------------------------------------------------------|------------------------------|-----------------|
| Li et al. (2003) [12]    | SARS            | 1                  | Beijing/China        | Use of methylprednisolone                                                     |                             |                 |
|                          |                 |                    |                      |                                                                              | IV hydrocortisone             | 621              |
|                          |                 |                    |                      |                                                                              | IV methylprednisolone         | 177              |
|                          |                 |                    |                      |                                                                              | Oral prednisolone             | 170              |
|                          |                 |                    |                      |                                                                              | IV pulsed methylprednisolone  | 220              |
| Yam et al. (2006) [13]   | SARS            | 14                 | Hong Kong/China      |                                                                              |                             |                 |
|                          |                 |                    | ICU/Non-ICU          |                                                                              | IV hydrocortisone             | 621              |
|                          |                 |                    | Mar-Oct 2003         |                                                                              | IV methylprednisolone         | 177              |
| Lau et al. (2009) [14]   | SARS            | -                  | Hong Kong/China      | Use of corticosteroid                                                        |                             |                 |
|                          |                 |                    | ICU/Non-ICU          |                                                                              | Use of corticosteroid         | -                |
|                          |                 |                    | 2002-2003            |                                                                              |                             |                 |
|                          |                 |                    | Onset before April 22, 2003 |                                                                              |                             |                 |
|                          |                 |                    | 773                  |                                                                              |                             |                 |
|                          |                 |                    | 970                  |                                                                              |                             |                 |
|                          |                 |                    | 790                  |                                                                              |                             |                 |
|                          |                 |                    | 953                  |                                                                              |                             |                 |
| Arabi et al. (2018)* [15]| MERS            | 14                 | All/Saudi Arabia     | Use of hydrocortisone, dexamethasone, methylprednisolone, IV pulsed methylprednisolone | -                            | -                |
| Chen et al. (2006) [16]  | SARS            | -                  | Guangzhou/China      | Use of hydrocortisone, prednisolone, methylprednisolone                        | -                            | -                |
| Wu et al. (2020) [17]    | COVID-19        | 1                  | Wuhan/China          | Use of methylprednisolone                                                     | -                            | -                |
| Al Ghamdi                | MERS            | 1                  | Jeddah/Saudi Arabia  | Use of corticosteroid among survivors                                         | 2                            | 3                |
|                          |                 |                    | ICU/Non-ICU          |                                                                              |                             |                 |
|                          |                 |                    | Jan-Dec 2014         |                                                                              |                             |                 |
| Study                  | Location               | By Jan 31, 2020 (N) | Use of corticosteroid |
|------------------------|------------------------|---------------------|----------------------|
| Zhou et al. (2020) [19]| Wuhan/China            | 56 119 72 57 134    | -                    |

SARS: Severe acute respiratory syndrome, MERS: Middle East respiratory syndrome, COVID-19: Coronavirus disease 19, ICU: intensive care unit, ARDS: acute respiratory distress syndrome, (-): no information. * This paper is also described in Russell (2020) [4] as references.
Table S9. Detailed description about steroids of included studies.

| Authors          | Steroid Type                        | Steroid Dose in Article | Mean Duration of Steroids, Day | Mean Duration between Onset of Illness and Steroid Initiation, d | Primary Endpoint of the Study | Mortality in Steroids | Mortality in Non-Steroids | Description about the Steroids in the Study                                                                 | Type of Case | Conclusion |
|------------------|-------------------------------------|-------------------------|--------------------------------|---------------------------------------------------------------|-------------------------------|-----------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------|-------------|
| Li et al. (2003) [12] | Methylprednisolone | 170.82 +/- 15.89 (Day 1) max dose 291.44 +/- 37.63 (Day1) | -                              | -                                                            | Treated SARS                 | 1                     | 0                       | Sub-pulse dosage of MP was effective for most SARS patients. Those who were less responsiveness might due to their poor sensitiveness to corticosteroids instead of SARS severity | Use of steroid | Helpful     |
| Yam et al. (2006) [13] | IV hydrocortisone | 13200mg/total | 19                              | 4                                                            | Treated SARS                 | 202                   | 28                      | Among four corticosteroid groups studied, mortality was lowest in the low-dose oral prednisolone (Group P) and high-dose methylprednisolone (Group MP) groups. | Combination therapy - corticosteroid and ribavirin | Helpful     |
|                   | IV methylprednisolone | 11350mg/total | 21                              | 5                                                            |                               |                       |                         |                                                                          |              |             |
|                   | Oral prednisolone | 7020mg/total | 15                              | 5                                                            |                               |                       |                         |                                                                          |              |             |
|                   | IV pulsed methylprednisolone | 17560mg/total | 19                              | 6                                                            |                               |                       |                         |                                                                          |              |             |
| Lau et al. (2009) [14] | -                                | -                        | -                              | -                                                            | Treated SARS                 | 108                   | 193                     | The combination of ribavirin and corticosteroids has no significant beneficial effect in the treatment of SARS. | Combination therapy - corticosteroid and ribavirin | Not-Helpful |
| Arabi et al. (2018)* [15] | Hydrocortisone, Dexamethasone, Methylprednisolone, Prednisolone | - | 7.0 (4.0–14.0) (case 10.0 (4.0–19.0) control 7.0(4.0-12.0)) | 10.0 (7.0–17.0) Illness to steroid | Treated MERS                 | 117                   | 92                      | Corticosteroid therapy in patients with MERS was not associated with a difference in mortality after adjustment for time varying confounders but was associated with delayed MERS coronavirus RNA clearance. | Use of steroid | Inconclusive |
| Chen et al. (2006) [16] | Hydrocortisone, Methylprednisolone, prednisolone, | Total Median MP 1868.06mg (1723.6 mg vs 5.01 +/- 3.48 (5.00 +/- 3.52 vs 5.04 +/- 3.12, p=0.961) | Treated SARS | 18 | 7 | Proper use of corticosteroid in confirmed critical SARS resulted in lowered mortality and shorter hospitalization stay, and was not associated with significant | Use of steroid | Helpful     |
| Study                          | Treatment | ards   | Treatment | p (Ards) | Use of steroid | Effect on mortality |
|-------------------------------|-----------|--------|-----------|----------|----------------|---------------------|
| Wu et al. (2020)              | -         | -      | Treated COVID-19 | 3874.42mg, p=0.011 | -               | Helpful |
| Al Ghamdi et al. (2016)       | Hydrocortisone | -      | Treated MERS | 3        | -               | Inconclusive |
| Zhou et al. (2020)            | -         | 12     | Treated COVID-19 | 26       | -               | Inconclusive |

Among patients with ARDS, treatment with methylprednisolone decreased the risk of death (HR, 0.38; 95%CI, 0.20-0.72).

In this retrospective cohort, interferon beta and mycophenolate mofetil treatment were predictors of increased survival in the univariate analysis. (Steroid is not a predictive factor of survival).

High-dose corticosteroid use might have also contributed to the poor clinical outcomes in some patients.

SARS: Severe acute respiratory syndrome, MERS: Middle East respiratory syndrome, COVID-19: Coronavirus disease 19, ICU: intensive care unit, ARDS: acute respiratory distress syndrome, MP: methylprednisolone, HR: hazard ratio, CI: confidence interval, (-): no information. * This paper is also described in Russell (2020) [4] as references.
7. Funnel plots (Figure S1–3)

**Figure S1.** Funnel plot for meta-analysis of association between steroids and mortality of studies about intervention (in total).

**Figure S2.** Funnel plot for meta-analysis of association and mortality of studies about steroids as an add-on therapy for ribavirin.
Figure S3. Funnel plot for meta-analysis of association between steroids and mortality of studies about steroids itself comparing non-steroid group.
8. Subset Analyses (Figure S4)

Figure S4. Association between steroids and mortality of SARS studies about “intervention”. Studies are presented as country study (study [year]). The data are presented for total SARS studies about intervention (a), steroids as an add-on therapy for ribavirin (b), and steroids itself comparing non-steroid group (c). † These are the same paper (Lau (2009) [14]) which has the two subgroups: one study conducted in Hong-Kong (H1 and H2) and the other study in Toronto (T).
9. References.

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