**Table S1** Etiologies of acute kidney injury

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Etiology, N (%) | Overall(N = 1392) | AKI alone (N = 632) | ARF first (N = 658) | AKI first (N = 79) | Concurrent AKI-ARF (N = 23) |
| Missing data | 406 (29.2) | 184 (29.1) | 198 (30.1) | 20 (25.3) | 4 (17.4) |
| Sepsis | 306 (22.0) | 115 (18.2) | 156 (23.7) | 29 (36.7) | 6 (26.1) |
| Renal hypoperfusion | 254 (18.2) | 144 (22.8) | 92 (14.0) | 13 (16.5) | 5 (21.7) |
| Nephrotoxina | 19 (1.4) | 7 (1.1) | 12 (1.8) | 0 (0.0) | 0 (0.0) |
| Tropical infectionb | 6 (0.4) | 6 (0.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Othersc | 138 (9.9) | 81 (12.8) | 53 (8.1) | 3 (3.8) | 1 (4.3) |
| Multiple etiologies | 263 (18.9) | 95 (15.0) | 147 (22.3) | 14 (17.7) | 7 (30.4) |

aNephrotoxin included hemoglobinuria, rhabdomyolysis, nephrotoxic drugs, and intravenous contrast media.

bTropical infection included leptospirosis, malaria, scrub typhus, and dengue fever.

cOthers included connective tissue diseases and pregnancy-related diseases.

**Table S2** Classification of acute respiratory failure

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Classification, N (%) | Overall (N = 2680) | ARF alone (N = 1920) | ARF first (N = 658) | AKI first (N = 79) | Concurrent AKI-ARF (N = 23) |
| Missing data | 61 (2.3) | 25 (1.3) | 6 (0.9) | 25 (31.6) | 5 (21.7) |
| Hypoxemica | 1686 (62.9) | 1236 (64.4) | 412 (62.6) | 28 (35.4) | 10 (43.5) |
| Non-hypoxemic | 933 (34.8) | 659 (34.3) | 240 (36.5) | 26 (32.9) | 8 (34.8) |

aHypoxemic ARF was defined by PF ratio below 300 on the day of ARF onset

**Table S3** Multivariable analyses examining factors associated with in-hospital mortality by acute kidney injury and acute respiratory failure pattern

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **No AKI/ARF** | **AKI alone** | **ARF alone** | **AKI first** | **ARF first** | **Concurrent AKI-ARF** |
| **Variables** | **Adjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** |
| Age, 10 years | 1.34 (1.05-1.72) | 0.019 | 1.02 (0.82-1.27) | 0.857 | 0.99 (0.9-1.08) | 0.771 | #N/A | #N/A | 0.91 (0.8-1.03) | 0.119 | 0.81 (0.5-1.31) | 0.392 |
| Hospital type |  |  |  |  |  |  |  |  |  |  |  |  |
| Provincial hospital | Reference |  | Reference |  | Reference |  | Reference |  | Reference |  | Reference |  |
| Regional hospital | #NUM! | 0.997 | 0.79 (0.12-5.37) | 0.809 | 0.92 (0.29-2.89) | 0.889 | #N/A | #N/A | 1.03 (0.39-2.74) | 0.95 | #N/A | #N/A |
| University hospital | #NUM! | 0.997 | 2.94 (0.51-16.92) | 0.227 | 1.46 (0.52-4.08) | 0.468 | #N/A | #N/A | 1.16 (0.47-2.86) | 0.755 | #N/A | #N/A |
| ICU type |  |  |  |  |  |  |  |  |  |  |  |  |
| Surgical ICU | Reference |  | Reference |  | Reference |  | Reference |  | Reference |  |  |  |
| Mixed ICU | 2.05 (0.07-60.77) | 0.679 | 5.04 (0.32-78.65) | 0.249 | 10.05 (1.41-71.45) | 0.021 | #N/A | #N/A | 16.86 (1.2-237.15) | 0.036 | #N/A | #N/A |
| Medical ICU | 0.54 (0.02-17.22) | 0.728 | 4.06 (0.27-60.96) | 0.311 | 6.72 (1.02-44.3) | 0.048 | #N/A | #N/A | 9.22 (0.69-123.33) | 0.093 | #N/A | #N/A |
| Government | 1.24 (0.64-2.4) | 0.528 | 0.91 (0.44-1.87) | 0.797 | 1.15 (0.8-1.65) | 0.447 | 0.37 (0.01-11) | 0.566 | 1.2 (0.75-1.94) | 0.448 | #N/A | #N/A |
| Self pay | 1 (0.18-5.69) | 0.999 | 1.17 (0.37-3.75) | 0.789 | 0.9 (0.48-1.67) | 0.732 | #NUM! | 0.999 | 0.5 (0.22-1.13) | 0.096 | #N/A | #N/A |
| BMI |  |  |  |  |  |  |  |  |  |  |  |  |
| Underweight | 1.31 (0.42-4.09) | 0.648 | 2.08 (0.75-5.76) | 0.158 | 1.12 (0.75-1.68) | 0.574 | 0.49 (0.02-12.21) | 0.663 | 1.6 (0.84-3.07) | 0.153 | #N/A | #N/A |
| Normal | Reference |  | Reference |  | Reference |  | Reference |  | Reference |  |  |  |
| Overweight | 1.07 (0.39-2.94) | 0.898 | 0.46 (0.18-1.16) | 0.101 | 0.96 (0.62-1.49) | 0.853 | 1.16 (0.04-33.18) | 0.932 | 0.92 (0.57-1.47) | 0.72 | #N/A | #N/A |
| Obese | 1.21 (0.12-12.14) | 0.87 | 0.59 (0.15-2.31) | 0.447 | 0.4 (0.16-1.05) | 0.062 | #NUM! | 0.999 | 0.91 (0.42-1.97) | 0.816 | #N/A | #N/A |
| Comorbidity |  |  |  |  |  |  |  |  |  |  |  |  |
| Hypertension | 0.94 (0.47-1.9) | 0.866 | 1.32 (0.66-2.63) | 0.431 | 0.9 (0.64-1.27) | 0.56 | #N/A | #N/A | 0.81 (0.52-1.25) | 0.333 | #N/A | #N/A |
| DM | 1.1 (0.54-2.24) | 0.787 | 1.12 (0.56-2.22) | 0.752 | 1.33 (0.91-1.94) | 0.143 | #N/A | #N/A | 1.73 (1.06-2.83) | 0.03 | 4.6 (0.24-89.87) | 0.314 |
| CKD | #NUM! | 0.997 | 1.15 (0.47-2.82) | 0.755 | 0.8 (0.36-1.81) | 0.599 | #N/A | #N/A | 0.58 (0.27-1.25) | 0.166 | #N/A | #N/A |
| CAD | 0.43 (0.12-1.53) | 0.191 | 1.66 (0.65-4.23) | 0.292 | 0.92 (0.53-1.58) | 0.75 | #N/A | #N/A | 1.09 (0.57-2.11) | 0.789 | #N/A | #N/A |
| CVD | 0.57 (0.06-5.69) | 0.628 | 0.55 (0.06-5.06) | 0.596 | 0.66 (0.34-1.27) | 0.213 | #N/A | #N/A | 0.61 (0.28-1.3) | 0.198 | #N/A | #N/A |
| Malignancy | 1.94 (0.54-6.93) | 0.307 | 4.52 (1.33-15.28) | 0.015 | 2.3 (1.19-4.43) | 0.013 | #N/A | #N/A | 1.65 (0.64-4.26) | 0.304 | #N/A | #N/A |
| Anemia | 1.31 (0.63-2.76) | 0.47 | 1.25 (0.61-2.57) | 0.535 | 1.13 (0.82-1.56) | 0.454 | #N/A | #N/A | 1.48 (0.96-2.28) | 0.079 | 0.64 (0.04-10.26) | 0.755 |
| Vasopressor | 1.14 (0.25-5.11) | 0.864 | 1.69 (0.76-3.79) | 0.201 | 3.56 (2.55-4.98) | 0 | 5.15 (0.18-149.54) | 0.341 | 3.52 (2.31-5.38) | 0 | 14.98 (0.85-264.34) | 0.065 |
| APACHE II | 1.14 (1.04-1.24) | 0.004 | 1.07 (1-1.15) | 0.046 | 1.1 (1.07-1.13) | 0 | #N/A | #N/A | 1.1 (1.06-1.14) | 0 | 0.98 (0.71-1.36) | 0.896 |
| Fluid overload | 0.9 (0.35-2.3) | 0.828 | 0.99 (0.44-2.22) | 0.975 | 1.48 (1.06-2.06) | 0.021 | #N/A | #N/A | 1.38 (0.9-2.11) | 0.137 | 0.6 (0.05-7.6) | 0.69 |

ICU, intensive care unit; BMI, body mass index; DM, diabetes mellitus; CKD, chronic kidney disease; CAD, coronary artery disease; CVD, cerebrovascular disease; APACHE, Acute Physiology and Chronic Health Evaluation.

**Table S4** Risk factors for acute respiratory failure after acute kidney injury

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Unadjusted OR (95% CI)** | **P-value** | **Adjusted OR (95% CI)** | **P-value** |
| Age, 10 years | 0.99 (0.87-1.13) | 0.90 | - | - |
| Female | 0.96 (0.6-1.55) | 0.88 | - | - |
| Hospital type |  |  |  |  |
| Provincial hospital | Reference |  | Reference |  |
| Regional hospital | 1.87 (0.78-4.82) | 0.17 | 0.38 (0.05-2.9) | 0.35 |
| University hospital | 3.46 (1.7-8.04) | 0.002 | 0.63 (0.09-4.3) | 0.64 |
| ICU type |  |  |  |  |
| Surgical ICU | Reference |  | Reference |  |
| Mixed ICU | 0.53 (0.23-1.32) | 0.14 | 0.23 (0.03-1.84) | 0.17 |
| Medical ICU | 0.37 (0.16-0.93) | 0.026 | 0.07 (0.01-0.5) | 0.009 |
| Reimbursement |  |  |  |  |
| UC, SS | Reference |  | Reference |  |
| Government | 0.88 (0.52-1.48) | 0.63 | 0.81 (0.3-2.21) | 0.69 |
| Self pay | 0.42 (0.2-0.82) | 0.016 | 0.55 (0.1-2.93) | 0.48 |
| BMI |  |  |  |  |
| Underweight | 1.46 (0.61-3.17) | 0.36 | 0.69 (0.1-4.92) | 0.71 |
| Normal | Reference |  | Reference |  |
| Overweight | 1.8 (1.04-3.07) | 0.033 | 2.27 (0.85-6.06) | 0.10 |
| Obese | 0.6 (0.14-1.75) | 0.41 | 0.41 (0.05-3.42) | 0.41 |
| Comorbidity |  |  |  |  |
| Hypertension | 1.05 (0.64-1.69) | 0.85 | - | - |
| DM | 1.8 (1.1-2.93) | 0.018 | 1.17 (0.44-3.12) | 0.76 |
| CKD | 0.74 (0.33-1.46) | 0.41 | - | - |
| CAD | 0.54 (0.18-1.26) | 0.20 | 0.68 (0.14-3.41) | 0.64 |
| CVD | 0.57 (0.09-1.97) | 0.45 | - | - |
| Malignancy | 1.61 (0.67-3.44) | 0.25 | - | - |
| Anemia | 1.47 (0.9-2.38) | 0.12 | 0.76 (0.28-2.1) | 0.60 |
| Vasopressor | 2.26 (1.41-3.68) | <0.001 | 2.3 (0.73-7.21) | 0.15 |
| APACHE II | 1.12 (1.07-1.17) | <0.001 | 1.06 (0.97-1.15) | 0.21 |
| Fluid overload | 4.69 (2.67-8.63) | <0.001 | 5.72 (2.11-15.54) | 0.001 |
| AKI stage 3 at diagnosis | 1.92 (1.19-3.13) | 0.008 | 1.5 (0.72-3.12) | 0.27 |
| AKI max stage 3 | 1.46 (1.18-1.86) | <0.001 | 1.93 (1.09-3.41) | 0.023 |
| Max BUN (mg/dL), increase by 10 | 1.04 (1.01-1.06) | 0.004 | 1.08 (0.99-1.18) | 0.08 |
| Renal recovery | 0.35 (0.15-0.7) | 0.006 | 0.08 (0.01-0.41) | 0.003 |

AKI alone and AKI first were compared to explore the risk factors of ARF after AKI

ICU, intensive care unit; UC, universal coverage; SS, social security; BMI, body mass index; DM, diabetes mellitus; CKD, chronic kidney disease; CAD, coronary artery disease; CVD, cerebrovascular disease; APACHE, Acute Physiology and Chronic Health Evaluation; AKI, acute kidney injury; BUN, blood urea nitrogen.

**Table S5** Risk factors for acute kidney injury after acute respiratory failure

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Unadjusted OR (95% CI)** | **P-value** | **Adjusted OR** **(95% CI)** | **P-value** |
| Age, 10 years | 1.13 (1.08-1.19) | <0.001 | 1.03 (0.96-1.11) | 0.40 |
| Female | 1.26 (1.04-1.52) | 0.018 | 1.14 (0.9-1.44) | 0.28 |
| Hospital type |  |  |  |  |
| Provincial hospital | Reference |  | Reference |  |
| Regional hospital | 1.01 (0.76-1.34) | 0.95 | - | - |
| University hospital | 0.99 (0.77-1.3) | 0.97 | - | - |
| ICU type |  |  |  |  |
| Surgical ICU | Reference |  | Reference |  |
| Mixed ICU | 3.72 (2.04-7.51) | <0.001 | 5.65 (1.42-22.46) | 0.014 |
| Medical ICU | 6.24 (3.49-12.4) | <0.001 | 4.91 (1.3-18.52) | 0.019 |
| Reimbursement |  |  |  |  |
| UC, SS | Reference |  | Reference |  |
| Government | 1.3 (1.04-1.62) | 0.023 | 1.08 (0.81-1.45) | 0.60 |
| Self pay | 0.58 (0.43-0.77) | <0.001 | 0.67 (0.4-1.13) | 0.13 |
| BMI |  |  |  |  |
| Underweight | 0.78 (0.58-1.05) | 0.10 | 0.63 (0.44-0.89) | 0.01 |
| Normal | Reference |  | Reference |  |
| Overweight | 1.85 (1.46-2.35) | <0.001 | 2.08 (1.53-2.81) | <0.001 |
| Obese | 1.69 (1.12-2.53) | 0.011 | 1.94 (1.18-3.21) | 0.009 |
| Comorbidity |  |  |  |  |
| Hypertension | 1.3 (1.07-1.57) | 0.007 | 1.14 (0.87-1.49) | 0.35 |
| DM | 1.47 (1.17-1.84) | <0.001 | 1.01 (0.75-1.36) | 0.95 |
| CKD | 1.81 (1.2-2.7) | 0.004 | 1.51 (0.91-2.52) | 0.11 |
| CAD | 1.35 (0.98-1.87) | 0.07 | 1.04 (0.69-1.55) | 0.86 |
| CVD | 1.36 (0.92-1.99) | 0.11 | 0.96 (0.59-1.55) | 0.85 |
| Malignancy | 1.21 (0.87-1.66) | 0.254 | - | - |
| Anemia | 1.61 (1.31-1.96) | <0.001 | 1.08 (0.82-1.4) | 0.59 |
| PF ratio, decrease by 100 | 1.06 (0.98-1.14) | 0.13 | 1.01 (0.91-1.12) | 0.92 |
| Vasopressor | 2.46 (2.04-2.98) | <0.001 | 2.78 (2.15-3.59) | <0.001 |
| APACHE II | 1.09 (1.08-1.11) | <0.001 | 1.06 (1.04-1.08) | <0.001 |
| Fluid overload | 3.26 (2.63-4.07) | <0.001 | 4.01 (3.04-5.29) | <0.001 |

ARF alone versus ARF first were compared to explore the risk factors of AKI after ARF

ICU, intensive care unit; UC, universal coverage; SS, social security; BMI, body mass index; DM, diabetes mellitus; CKD, chronic kidney disease; CAD, coronary artery disease; CVD, cerebrovascular disease; PF ratio, PaO2/FiO2 ratio; APACHE, Acute Physiology and Chronic Health Evaluation.