

Supplementary Index

Table of Contents

1. Table S1: Baseline Characteristics of Hospitalized COVID(+) and COVID(-) Patients
2. Table S2: Incidence of AKI by ICU versus general floor admission and requirement of ICU and mechanical ventilation in COVID(+) and COVID(-) patients hospitalized during the study period
3. Table S3: Odds Ratio (OR) of AKI development in unadjusted and adjusted models
4. Table S4: Sub-Hazard Ratios (SHR) for Competing Risk of Death with AKI
5. Table S5: Hazard Ratio (HR) for Composite Outcome of Mortality or RRT in unadjusted and adjusted models
6. Table S6: Predictive model for Stage 2 or 3 AKI in COVID-19 infection
7. Table S7. Sensitivity analysis: AKI Incidence in Hospitalized Patients Using $\geq 50\%$ Relative Increase in Serum Creatinine
8. Figure S1: Flowchart of AKI Incidence in COVID(+) patients admitted to the intensive care unit or general floor
9. Figure S2: Area under the receiver operating curve for predictive model for Stage 2 or 3 AKI

Table S1. Baseline characteristics of Hospitalized COVID(+) Patients and COVID(-) Patients

| n=4610 | COVID(+) n=3345 | | | P value | COVID(-) n=1265 | | | P value |
|--------------------------------------|----------------------|-------------------------------|-----------------------------|---------|----------------------|------------------------------|----------------------------|---------|
| | Total | with AKI n=1903 (56.9%) | no AKI n=1442 (43.1%) | | Total | with AKI n=471 (37.2%) | no AKI n=794 (62.8%) | |
| Socio-demographic Data, n(%) | | | | | | | | |
| Age, yrs, mean (SD) | 64.4(16.4) | 67.1(15.3) | 60.7(17.0) | <0.001 | 58.5(19.1) | 64.7(16.2) | 54.8(19.7) | <0.001 |
| Age decile, yrs | | | | | | | | |
| <30 | 113(3.4) | 42(2.2) | 71(4.9) | <0.001 | 113(8.9) | 17(3.6) | 96(12.1) | <0.001 |
| 31-40 | 189(5.6) | 69(3.6) | 120(8.3) | | 161(4.0) | 27(5.7) | 134(16.9) | |
| 41-50 | 311(9.3) | 135(7.1) | 176(12.2) | | 107(8.5) | 25(5.3) | 82(10.3) | |
| 51-60 | 553(16.5) | 286(15.0) | 267(18.5) | | 212(16.8) | 87(18.5) | 125(15.7) | |
| 61-70 | 779(23.3) | 436(22.9) | 343(23.8) | | 269(21.3) | 123(26.1) | 146(18.4) | |
| 71-80 | 771(23.0) | 513(27.0) | 258(17.9) | | 231(18.3) | 111(23.6) | 120(15.1) | |
| >80 | 629(18.8) | 422(22.2) | 207(14.4) | | 64(13.6) | 81(17.2) | 91(11.5) | |
| Sex | | | | | | | | |
| Female | 1569(46.9) | 812(42.7) | 757(52.5) | <0.001 | 656(51.9) | 207(44.0) | 449(56.6) | <0.01 |
| Male | 1776(53.1) | 1091(57.3) | 685(47.5) | | 609(48.1) | 264(56.0) | 345(43.5) | |
| Race/ethnicity | | | | | | | | |
| Non-Hispanic White | 275(8.2) | 155(8.2) | 120(8.3) | <0.001 | 140(11.1) | 45(9.6) | 95(12.0) | 0.1 |
| Non-Hispanic Black | 1201(35.9) | 771(40.5) | 430(29.8) | | 480(37.9) | 198(42.0) | 282(35.5) | |
| Hispanic | 1247(37.3) | 638(33.5) | 609(42.2) | | 449(35.5) | 162(34.4) | 287(36.2) | |
| Other | 622(18.6) | 339(17.8) | 283(19.6) | | 196(15.5) | 66(14.0) | 130(16.4) | |
| NH Resident | 548(16.4) | 399(21.0) | 149(10.3) | <0.001 | 141(11.2) | 78(16.6) | 63(7.9) | <0.001 |
| SES n=3680 median (IQR) | -2.2 [-5.3(-1.1)] | -2.1 [-4.9(-1.0)] | -2.4 [-5.7(-1.1)] | 0.03 | -2.3 [-5.3(-1.0)] | -2.3 [-5.8(-1.0)] | -2.3 [-5.1(-1.0)] | 0.6 |
| Clinical comorbidities, n(%) | | | | | | | | |
| BMI (k/m ²) n=4367 | | | | | | | | |
| <30 | 1797(57.1) | 1069(59.6) | 728(53.8) | 0.005 | 772(63.3) | 304(67.0) | 368(61.2) | 0.01 |
| 30-35 | 725(23.0) | 388(21.6) | 337(24.9) | | 231(19.0) | 89(19.6) | 142(18.6) | |
| >35 | 626(19.9) | 338(18.8) | 288(21.3) | | 216(17.7) | 61(13.4) | 155(20.3) | |
| DM | 906(27.1) | 569(29.9) | 337(23.4) | <0.001 | 310(24.5) | 156(33.1) | 154(19.4) | <0.001 |
| CKD | 409(12.2) | 287(15.1) | 122(8.5) | <0.001 | 217(17.2) | 117(24.8) | 100(12.6) | <0.001 |
| CHF | 129(3.9) | 87(4.6) | 42(2.9) | 0.01 | 130(10.3) | 72(15.3) | 58(7.3) | <0.001 |
| Lung disease | 163(4.9) | 88(4.6) | 75(5.2) | 0.4 | 167(13.2) | 73(15.5) | 94(11.8) | 0.1 |
| HIV/AIDS | 7(0.2) | 3(0.2) | 4(0.3) | 0.4 | 16(1.3) | 7(1.5) | 9(1.1) | 0.6 |
| Malignancy | 61(1.8) | 38(2.0) | 23(37.7) | 0.4 | 59(4.7) | 24(5.1) | 35(4.4) | 0.6 |
| Rheumatologic | 15(0.4) | 8(0.4) | 7(0.5) | 0.8 | 12(1.0) | 5(1.1) | 7(0.9) | 0.8 |
| Charlson Comorbidity Index | | | | | | | | |
| 0-1 | 1094(32.7) | 495(26.0) | 599(41.5) | <0.001 | 499(39.4) | 118(25.0) | 381(48.0) | <0.001 |
| 1-5 | 1993(59.6) | 1237(65.0) | 756(52.4) | | 568(44.9) | 247(52.4) | 321(40.4) | |
| >5 | 258(7.7) | 171(9.0) | 87(6.0) | | 198(15.7) | 106(22.5) | 92(1.6) | |
| Outpatient visit within 1-year prior | 2453(73.3) | 1376(72.3) | 1077(74.7) | 0.1 | 977(77.2) | 351(74.5) | 626(78.8) | 0.1 |

| | | | | | | | | |
|--|-----------------------|----------------------|---------------------|--------|---------------------|---------------------|---------------------|--------|
| Pre-hospital ACEi or ARB use | 310(9.3) | 195(10.2) | 115(8.0) | 0.02 | 209(16.5) | 87(18.5) | 122(15.4) | 0.2 |
| Initial vital signs, mean (SD) | | | | | | | | |
| Temperature n=4598 (degrees Fahrenheit) | 99.2(1.6) | 99.3(1.6) | 99.2(1.5) | 0.6 | 98.5(1.3) | 98.5(1.5) | 98.4(1.1) | 1.0 |
| Respiratory rate n=4599 (breaths/min) | 21.6(6.3) | 22.3(6.8) | 20.6(5.4) | <0.001 | 20.1(4.9) | 20.9(5.2) | 19.7(4.6) | <0.001 |
| Pulse ox n=4601 (%) | 92.8(8.0) | 91.7(9.4) | 94.3(5.4) | <0.001 | 96.4(5.3) | 95.3(7.2) | 97.1(3.7) | <0.001 |
| Pulse rate n=4601 (beats/min) | 98.3(20.4) | 99.1(21.3) | 97.2(19.3) | 0.01 | 95.3(21.8) | 98.5(23.0) | 93.4(92.0) | 0.001 |
| Initial laboratory data | | | | | | | | |
| WBC (k/ μ L) n=4602 mean (SD) | 8.7(7.0) | 9.3(6.9) | 7.8(7.1) | <0.001 | 11.1(16.3) | 12.2(9.3) | 10.4(19.2) | 0.03 |
| Lymphocyte (k/ μ L) n=4602 mean (SD) | 1.3(4.8) | 1.2(3.7) | 1.4(5.8) | 0.4 | 1.6(2.2) | 1.6(3.1) | 1.7(1.5) | 0.6 |
| Neutrophil (k/ μ L) n=4602 mean (SD) | 6.7(4.0) | 7.3(4.2) | 5.8(3.5) | <0.001 | 8.1(6.0) | 9.4(6.2) | 7.3(5.7) | 0.05 |
| Neutrophil/Lymphocyte ratio median (IQR) | 5.7 (3.5-9.3) | 6.6 (4.1-10.4) | 4.7 (3.0-7.7) | <0.001 | 4.8 (2.8-8.9) | 6.6 (3.5-11.7) | 4.1 (2.5-6.9) | <0.001 |
| Platelets (k/ μ L) n=4602 mean (SD) | 230.6 (101.5) | 228.3 (102.4) | 233.6 (100.2) | 0.1 | 254.3 (109.1) | 253.5 (115.3) | 254.8 (105.2) | 0.8 |
| INR, mean (SD) <1.1 >1.1 | 1215(36.3) 2130(63.7) | 602(31.6) 1301(68.4) | 613(42.5) 829(57.5) | <0.001 | 348(27.5) 917(72.5) | 101(21.4) 370(78.6) | 247(31.1) 547(68.9) | <0.001 |
| Fibrinogen(mg/dL) n=2297 mean (SD) | 649.0 (200.0) | 659.1 (210.9) | 631.8 (177.8) | 0.002 | 532.7 (218.6) | 547.7 (239.8) | 517.8 (194.8) | 0.2 |
| CRP (mg/dL) n=3429 median (IQR) | 10.8 (4.8-19.1) | 13.2 (6.1-22.4) | 7.3 (3.3-14.3) | <0.001 | 4.3 (0.9-13.8) | 6.2 (1.7-18.7) | 2.6 (0.5-10.4) | <0.001 |
| Ferritin (ng/mL) n=2470 median (IQR) | 763 (384-1420) | 911 (491-1668) | 610 (296-1087) | <0.001 | 320 (107-856) | 369 (167-1085) | 230 (82-664) | <0.001 |
| PTT (seconds) median (IQR) | 32.6 (29.6-36.6) | 32.9 (29.8-37.1) | 32.3 (29.3-35.9) | <0.001 | 30.8 (27.6-35.1) | 31.4 (27.8-35.6) | 30.5 (27.4-34.2) | 0.02 |
| D-dimer (μ g/mL) n=2726 median (IQR) | 1.7 (0.9-3.8) | 2.2 (1.1-6.2) | 1.1 (0.7-2.3) | <0.001 | 1.7 (0.7-4.0) | 2.8 (1.2-7.0) | 1.2 (0.5-2.5) | 0.01 |
| LDH (U/L) n=3715 median (IQR) | 403 (300-546) | 458 (336-637) | 350 (270-451) | <0.001 | 280 (215-397) | 338.5 (251-504) | 248 (201-335) | <0.001 |
| Total bilirubin (mg/dL) n=4472 median (IQR) | 0.5 (0.3-0.7) | 0.5 (0.3-0.7) | 0.5 (0.3-0.6) | <0.001 | 0.5 (0.3-0.7) | 0.5 (0.3-0.8) | 0.4 (0.3-0.7) | <0.001 |
| Direct Bilirubin (mg/dL) n=4479 median (IQR) | 0.2 (0.2-0.3) | 0.2 (0.2-0.3) | 0.2 (0.2-0.2) | 0.001 | 0.2 (0.2-0.2) | 0.2 (0.2-0.3) | 0.2 (0.2-0.2) | <0.001 |

| | | | | | | | | |
|---|------------------|------------------|------------------|--------|------------------|------------------|------------------|--------|
| Procalcitonin n=2185 median (IQR) | 0.2 (0.1-0.7) | 0.4 (0.1-1.3) | 0.2 (0.1-0.2) | <0.001 | 0.1 (0.1-0.7) | 0.3 (0.1-1.9) | 0.1 (0.1-0.1) | <0.001 |
| Proteinuria, n(%) n=2590 | | | | | | | | |
| <30 mg | 14(0.8) * | 5(0.4) | 7(1.4) | | 154(12.2) | 73(21.5) | 81(19.6) | |
| 30-500 mg | 1761(95.9) | 1128(95.0) | 633(97.5) | <0.001 | 513(40.6) | 222(65.3) | 291(70.5) | 0.2 |
| >500 mg | 62(3.4) | 55(4.6) | 9(1.1) | | 86(6.8) | 45(13.2) | 41(9.9) | |
| Need for ICU or mechanical ventilation, n(%) | | | | | | | | |
| Mechanical Ventilation | 624(17.6) | 569(29.9) | 55(3.8) | <0.001 | 126(10.0) | 90(19.1) | 36(4.5) | <0.001 |
| ICU Admission n=4603 | 438(13.1) | 382(20.1) | 56(3.9) | <0.001 | 46(3.6) | 30(6.4) | 16(2.0) | <0.001 |

SES, socioeconomic status; BMI, body mass index; DM, diabetes mellitus; CKD, chronic kidney disease; CHF, congestive heart failure; ACEI, angiotensin inhibitor; ARB, angiotensin receptor blocker; WBC, white blood cell count; INR, international normalized ratio; CRP, c-reactive protein; PTT, prolonged prothrombin time; LDH, lactate dehydrogenase; ICU, intensive care unit
*percentages are of the total tested for proteinuria

Table S2. Incidence of AKI by ICU or general floor admission and requirement of ICU and mechanical ventilation in COVID(+) and COVID(-) patients with and without AKI

| | COVID(+) n=3345 | | COVID(-) n=1265 | |
|--------------------------------|-----------------|---------------|-----------------|--------------|
| | AKI n=1903 | No AKI n=1442 | AKI n=471 | No AKI n=794 |
| General floor admission | 1521 (79.9) | 1386 (96.1) | 441 (93.6) | 778 (98.0) |
| ICU Admission | 382 (20.1) | 56 (3.9) | 30 (6.4) | 16 (2.0) |
| RRT | 164 (8.6) | | 20 (4.2) | |
| Mechanical ventilation | 569 (29.9) | 55 (3.8) | 90 (19.1) | 36 (4.5) |
| In-hospital death | 641 (33.7) | 124 (9.3) | 63 (13.4) | 29 (3.7) |

*ICU, intensive care unit

Table S3. Odds Ratio (OR) of AKI development in unadjusted and adjusted models

| | | Odds Ratio for AKI | | |
|------------------------------------|--------------------|----------------------|----------------------|----------------------|
| | | Model 1 ¹ | Model 2 ² | Model 3 ³ |
| Sex ⁴ | COVID(+) n=3345 | | | |
| | Female | 1 | 1 | 1 |
| | Male | 1.5(1.3-1.7) | 1.6(1.4-1.8) | 1.5(1.2-1.9) |
| | COVID (-) n=1265 | | | |
| | Female | 1 | 1 | 1 |
| | Male | 1.7(1.3-2.1) | 1.7(1.3-2.1) | 1.6(1.1-2.3) |
| Race/Ethnicity ⁵ | COVID(+) | | | |
| | Non-hispanic White | 1 | 1 | 1 |
| | Non-hispanic Black | 1.4(1.1-1.8) | 1.7(1.3-2.3) | 1.8(1.2-2.7) |
| | Hispanic | 0.8(0.6-1.0) | 1.0(0.8-1.4) | 1.1(0.8-1.7) |
| | Other | 0.9(0.7-1.2) | 1.1(0.8-1.5) | 1.1(0.7-1.7) |
| | COVID(-) | | | |
| | Non-hispanic White | 1 | 1 | 1 |
| | Non-hispanic Black | 1.5(1.0-2.2) | 1.9(1.2-2.8) | 2.2(1.1-4.3) |
| | Hispanic | 1.2(0.8-1.8) | 1.6(1.0-2.4) | 1.6(0.8-3.3) |
| | Other | 1.1(0.7-1.7) | 1.4(0.8-2.2) | 1.4(0.6-3.2) |
| Age decile ⁶ | COVID(+) | | | |
| | <30 | 1 | 1 | 1 |
| | 31-40 | 1.0(0.6-1.6) | 0.9(0.6-1.5) | 1.4(0.6-3.0) |
| | 41-50 | 1.3(0.8-2.0) | 1.2(0.8-1.8) | 1.8(0.9-3.6) |
| | 51-60 | 1.8(1.2-2.7) | 1.6(1.1-2.5) | 1.8(0.9-3.6) |
| | 61-70 | 2.1(1.4-3.2) | 1.8(1.2-2.8) | 2.2(1.1-4.2) |
| | 71-80 | 3.4(2.2-5.1) | 2.7(1.7-4.3) | 2.9(1.5-5.6) |
| | >80 | 3.5(2.3-5.2) | 2.9(1.8-4.7) | 2.8(1.4-5.7) |
| | COVID(-) | | | |
| | <30 | 1 | 1 | 1 |
| | 31-40 | 1.1(0.6-2.2) | 1.1(0.6-2.2) | 1.6(0.6-4.8) |
| | 41-50 | 1.7(0.9-3.4) | 1.4(0.7-2.8) | 1.5(0.5-4.8) |
| | 51-60 | 3.9(2.2-7.0) | 2.8(1.5-2.8) | 2.5(0.9-4.8) |
| | 61-70 | 4.8(3.7-8.4) | 3.5(1.9-6.3) | 3.1(1.2-8.2) |
| | 71-80 | 5.2(2.9-9.3) | 3.3(1.7-6.2) | 3.4(1.3-9.3) |
| | >80 | 5.0(2.8-9.1) | 3.1(1.6-6.1) | 3.2(1.2-9.1) |

1 Unadjusted

2 Model 1+ Adjusted for clinical comorbidities: Diabetes mellitus, Chronic kidney disease, Charlson comorbidity index, Congestive heart failure, pre-hospitalization ACEi or ARB, Nursing home resident

3 Model 2+ adjusted for SES and crowding

4 Adjusted for age & race/ethnicity in Models 2 and 3

5 Adjusted for sex & age in Models 2 and 3

6 Adjusted for sex & race/ethnicity in Models 2 and 3

Table S4. Sub-Hazard Ratios (SHR) for Competing Risk of AKI and Death

| | Unadjusted SHR | Adjusted SHR¹ |
|---|-----------------------|---------------------------------|
| Sex | | |
| Female | 1 | 1 |
| Male | 1.2 (1.1-1.3) | 1.2 (1.1-1.3) |
| Race/ethnicity | 1 | |
| Non-Hispanic White | 1.4 (1.2-1.7) | 1 |
| Non-Hispanic Black | 1.0 (0.9-1.2) | 1.5 (1.2-1.7) |
| Hispanic | 1.1 (0.9-1.3) | 1.1 (0.9-1.3) |
| Other | | 1.1 (0.9-1.3) |
| Age (for every 10 year increase) | | |
| | 1.1 (1.0-1.1) | 1.1 (1.0-1.1) |

1 Adjusted for clinical comorbidities: Diabetes mellitus, Chronic kidney disease, Charlson comorbidity index, Congestive heart failure, pre-hospitalization ACEi or ARB, Nursing home resident

Table S5. Hazard Ratio (HR) for Composite Outcome of Mortality or RRT in unadjusted and adjusted models

| COVID(+) n=3445 | Unadjusted HR n=3345 | Adjusted HR¹ n=3345 | Adjusted HR² n=2367 |
|------------------------|---------------------------------|---|---|
| Sex | | | |
| Female | 1 | 1 | 1 |
| Male | 1.2(1.1-1.3) | 1.3(1.2-1.5) | 1.3(1.1-1.6) |
| Race/Ethnicity | | | |
| Non-hispanic white | 1 | 1 | 1 |
| Non-hispanic Black | 0.8(0.6-1.0) | 0.9(0.7-1.2) | 1.0(0.7-1.4) |
| Hispanic | 0.7(0.6-0.9) | 0.9(0.7-1.2) | 1.1(0.8-1.6) |
| Other | 0.7(0.6-1.0) | 1.0(0.8-1.3) | 1.0(0.7-1.5) |
| Age decile | | | |
| <30 | 1 | 1 | 1 |
| 31-40 | 1.2(0.4-3.4) | 1.2(0.4-3.4) | 2.7(0.3-24.4) |
| 41-50 | 1.7(0.6-4.3) | 1.6(0.6-4.2) | 5.1(0.7-39.1) |
| 51-60 | 3.5(1.4-8.6) | 3.1(1.2-7.5) | 6.7(0.9-49.1) |
| 61-70 | 5.4(2.2-13.2) | 4.4(1.8-10.7) | 9.9(1.4-71.6) |
| 71-80 | 9.2(3.8-22.2) | 6.6(2.7-16.3) | 15.3(2.1-110.4) |
| >80 | 11.2(4.6-27.3) | 7.6(3.1-18.9) | 19.5(2.7-141.2) |

1 Adjusted for clinical comorbidities: Diabetes mellitus, Chronic kidney disease, Charlson comorbidity index, Congestive heart failure, pre-hospitalization ACEi or ARB, Nursing home resident

2 Further adjustment for SES and % of household with >1.5 occupants per room

Table S6. Predictive Model for Stage 2 or 3 AKI in COVID-19 Infection

| Variable | Odds Ratio, 95% CI |
|---|---------------------------|
| Age for every 1 year increase | 1.0 (1.0-1.0) |
| Black race | 1.8 (1.2-2.8) |
| Male sex | 1.4 (1.1-1.7) |
| Diabetes mellitus | 1.3 (1.0-1.7) |
| Nursing home resident | 1.6 (1.2-2.1) |
| Respiratory rate for every increase in breath per minute* | 1.0 (1.0-1.0) |
| WBC count (for every k/ μ L) | 1.0 (1.0-1.1) |
| ¹ Neutrophil/lymphocyte ratio* | 1.5 (1.2-1.9) |
| ² Lactate dehydrogenase* | 2.1 (1.8-2.5) |

**Initial value on hospitalization*

1 Each increase in category: <3 k/ μ L, 3-13.9 k/ μ L, >13.9 k/ μ L

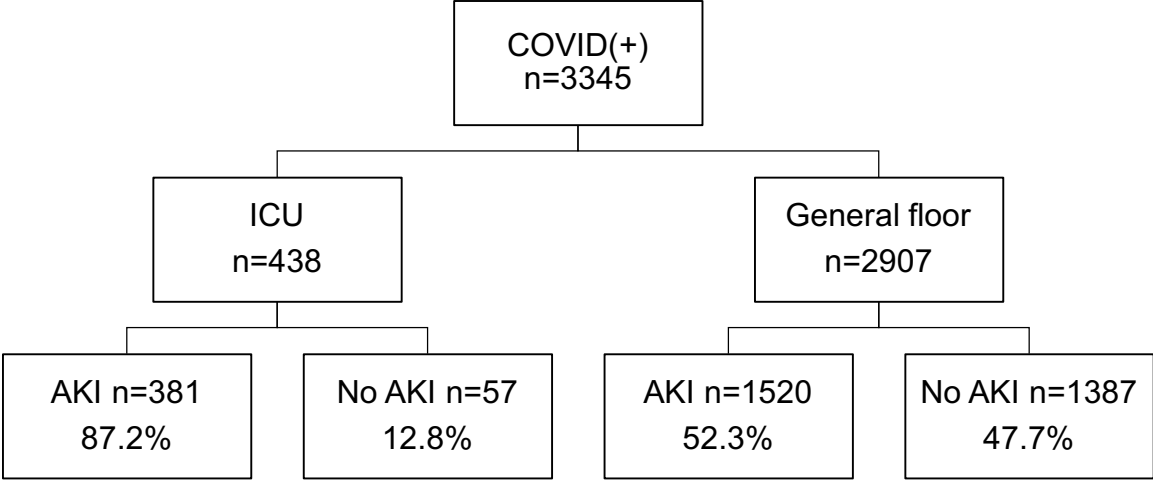
2 Each increase in category: <300 U/L, 300-599 U/L, >600 U/L

The area under the precision-recall curves for WBC, respiratory rate, neutrophil/lymphocyte ratio in tertiles, LDH in tertiles as compared to sex as a classifier are 0.54, 0.55, 0.52, 0.44, respectively

Table S7. Sensitivity Analysis: AKI Incidence in Hospitalized COVID(+) Patients Using \geq 50% Relative Increase in Serum Creatinine

| n (%) | COVID(+) n=3345 | COVID(-) n=1265 | Historical cohort n=9859 |
|---------------|-----------------|-----------------|--------------------------|
| AKI incidence | 1574 (47.1) | 354 (28) | 1528 (15.5) |

Figure S1. Flowchart of AKI Incidence in COVID(+) patients admitted to the intensive care unit or general medical floor



**ICU= both conventional and non-conventional ICU*

Figure S2. Area under the receiver operating curve for predictive model

