

Supplementary

Table S1 Missing variables in calculation of scores for N=347

| Missing Score variable | Score | First cohort N (%) | Second cohort N (%) | Third cohort N (%) |
|-------------------------|---|-----------------------|------------------------|-----------------------|
| Urea | 4C-Score | 33 (24.6) | 91 (48.7) | 22 (84.6) |
| Bilirubine | COVID-GRAM | 11 (8.2) | 42 (22.5) | 7 (26.9) |
| LDH | COVID-GRAM | 13 (9.7) | 39 (20.9) | 7 (26.9) |
| Respiratory rate | 4C-Score, qSOFA, CRB-65, NEWS | 10 (7.5) | 36 (19.3) | 5 (19.2) |
| Oxygen supply | NEWS | 10 (7.5) | 27 (14.4) | 5 (19.2) |
| Oxygen saturation | 4C-Score, NEWS | 10 (7.5) | 27 (14.4) | 5 (19.2) |
| Temperature | NEWS | 9 (6.7) | 26 (13.9) | 5 (19.2) |
| Systolic blood pressure | CRB-65, qSOFA, NEWS | 8 (6.0) | 25 (13.4) | 5 (19.2) |
| Heart rate | NEWS | 8 (6.0) | 24 (12.8) | 5 (19.2) |
| GCS | 4C-Score, CRB-65, qSOFA, COVID-GRAM, NEWS | 8 (6.0) | 24 (12.8) | 5 (19.2) |
| CRP | 4C-Score | 7 (5.2) | 18 (9.6) | 3 (11.5) |

Table S1. Missing variables in calculation of scores at patients admission for N=347 patients of study population. Abbreviations: *COVID* Coronavirus Disease, *GRAM* Guangzhou Institute of Respiratory Health Calculator at Admission, *qSOFA* Quick Sequential Organ Failure Assessment, *CRB* Confusion, Respiratory rate, Blood pressure, *NEWS* National Early Warning Score, *LDH* Lactate dehydrogenase, *GCS* Glasgow Coma Scale, *CRP* C-reactive protein

Table S2 Characteristics of excluded patients

| | CRB-65 N (% or Q1- Q3) | NEWS N (% or Q1- Q3) | 4C-Score N (% or Q1-Q3) | COVID- GRAM N (% or Q1- Q3) | qSOFA N (% or Q1- Q3) |
|--------------------------|-------------------------------------|-----------------------------------|-----------------------------------|--|------------------------------------|
| Overall | 51 | 66 | 194 | 98 | 51 |
| Female | 26 (51.0) | 35 (53.0) | 95 (49.0) | 55 (56.1) | 26 (51.0) |
| Average age | 59.3 (46.0- 76.0) | 61.2 (50.0- 76.0) | 62.9 (53.0-76.0) | 65.9 (59.0- 80.0) | 59.3 (46.0- 76.0) |
| ICU admission | 10 (19.6) | 17 (25.8) | 25 (12.9) | 16 (16.3) | 10 (19.6) |
| In-hospital mortality | 3 (5.9) | 6 (9.1) | 14 (7.2) | 8 (8.2) | 3 (5.9) |
| Cohort 1 | 10 (19.6) | 17 (25.8) | 47 (24.2) | 20 (20.4) | 10 (19.6) |
| Female | 4 (40.0) | 10 (58.8) | 22 (46.8) | 13 (65.0) | 4 (40.0) |
| Average age | 52.8 (33.8- 80.0) | 56.1 (46.0- 74.0) | 62.7 (50.0-80.0) | 64.9 (50.8- 80.8) | 52.8 (33.8- 80.0) |
| ICU admission | 5 (50.0) | 7 (41.2) | 14 (29.8) | 8 (40.0) | 5 (50.0) |
| In-hospital mortality | 2 (20.0) | 3 (17.6) | 10 (21.3) | 4 (20.0) | 2 (20.0) |
| Cohort 2 | 36 (70.6) | 44 (66.7) | 124 (63.9) | 66 (67.3) | 36 (70.6) |
| Female | 20 (55.6) | 23 (52.3) | 63 (50.8) | 36 (54.5) | 20 (55.6) |
| Average age | 61.9 (55.0- 76.0) | 63.9 (56.0- 76.0) | 63.8 (55.0-76.0) | 67.4 (60.0- 81.0) | 61.9 (55.0- 76.0) |
| ICU admission | 4 (11.1) | 9 (20.5) | 10 (8.1) | 7 (10.6) | 4 (11.1) |
| In-hospital mortality | 1 (2.8) | 3 (6.8) | 4 (3.2) | 4 (6.1) | 1 (2.8) |
| Cohort 3 | 5 (9.8) | 5 (7.6) | 23 (11.9) | 12 (12.2) | 5 (9.8) |
| Female | 2 (40.0) | 2 (40.0) | 10 (43.5) | 6 (50.0) | 2 (40.0) |
| Average age | 53.8 (36.0- 71.0) | 53.8 (36.0- 71.0) | 58.5 (48.0-68.0) | 59.5 (49.8- 68.0) | 53.8 (36.0- 71.0) |
| ICU admission | 1 (20.0) | 1 (20.0) | 1 (4.3) | 1 (8.3) | 1 (20.0) |
| In-hospital mortality | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |

Table S2 Characteristics of excluded patients for each score studied. Abbreviations: *CRB* Confusion, Respiratory rate, Blood pressure, *NEWS* National Early Warning Score, *COVID* Coronavirus Disease, *GRAM* Guangzhou Institute of Respiratory Health Calculator at Admission, *qSOFA* Quick Sequential Organ Failure Assessment, *ICU* Intensive Care Unit

Table S3 Discriminatory indices at several cut-offs of the scores¹

| | Cut-off | Prevalence (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) | Positive predictive value (95% CI) | Negative predictive value (95% CI) |
|---|---------|------------------------|-------------------------|-------------------------|--|--|
| ICU-admission | | | | | | |
| qSOFA | ≥2 | 24.3 (19.5-29.3) | 15.3 (7.5-24.2) | 98.2 (96.3-99.6) | 73.4 (50.0-93.8) | 78.3 (73.4-83.1) |
| COVID-GRAM ² | ≥1.7% | - | - | - | - | - |
| | ≥40.4% | 26.5 (21.0-32.0) | 98.5 (94.9-100) | 3.8 (1.2-6.9) | 27.0 (21.4-32.6) | 87.5 (57.1-100) |
| NEWS | ≥5 | 22.9 (18.1-27.9) | 89.0 (80.7-96.2) | 64.1 (57.7-70.4) | 42.5 (34.2-51.0) | 95.2 (91.3-98.5) |
| | ≥7 | 22.9 (18.1-27.9) | 67.1 (55.4-78.3) | 81.8 (76.5-86.9) | 52.4 (41.5-63.3) | 89.3 (84.7-93.4) |
| CRB-65 | ≥2 | 24.3 (19.5-29.3) | 44.4 (32.8-56.2) | 87.5 (82.9-91.6) | 53.3 (40.4-66.1) | 83.0 (78.2-87.7) |
| 4C-Score | ≥4 | 37.2 (29.6-45.0) | 98.2 (94.0-100) | 2.1 (0-5.4) | 37.3 (29.6-45.2) | 66.5 (0-100) |
| | ≥9 | 37.2 (29.6-45.0) | 93.0 (85.7-98.4) | 22.9 (14.8-31.6) | 41.7 (33.1-50.4) | 84.6 (69.6-96.6) |
| | ≥15 | 37.2 (29.6-45.0) | 21.0 (10.9-32.0) | 96.9 (92.9-100) | 79.9 (57.1-100) | 67.4 (59.4-75.0) |
| In-hospital mortality | | | | | | |
| qSOFA | ≥2 | 9.8 (6.5-13.3) | 6.9 (0-17.6) | 95.1 (92.4-97.5) | 13.3 (0-33.3) | 90.4 (86.8-93.7) |
| COVID-GRAM ² | ≥1.7% | - | - | - | - | - |
| | ≥40.4% | 9.6 (6.1-13.5) | 100 | 3.6 (1.3-6.2) | 9.9 (6.3-13.9) | 100 |
| NEWS | ≥5 | 9.3 (6.0-12.9) | 84.6 (69.2-96.7) | 55.7 (49.6-61.7) | 16.4 (10.4-23.0) | 97.2 (94.3-99.4) |
| | ≥7 | 9.3 (6.0-12.9) | 69.2 (50.0-86.4) | 74.7 (69.2-80.0) | 21.9 (13.3-31.4) | 95.9 (93.0-98.5) |
| CRB-65 | ≥2 | 9.8 (6.5-13.3) | 48.3 (30.0-66.7) | 82.7 (78.1-87.1) | 23.3 (13.0-34.5) | 93.6 (90.4-96.6) |
| 4C-Score | ≥4 | 11.8 (6.9-17.1) | 100 | 2.2 (0-5.1) | 12.0 (7.1-17.5) | 100 |
| | ≥9 | 11.8 (6.9-17.1) | 100 | 19.3 (12.8-26.1) | 14.2 (8.5-20.6) | 100 |
| | ≥15 | 11.8 (6.9-17.1) | 33.3 (11.8-57.1) | 93.3 (88.8-97.2) | 40.1 (14.3-66.7) | 91.3 (86.3-95.7) |
| ¹ Score cut-offs according to derivation literature | | | | | | |
| ² COVID-GRAM risk of critical illness. We only assessed discriminatory indices at the higher cut-off because we had no patient with a score value less than 1.7% | | | | | | |

Table S3 Discriminatory indices at several clinical cut-offs of the scores (defined by international literature) regarding the overall study population. Abbreviations: *ICU* Intensive Care Unit, *qSOFA* Quick Sequential Organ Failure Assessment, *COVID* Coronavirus Disease, *GRAM* Guangzhou Institute of Respiratory Health Calculator at Admission, *NEWS* National Early Warning Score, *CRB* Confusion, Respiratory rate, Blood pressure

Figure S1

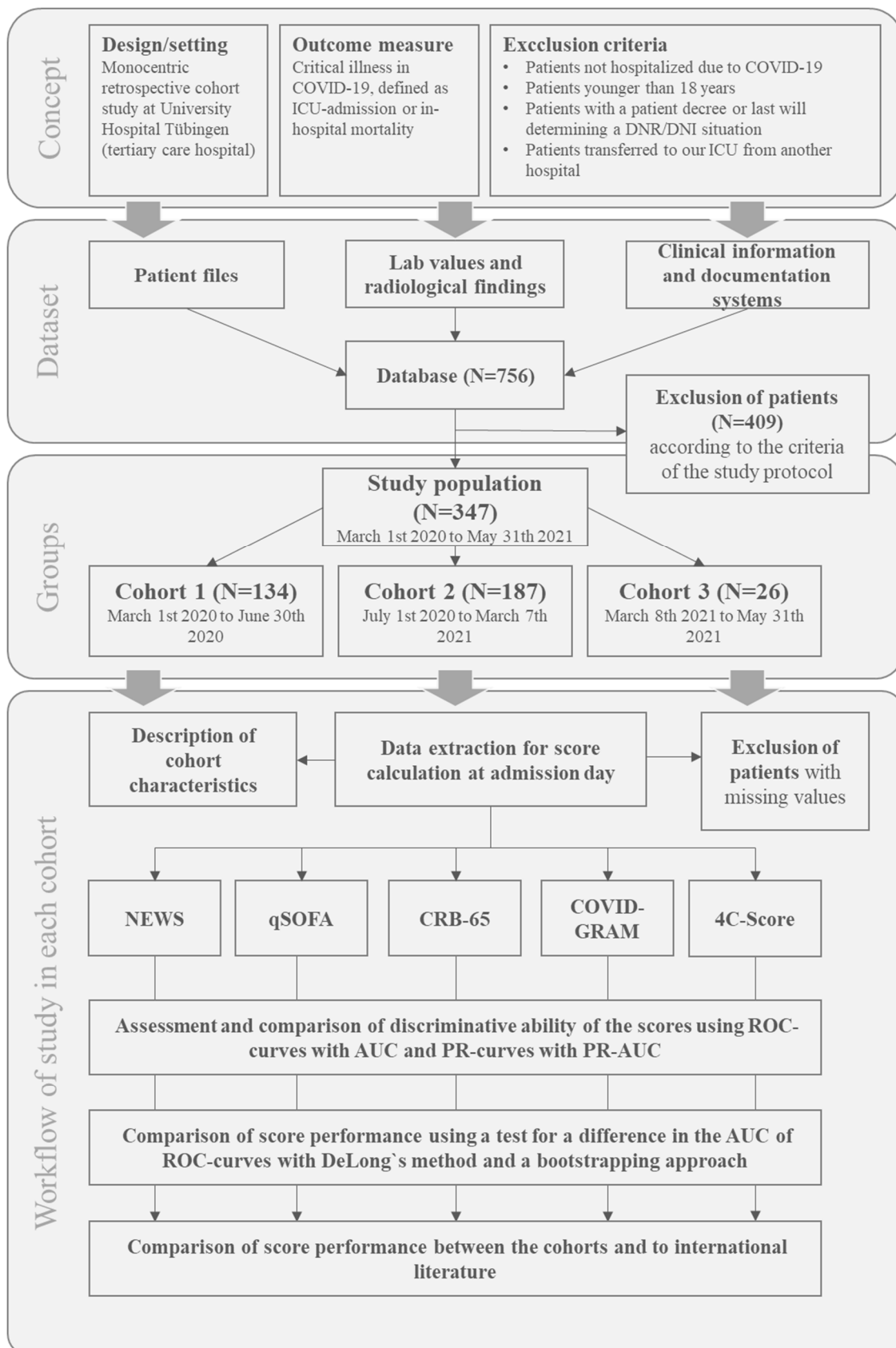


Fig S1. Schematic workflow of study. Study concept (upper panel), dataset and groups (middle panel), the workflow of score calculation, validation, and comparison in each cohort (lower panel). Abbreviations: *COVID* Coronavirus Disease, *ICU* Intensive Care Unit, *DNR* Do not intubate, *DNI* Do not resuscitate, *CRB* Confusion,

Respiratory rate, Blood pressure, *NEWS* National Early Warning Score, *GRAM* Guangzhou Institute of Respiratory Health Calculator at Admission, *qSOFA* Quick Sequential Organ Failure Assessment, *AUC* Area under the curve, *PR* Precision recall, *ROC* Receiver Operating Characteristics

Figure S2

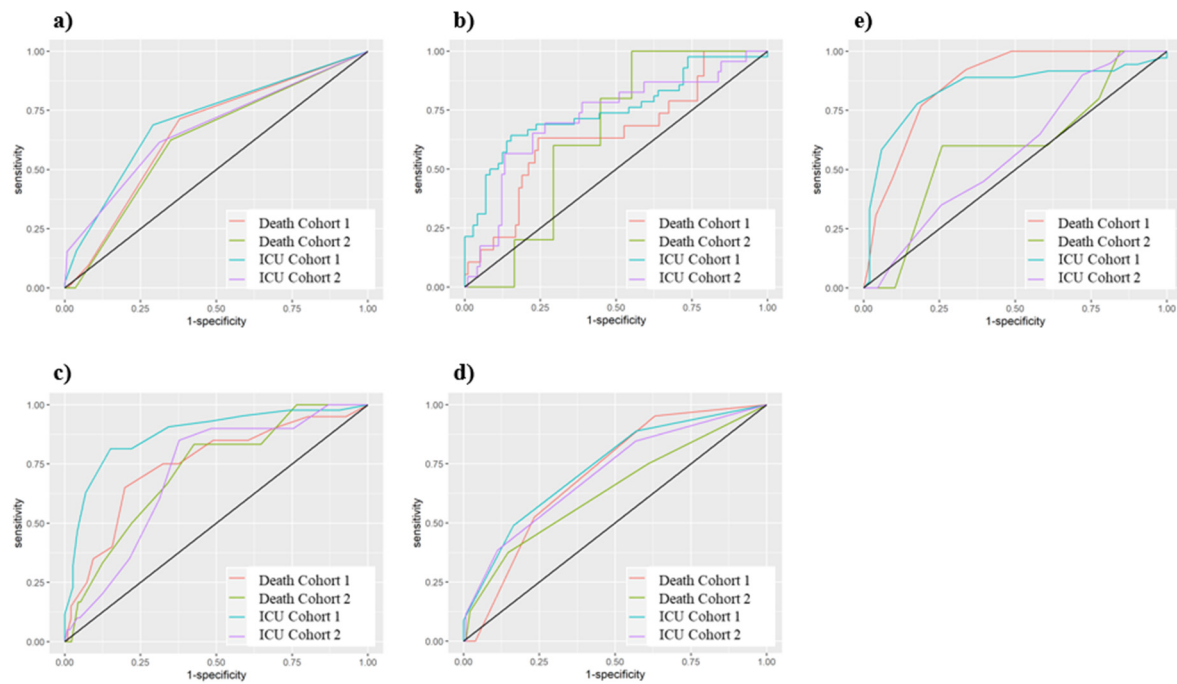


Figure S2. Plots of Area under the receiver operating characteristics of qSOFA (a), COVID-GRAM (b), NEWS (c), CRB-65 (d) and 4C-Score (e) with regard to ICU admission and in-hospital mortality in the first and the second cohort. Abbreviations: *ICU* Intensive Care Unit