Association of <u>IV Contrast</u> and <u>Renal Replacement Therapy</u> among Critically Ill Patients with Chronic Kidney Disease

Team – 'SCCM Fantastic Four'

Datathon, Chicago, 7/14/2024

DISCOVERY
The Critical Care Research Network

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Background

- Roughly 20% of critically ill patients require renal replacement therapy (RRT)

- Critically ill patients often have multiple comorbidities and require imaging studies utilizing intravenous (IV) contrast

- There is a rising incidence of critically ill patients with chronic kidney disease (CKD) receiving IV contrast in the ICU

- **Do critically ill patients with preexisting CKD who receive IV contrast have an increased incidence of RRT and mortality?**

- MIMIC IV Database- years 2008-2014
- Retrospective Cohort Study Design/ Prediction Modeling
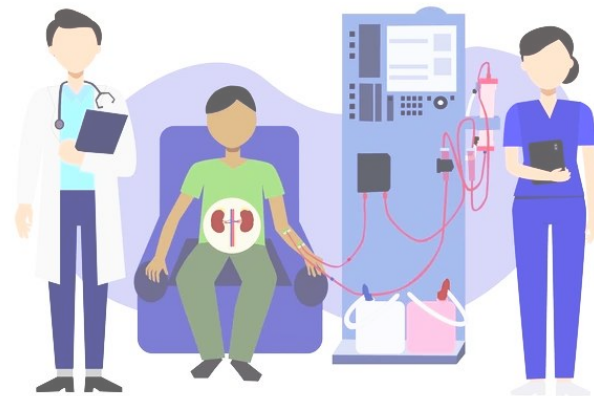- Processing- Github, Thankful to Jack, Ian, Leo, Mary

P- Critically ill patients with CKD (stage 1-4)

E- IV Contrast

**C- No IV Contrast**

O- Need for Dialysis- CRRT/RRT

Hypothesis: We hypothesized that critically ill patients with CKD(Stage 1-4) who received IV contrast will have higher need for Dialysis during ICU stay.
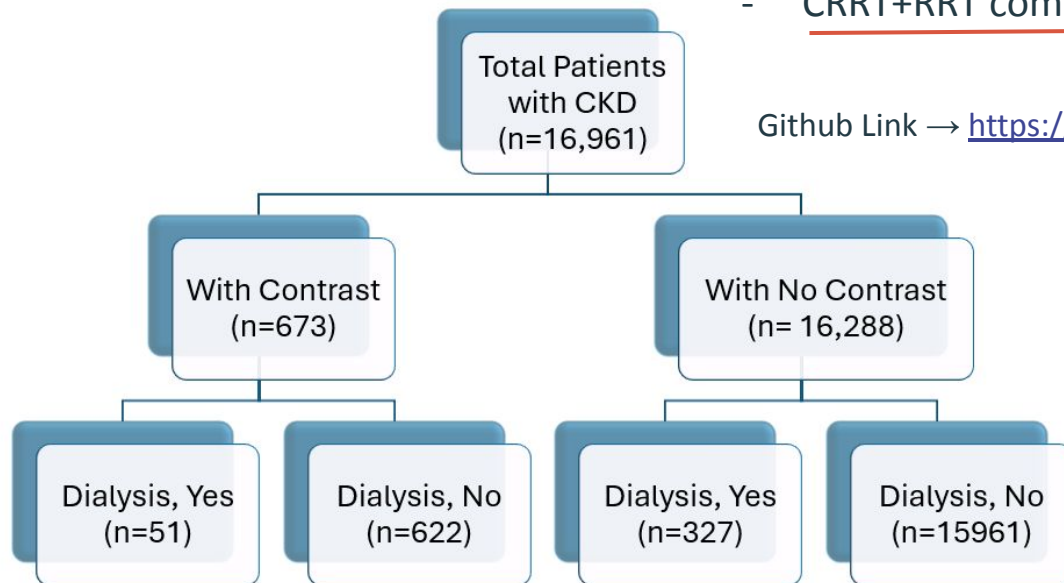
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METHODS

- Exclusions- Died in 24 hours; LOS <48 hours; Age<18
- Pivoting from ~~Trauma~~+CKD (only 200)
- Exposure- Contrast data- Radiology reports* (not the easiest) Journey of two patients → 650+
- CRRT+RRT comabied
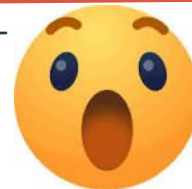
Github Link → https://github.com/SCCMdatathon2024/team_04

Novel -Approach- Method;
Hypothesis Generating

Figure 1. Flow Diagram of Study Participants with CKD and Association of Contrast and Need for Dialysis

Total Patients with CKD (n=16,961)
- With Contrast (n=673)
  - Dialysis, Yes (n=51)
  - Dialysis, No (n=622)
- With No Contrast (n= 16,288)
  - Dialysis, Yes (n=327)
  - Dialysis, No (n=15961)

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Results

Table 1. Demographics Univariate

Variables	Total patient, n = 16,961	With Contrast, (n = 673)	Without Contrast, n = 16,288	P-value
Age, Median (IQR)	74 (64-83)	73 (65-80)	74 (64-83)	0.028*
Gender Male, n (%)	9960 (58.7%)	382 (56.8%)	9578 (58.8%)	0.31
Race, N (%) White Black Asian Others	11987 (70.7%) 2522 (14.9%) 418 (2.5%) 2034 (12.0%)	447 (66.4%) 105 (15.6%) 32 (4.8%) 89 (13.2%)	11540 (70.8%) 2417 (14.8% 386 (2.4%) 1945 (11.9%)	0.0005*
Ethnicity, Hispanic, n (%)	532 (3.1%)	20 (3.0%)	512 (3.1%)	0.89

Table 2. Outcomes Univariate

|	With Contrast	Without Contrast	P-value
Charlson	8 (7, 10)	8 (6, 9)	0.002*
SOFA day-1	5 (3, 8)	5 (3, 7)	0.1223
ICU LOS- hours, Median (IQR)	209 (120-399)	129 (85-212)	<0.001*
Dialysis in ICU, N (%)	51 (7.6%)	327 (2.0%)	<0.001*
ICU Mortality	57 (8.5%)	659 (4.0%)	<0.001*

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Results..

Table 3. Multivariate analysis- Odds Ratio for Dialysis

	OR	95% CI	p-value
Age	0.96	0.95-0.97	<0.001
Female	0.94	0.75-1.18	0.61
Race- Other	1.57	1.21-2.01	0.005
Contrast	2.85	2.03-3.93	<0.001

Table 4. Multivariate analysis- Odds Ratio for ICU death

	OR	95% CI	p-value
Age	1.01	0.99-1.01	0.16
Female	0.97	0.81-1.15	0.73
Race- Other	1.65	1.35-2.02	<0.001*
Contrast	1.45	1.04-1.99	0.024*
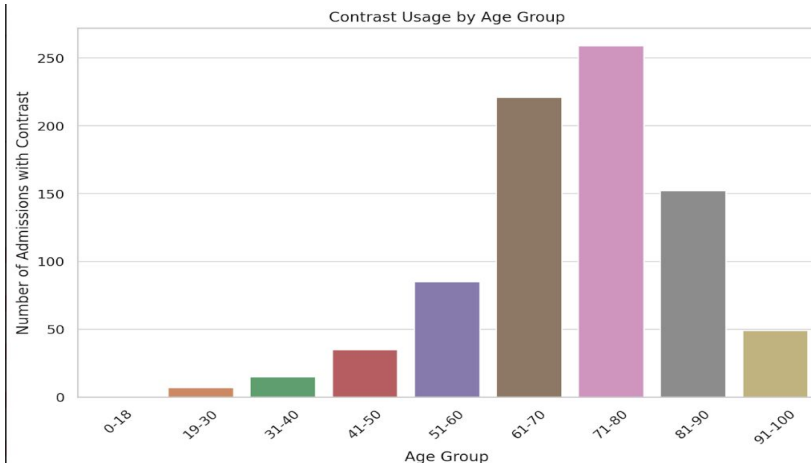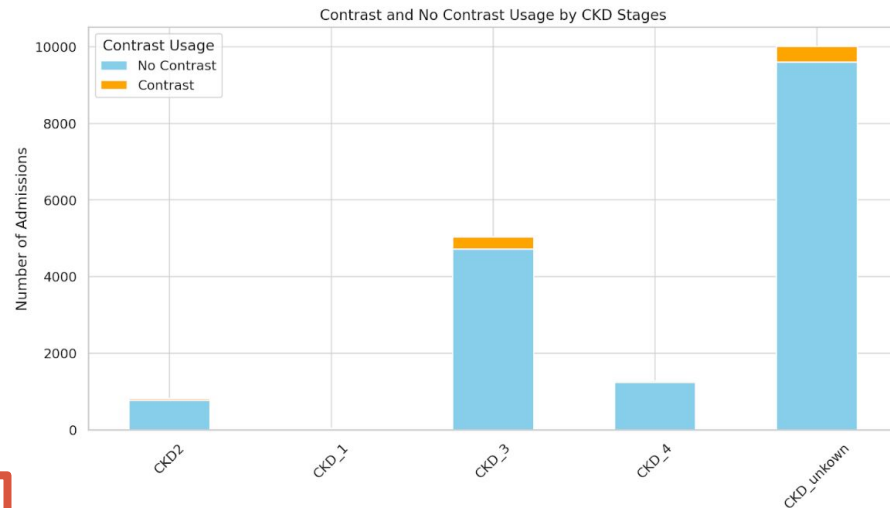
Conclusion/Discussion

In retrospective cohort study with univariate and multivariate analysis we found a significant association between IV contrast and need for dialysis in critically ill patients with CKD (stage 1-4)- **Novel**

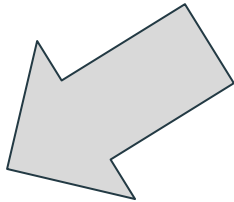## Risk of Acute Kidney Injury, Dialysis, and Mortality in Chronic Kidney Disease Patients following Intravenous Contrast Material Exposure

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Conclusion

Intravenous contrast material administration was not associated with an increased risk of AKI, emergent dialysis, and short-term mortality in a cohort of patients with diminished renal function.

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Discussion

Building Machine Learning Model, requires Internal/External validation- eICU data/CURE ID/Epic Cosmos

Next steps →

- Does the stage of pre-existing CKD affect outcome
- NLP methods to extract robust Contrast data
- Does the type of contrast used matter
- There is a dose response curve between the number of receiving IV contrast and need for RRT
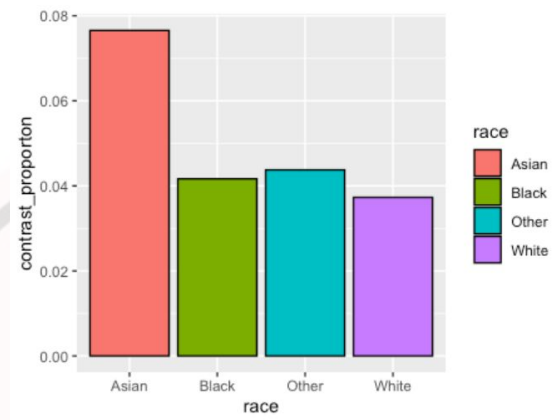

Figure: Proportion of Contrast per race

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