**Data checking:**

|  |  |  |  |
| --- | --- | --- | --- |
| age | gender | weight | height |
| Min. : 17.00 | F:7009 | Min. : 1.00 | Min. :101.6 |
| 1st Qu.: 55.84 | M:7935 | 1st Qu.: 64.20 | 1st Qu.:160.0 |
| Median : 68.77 |  | Median : 77.00 | Median :168.0 |
| Mean : 81.09 |  | Mean : 80.66 | Mean :168.6 |
| 3rd Qu.: 79.95 |  | 3rd Qu.: 92.00 | 3rd Qu.:177.8 |
| Max. :310.28 |  | Max. :472.00 | Max. :431.8 |
|  |  | NA's :1388 | NA's :4713 |

|  |  |  |
| --- | --- | --- |
| ethnicity | admission\_type | los\_hospital |
| WHITE :10742 | ELECTIVE : 822 | Min. : -7.733 |
| BLACK/AFRICAN AMERICAN: 1436 | EMERGENCY:13751 | 1st Qu.: 151.571 |
| UNKNOWN/NOT SPECIFIED : 1002 | URGENT : 371 | Median : 268.442 |
| HISPANIC OR LATINO : 340 |  | Mean : 372.073 |
| OTHER : 301 |  | 3rd Qu.: 477.538 |
| UNABLE TO OBTAIN : 265 |  | Max. :7071.850 |
| (Other) : 858 |  |  |

|  |  |  |
| --- | --- | --- |
| first\_hosp\_stay | hospital\_expire\_flag | los\_icu |
| N: 4353 | Min. :0.0000 | Min. : 3.151 |
| Y:10591 | 1st Qu.:0.0000 | 1st Qu.: 46.403 |
|  | Median :0.0000 | Median : 93.671 |
|  | Mean :0.2133 | Mean : 172.135 |
|  | 3rd Qu.:0.0000 | 3rd Qu.: 213.558 |
|  | Max. :1.0000 | Max. :3694.271 |

|  |  |  |
| --- | --- | --- |
| first\_careunit | last\_careunit | Ventilationduration\_hours |
| CCU :1885 | CCU :1750 | Min. : 0.00 |
| CSRU :1109 | CSRU :1082 | 1st Qu.: 36.34 |
| MICU :8417 | MICU :8563 | Median : 84.78 |
| SICU :2137 | SICU :2271 | Mean : 160.75 |
| TSICU:1396 | TSICU:1278 | 3rd Qu.: 203.00 |
|  |  | Max. :3567.77 |
|  |  | NA's :654 |

**GCS scores**

|  |  |  |  |
| --- | --- | --- | --- |
| gcseyes | gcsmotor | gcsverbal | mingcs |
| Min. :1.000 | Min. :1.000 | Min. :0.000 | Min. : 3.00 |
| 1st Qu.:2.000 | 1st Qu.:5.000 | 1st Qu.:0.000 | 1st Qu.:14.00 |
| Median :3.000 | Median :6.000 | Median :4.000 | Median :15.00 |
| Mean :3.001 | Mean :5.094 | Mean :2.674 | Mean :13.51 |
| 3rd Qu.:4.000 | 3rd Qu.:6.000 | 3rd Qu.:5.000 | 3rd Qu.:15.00 |
| Max. :4.000 | Max. :6.000 | Max. :5.000 | Max. :15.00 |
| NA's :194 | NA's :258 | NA's :244 | NA's :174 |
|  |  |  |  |

**Angus definitions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| infection | explicit\_sepsis | organ\_dysfunction | mech\_vent | angus |
| Min. :0.000 | Min. :0.0000 | Min. :0.0000 | Min. :0.0000 | Min. :1 |
| 1st Qu.:1.000 | 1st Qu.:0.0000 | 1st Qu.:1.0000 | 1st Qu.:0.0000 | 1st Qu.:1 |
| Median :1.000 | Median :0.0000 | Median :1.0000 | Median :1.0000 | Median :1 |
| Mean :0.999 | Mean :0.2724 | Mean :0.8063 | Mean :0.5331 | Mean :1 |
| 3rd Qu.:1.000 | 3rd Qu.:1.0000 | 3rd Qu.:1.0000 | 3rd Qu.:1.0000 | 3rd Qu.:1 |
| Max. :1.000 | Max. :1.0000 | Max. :1.0000 | Max. :1.0000 | Max. :1 |

**Fluid balance**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| fb3hr | fb12hr | fb24hr | fb48hr | fb72hr |
| Min. :-27206.08 | Min. :-80501.49 | Min. :-167220.1 | Min. :-4552814 | Min. :-4551845 |
| 1st Qu.: -65.07 | 1st Qu.: -84.43 | 1st Qu.: -302.4 | 1st Qu.: -1480 | 1st Qu.: -3304 |
| Median : 195.19 | Median : 1425.22 | Median : 2085.3 | Median : 2384 | Median : 1897 |
| Mean : 1174.08 | Mean : 2414.00 | Mean : 2976.5 | Mean : 2448 | Mean : 1279 |
| 3rd Qu.: 1743.77 | 3rd Qu.: 4175.59 | 3rd Qu.: 5569.4 | 3rd Qu.: 6975 | 3rd Qu.: 7570 |
| Max. : 50870.87 | Max. : 57843.23 | Max. : 180635.8 | Max. : 309210 | Max. : 560730 |
| NA's :340 | NA's :340 | NA's :340 | NA's :340 | NA's :340 |

**Lab tests**

|  |  |  |  |
| --- | --- | --- | --- |
| lactate | lactate\_uom | hemoglobin | hemoglobin\_uom |
| Min. : 0.100 | : 1 | Min. : 0.00 | : 1 |
| 1st Qu.: 1.300 | mmol/L:13226 | 1st Qu.: 9.80 | g/dL:14922 |
| Median : 1.900 | NA's : 1717 | Median :11.30 | NA's: 21 |
| Mean : 2.543 |  | Mean :11.36 |  |
| 3rd Qu.: 3.000 |  | 3rd Qu.:12.90 |  |
| Max. :27.100 |  | Max. :21.70 |  |
| NA's :1723 |  | NA's :25 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| creatinine | creatinine\_uom | wbc | wbc\_uom |
| Min. : 0.000 | : 1 | Min. : 0.00 | : 1 |
| 1st Qu.: 0.900 | mg/dL:14921 | 1st Qu.: 7.70 | K/uL:14921 |
| Median : 1.300 | NA's : 22 | Median : 11.20 | NA's: 22 |
| Mean : 1.889 |  | Mean : 13.09 | |
| 3rd Qu.: 2.100 |  | 3rd Qu.: 15.90 | |
| Max. :808.000 |  | Max. :846.70 | |
| NA's :22 |  | NA's :25 |  |

|  |  |
| --- | --- |
| neutrophils | neutrophils\_uom |
| Min. : 0.00 | : 1 |
| 1st Qu.:73.00 | % :13868 |
| Median :81.80 | NA's: 1075 |
| Mean :77.92 |  |
| 3rd Qu.:88.10 |  |
| Max. :99.00 |  |

**Chartevents**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| temp\_uom | temp\_value(?C) | temp\_value(?F) | temp\_value(Deg.C) | temp\_value(Deg.F) |  |
| : 38 | Min. : 31.10 | Min. : 0 | Min. : 0 | Min. : 0 |  |
| ?C : 229 | 1st Qu.: 34.70 | 1st Qu.: 97.00 | 1st Qu.: 36.06 | 1st Qu.: 96.85 |  |
| ?F : 6876 | Median : 35.90 | Median : 98.00 | Median : 36.72 | Median : 97.90 |  |
| Deg. C:7646 | Mean : 36.83 | Mean : 97.83 | Mean : 36.67 | Mean : 93.10 |  |
| Deg. F :126 | 3rd Qu.: 36.80 | 3rd Qu.: 99.10 | 3rd Qu.: 37.44 | 3rd Qu.: 99.25 |  |
| NA's : 116 | Max. : 99.40 | Max. : 105.80 | Max. : 40.83 | Max. : 102.30 |  |
|  |  |  | NA's : 84 | NA's : 23 |  |
|  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| resp\_rate | resp\_rate\_uom | heart\_rate | heart\_rate\_uom |
| Min. : 0.00 | BPM :7815 | Min. : 0.00 | bpm :7115 |
| 1st Qu.: 16.00 | insp/min:7115 | 1st Qu.: 78.00 | BPM :7818 |
| Median : 19.00 | NA's : 101 | Median : 91.00 | NA's: 98 |
| Mean : 20.15 |  | Mean : 93.03 |  |
| 3rd Qu.: 24.00 |  | 3rd Qu.:107.00 |  |
| Max. :100.00 |  | Max. :941.00 |  |
| NA's :187 |  | NA's :189 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| sys\_bp | sys\_bp\_uom | dias\_bp | dias\_bp\_uom | mean\_bp | mean\_bp\_uom |
| Min. : -5.0 | : 359 | Min. : -12.00 | mmHg:8375 | Min. :-38.00 | : 365 |
| 1st Qu.: 98.0 | mmHg:8350 | 1st Qu.: 49.00 | NA's:6656 | 1st Qu.: 65.00 | mmHg:8393 |
| Median :116.0 | NA's:6322 | Median : 59.00 | | Median : 78.00 | NA's:6273 |
| Mean :115.4 |  | Mean : 69.91 | | Mean : 80.14 |  |
| 3rd Qu.:137.0 |  | 3rd Qu.: 69.00 | | 3rd Qu.: 92.00 |  |
| Max. :268.0 |  | Max. :100105.01 | | Max. :361.00 |  |
| NA's :6780 |  | NA's :6678 |  | NA's :6708 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| spo2 | spo2\_uom | fio2 | fio2\_uom |
| Min. : 0.00 | % :14925 | Min. : 0.00 | : 4763 |
| 1st Qu.: 95.00 | NA's: 106 | 1st Qu.: 50.00 | NA's:10268 |
| Median : 98.00 |  | Median : 60.00 |  |
| Mean : 96.61 |  | Mean : 72.06 |  |
| 3rd Qu.:100.00 |  | 3rd Qu.: 100.00 |  |
| Max. :100.00 |  | Max. :1001.00 |  |
| NA's :266 |  | NA's :10268 |  |

**Preliminary findings:**

**Table 1: Number of patients with sepsis**

|  |  |
| --- | --- |
|  | N (%) |
| Total number of adult patients with index ICU LOS > 3 hrs | 38456 |
| Sepsis\* | 12431 (32.3%) |

**Table 3: Number of patient admissions with sepsis**

|  |  |
| --- | --- |
|  | N (%) |
| Total number of adult admissionwith index icu LOS > 3 hrs | 49191 |
| Sepsis\* | 14944 (30.4%) |

\*Defined using Angus’s criteria

**Table 3: Admissions’ characteristics with respect to hospital mortality status**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Alive  N(11756) | Death  N(3188) | Effect size | P-value |
|  |  |  |  |  |
| Gender n(%) |  |  |  | 0.034 |
| Female | 5567 ( 47.4 ) | 1442 ( 45.2 ) |  |  |
| Male | 6189 ( 52.6 ) | 1746 ( 54.8 ) | 1.09 (1.01,1.18) |  |
| Ethnicity |  |  |  | < 0.001 |
| White | 8595 ( 72.9 ) | 2310 ( 71.5 ) |  |  |
| Black | 1270 ( 10.8 ) | 251 ( 7.8 ) |  |  |
| Asian | 302 ( 2.6 ) | 73 ( 2.3 ) |  |  |
| Hispanic | 381 ( 3.2 ) | 69 ( 2.1 ) |  |  |
| Others | 1250 ( 10.6 ) | 530 ( 16.4 ) |  |  |
| Admission Type n(%) |  |  |  | < 0.001 |
| Elective | 721 ( 6.1 ) | 101 ( 3.2 ) |  |  |
| Emergency | 10747 ( 91.4 ) | 3004 ( 94.2 ) |  |  |
| Urgent | 288 ( 2.4 ) | 83 ( 2.6 ) |  |  |
|  |  |  |  |  |
| Age | 79 ( 59.2 ) | 88.7 ( 67.2 ) |  | < 0.001 |
| Weight | 81.4 ( 25.2 ) | 78.1 ( 24 ) |  | < 0.001 |
| Height | 168.7 ( 11.9 ) | 168.3 ( 11.1 ) |  | 0.14 |
| Hospital LOS (hrs); Median (IQR) | 282.8  ( 164.8 , 486.6 ) | 225.8  ( 98.7 , 428.7 ) |  | < 0.001 |
| ICU LOS (hrs); Median (IQR) | 90.4  ( 46.2 , 201.8 ) | 114.4  ( 47.2 , 254 ) |  | < 0.001 |
| Ventilation duration (hrs); Median (IQR) | 81.1  ( 36 , 192.8 ) | 102  ( 37 , 237 ) |  | < 0.001 |
| GCS Eyes | 3.1 ( 1.1 ) | 2.7 ( 1.2 ) |  | < 0.001 |
| GCS Motor | 5.2 ( 1.4 ) | 4.6 ( 1.9 ) |  | < 0.001 |
| GCS Verbal | 2.8 ( 2.2 ) | 2.2 ( 2.2 ) |  | < 0.001 |
| Min GCS | 13.6 ( 2.6 ) | 13 ( 3.4 ) |  | < 0.001 |
| Lab tests |  |  |  |  |
| Lactate | 2.3 ( 1.8 ) | 3.3 ( 2.9 ) |  | < 0.001 |
| Hemoglobin | 11.4 ( 2.3 ) | 11.1 ( 2.2 ) |  | < 0.001 |
| Creatinine | 1.8 ( 1.8 ) | 2.2 ( 14.4 ) |  | 0.11 |
| WBC | 12.8 ( 10.2 ) | 14.3 ( 20.3 ) |  | < 0.001 |
| Neutrophils | 78.3 ( 14.5 ) | 76.7 ( 19 ) |  | < 0.001 |
| Vital signs |  |  |  |  |
| temperature | 36.7 ( 2.4 ) | 36.3 ( 3.3 ) |  | < 0.001 |
| respiratory rate | 19.8 ( 6.7 ) | 21.5 ( 7.3 ) |  | < 0.001 |
| heart rate | 92.2 ( 21.9 ) | 96.1 ( 22.3 ) |  | < 0.001 |
| systolic BP | 118.2 ( 37 ) | 107.5 ( 41.1 ) |  | < 0.001 |
| diastolic BP | 59.2 ( 19.1 ) | 99.3 ( 2120.7 ) |  | < 0.001 |
| mean BP | 81.2 ( 40 ) | 77.2 ( 45.1 ) |  | < 0.001 |
| SpO2 | 96.9 ( 5.2 ) | 95.7 ( 6.9 ) |  | < 0.001 |
| FiO2 | 71.1 ( 34.6 ) | 75.4 ( 38.6 ) |  | < 0.001 |
| Net fluid balance; Median (IQR) |  |  |  | < 0.001 |
| 3 hr | 168.9  ( -86.5 , 1728.2 ) | 318.4  ( -6.7 , 1812 ) |  | < 0.001 |
| 12 hr | 1326.4  ( -173.8 , 3992.3 ) | 1788.3  ( 185.2 , 4967.9 ) |  | < 0.001 |
| 24 hr | 1866  ( -512.3 , 5181.7 ) | 2926.2  ( 481.8 , 7220.6 ) |  | < 0.001 |
| 48 hr | 1880.5  ( -1897.5 , 6275.5 ) | 4272  ( 443.9 , 9682.2 ) |  | < 0.001 |
| 72 hr | 1136.1  ( -4085.5 , 6587 ) | 4838.3  ( -88.5 , 11564.1 ) |  | < 0.001 |

**Ethnicity (If have time, classify )**

|  |  |
| --- | --- |
| White | WHITE |
|  | WHITE - BRAZILIAN |
|  | WHITE - EASTERN EUROPEAN |
|  | WHITE - OTHER EUROPEAN |
|  | WHITE - RUSSIAN |
| Black | BLACK/AFRICAN |
|  | BLACK/AFRICAN AMERICAN |
|  | BLACK/CAPE VERDEAN |
|  | BLACK/HAITIAN |
| Asian | ASIAN |
|  | ASIAN - ASIAN INDIAN |
|  | ASIAN - CAMBODIAN |
|  | ASIAN - CHINESE |
|  | ASIAN - FILIPINO |
|  | ASIAN - JAPANESE |
|  | ASIAN - KOREAN |
|  | ASIAN - OTHER |
|  | ASIAN - VIETNAMESE |
| Hispanic | HISPANIC OR LATINO |
|  | HISPANIC/LATINO - CENTRAL AMERICAN (OTHER) |
|  | HISPANIC/LATINO - COLOMBIAN |
|  | HISPANIC/LATINO - CUBAN |
|  | HISPANIC/LATINO - DOMINICAN |
|  | HISPANIC/LATINO - GUATEMALAN |
|  | HISPANIC/LATINO - HONDURAN |
|  | HISPANIC/LATINO - MEXICAN |
|  | HISPANIC/LATINO - PUERTO RICAN |
|  | HISPANIC/LATINO - SALVADORAN |
| Others | MIDDLE EASTERN |
|  | CARIBBEAN ISLAND |
|  | NATIVE HAWAIIAN OR OTHER PACIFIC ISLANDER |
|  | PORTUGUESE |
|  | SOUTH AMERICAN |
|  | PATIENT DECLINED TO ANSWER |
|  | OTHER |
|  | UNABLE TO OBTAIN |
|  | UNKNOWN/NOT SPECIFIED |
|  | MULTI RACE ETHNICITY |

**Fluid balance table algorithm:**

1. Convert L to mL.
2. Adjust timing with respect to admission time
3. For input, attribute the volume hourly, Fluid input record A starting at time t1 and end at time t2. Have the following situations, examples:
   1. 3.5hr to 4.7hr: 3.5 to 4 contribute to fb at 4hrs; 4-4.7 contribute to fb at 5hrs. Uniformly. For this case, if starting time is 3hr, then 3 to 4 will still contribute to fb at 4hrs but no contribution to fb at 3 hrs.
   2. 3.5hr to 3.7hr: 3.5 to 3.7 contribute to fb at 4hrs
4. For output, attribute the volume hourly, fluid output record B at time t3
   1. 3.4hr, all volume will be calculated towards fb at 4hrs.
5. Then with that, we could calculate each hourly input and output, and hourly net fluid balance.

**Issues:**1. ICUSTAY recorded in both **CareVue and MetaVison**, affecting input and output values. (136 ICUSTAYs)

2. Chart events extraction codes confirmation

3. Source of infection, there are 14k diagnosis. Might be good if there are some terms that can be used for extraction.

4. Data extraction for APACHE IV score

5. Data extraction for dialysis during ICU stay

6. Data extraction for ICU type: first care unit, last care unit

7. Data extraction for fluid balance tables.

8. Data extraction for Comorbidities

|  |  |
| --- | --- |
| diabetes mellitus (DM) | icd9\_code(7751, V180, 250%, 249%); 7751 for neonatal diabetes mellitus(not include only 1 case);V180 family history of diabetes mellitus |
| Hypertension (HTN) | icd9\_code(401%, 405%) |
| Ischemic heart disease (IHD) | icd9\_code(410-414) |
| Recent Myocardial Infarction | icd9\_code(410); acute myocardial infrction'; icd9\_code(412); old myocardial infrction' |
| Chronic kidney disease (CKD) | icd9\_code(585%) |
| Chronic liver disease (CLD) | icd9\_code(571%) |
| Cancer | 140.0 – 209 |
| Immunosuppression | icd9\_code(9631); 9631 immunosuppresive drugs(only 2 cases) |
| Chronic obstructive pulmonary disease (COPD) | 490-492, 494, 496 |
| AIDS | icd9\_code(042, 07953) |

9. Sepsis diagnosis based on admission diagnosis.

10. Data extraction for source of admission: admission\_location, not extracted yet, the following table is based on admission table.

|  |  |
| --- | --- |
| Admission\_Location | Freq |
| EMERGENCY ROOM ADMIT | 22754 |
| PHYS REFERRAL/NORMAL DELI | 15079 |
| CLINIC REFERRAL/PREMATURE | 12032 |
| TRANSFER FROM HOSP/EXTRAM | 8456 |
| TRANSFER FROM SKILLED NUR | 273 |
| \*\* INFO NOT AVAILABLE \*\* | 204 |
| HMO REFERRAL/SICK | 102 |
| TRANSFER FROM OTHER HEALT | 71 |
| TRSF WITHIN THIS FACILITY | 5 |