# Question

Among patients with sepsis who were not on dialysis prior to ICU admission, can we predict the need for renal replacement therapy at 24 hours after ICU admission?

Among patients with sepsis who were not on dialysis prior to ICU admission, can we predict the need for renal replacement therapy at time of onset of acute kidney injury?

Our Github link - <https://github.com/reneahlsdorf/sccm2020_datathon_team10> (we’ll have to convert our bigquery to .sql files and push it that way)

Datathon github link - <https://github.com/MIT-LCP/sccm-datathon>

## Context

-> when you start early, there’s a specific group of patients that seem to benefit from it

# Analysis

## Inclusion/Exclusion Criteria

Each hospital admission will be separate encounter and all icu’s in that hospitalization will count the ONCE.

Inclusion

* Patients with sepsis, not on dialysis prior to ICU
  + Specifically septic shock
  + On antibiotics for at least 48 hours while in the ICU
  + Vasopressors
    - Dopamine
    - Epinephrine
    - Norepinephrine
    - Phenylephrine
    - Vasopressin
* ICU admission
* Age >18 years
* ICU stay >48 hours
* KDIGO at least 1

Exclusion

* Patients with end stage renal disease
* Hemodialysis, Peritoneal dialysis
* People with acute kidney injury (per prior definition)
* People who received CRRT
  + When did it start
  + Duration

Features for building ML Model

Literature search + Delphi

Demographic

* Age - oasis (derived)
* Race - admissions
* Sex - patients
* BMI - heightfirstday(derived), heightweight(derived)
  + Weight
    - ICU Admit weight
    - Max weight
    - Weight gain (Max-Initial while in ICU)
* Admission weight height (derived)
* Mechanical ventilation -(oasis): mechvent, mechvent\_score

Clinical features on ICU admission

* Hospital Admission service - Services table
* Whether a surgical procedure was performed
* Days in hospital before ICU admission
* Number of ICU admissions per stay
* Which ICU
* Contrasted study performed?
  + Number of studies
  + Doses or cumulative dose of contrast administered
  + Exposure to IV contrast
    - 0
    - 1-2
    - > or equal to 3
* Use of noninvasive ventilation (BiPAP)
* Mechanically ventilated
* Respiratory rate
* Oxygen saturation
* FiO2%
* Positive End Expiratory Pressure
* PaO2/FiO2 ratio
* Temperature
* Heart rate
* Systolic blood pressure
* Diastolic blood pressure
* Urine Output (Oliguria)
* Rate of change in Urine output
* Volume of fluids/input administered during hospitalization
* Volume of fluids/input administered before initiation of CRRT
* Use of diuretics before initiation of CRRT
  + Furosemide
  + Bumetanide
  + Indapamide
  + Metolazone
  + Hydrochlorothiazide
  + Chlorothiazide
* Vasopressor use (initially as binary variable)
  + - Dopamine
    - Epinephrine
    - Norepinephrine
    - Vasopressin
    - Phenylephrine
  + Number of vasopressors
  + Vasopressor duration
  + Highest dose of vasopressors
* Antibiotic choice
  + when lower(drug) like '%' || lower('linezolid') || '%' then 1
  + when lower(drug) like '%' || lower('ceftriaxone') || '%' then 1
  + when lower(drug) like '%' || lower('daptomycin') || '%' then 1
  + when lower(drug) like '%' || lower('tigecycline') || '%' then 1
  + when lower(drug) like '%' || lower('meropenem') || '%' then 1
  + when lower(drug) like '%' || lower('imipenem') || '%' then 1
  + when lower(drug) like '%' || lower('linezolid') || '%' then 1
  + when lower(drug) like '%' || lower('sulbactam') || '%' then 1
  + when lower(drug) like '%' || lower('colistin') || '%' then 1
  + when lower(drug) like '%' || lower('acyclovir') || '%' then 1
  + when lower(drug) like '%' || lower('valacyclovir') || '%' then 1
  + when lower(drug) like '%' || lower('ganciclovir') || '%' then 1
  + when lower(drug) like '%' || lower('valganciclovir') || '%' then 1
  + when lower(drug) like '%' || lower('amphotericin') || '%' then 1
  + when lower(drug) like '%' || lower('fluconazole') || '%' then 1
  + when lower(drug) like '%' || lower('caspofungin') || '%' then 1
  + when lower(drug) like '%' || lower('voriconazole') || '%' then 1
  + Were vancomycin and piperacillin-tazobactam used at the same time? This combination was recently recognized as toxic to kidneys
* Timing of CRRT initiation in relation to ICU admission

Lab Values

* White blood cell count
* Hemoglobin/Hematocrit
* Platelets
* RDW
* pH--lowest
* PaO2
* Sodium
* Potassium
* Bicarbonate
  + Lowest bicarb
* Blood Urea Nitrogen
* Lactate
* Base Deficit
* Creatinine at ICU admission
  + Highest CR
* GFR at ICU admission
* GFR before ICU admission
* Rate of change in Creatinine before initiation of CRRT
* Positive blood cultures during ICU admission

Severity Scores on ICU admission

* SOFA
* Elixhauser Score: list all co-morbid conditions
* Apache (2 or 3)
* OASIS?
* SAPS 2

### SQL criteria (for data scientists to plan out where we’re grabbing data)

* Admissions table -
* CRRTDurations table (mimic Derived)
* Sepsis3 criteria? (Alistair’s repository for this)

Example query:

select \* from `physionet-data.mimiciii\_clinical.admissions` limit 10

#this statement above looks at the admissions table and grabs 10 records

# <https://console.cloud.google.com/bigquery?sq=228265716935:430c5d2e5928455a8d52a1b5da9b2db5>

Rrt sql <https://github.com/MIT-LCP/mimic-code/blob/master/concepts/rrt.sql>

<https://github.com/MIT-LCP/mimic-code/blob/master/concepts/durations/crrt-durations.sql>

first\_careunit (%)

CCU 511 (10.7)

CSRU 951 (20.0)

MICU 1993 (41.9)

SICU 771 (16.2)

TSICU 528 (11.1)

# 

# Resources

1. <https://github.com/alistairewj/sepsis3-mimic/tree/384198910524f9bfbaecf898982fc070b70e9bc2>
2. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0204586>

ELAIN:

Zarbock A et al. JAMA. 2016 May 24-31;315(20):2190-9. PMID #: 27209269​

AKIKI:

Gaudry et al. NEJM. 2016 Jul 14;375(2):122-33. PMID #: 27181456​

IDEAL-ICU:

Barbar et al. NEJM. 2018;379(15):1431-42. PMID #: 30304656​

Sub Questions

1. Do we have a lot of pre-admission CRRT data in MIMIC? Maybe eICU might be more appropriate over here