

Three Subgroups of COVID-19 Acute Lung Injury Identified by Latent Class Analysis

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INTRODUCTION

Background

Two acute respiratory distress syndrome (ARDS) subgroups with differential response to treatments have been consistently identified in ARDS trials, including both all cause ARDS and COVID ARDS.

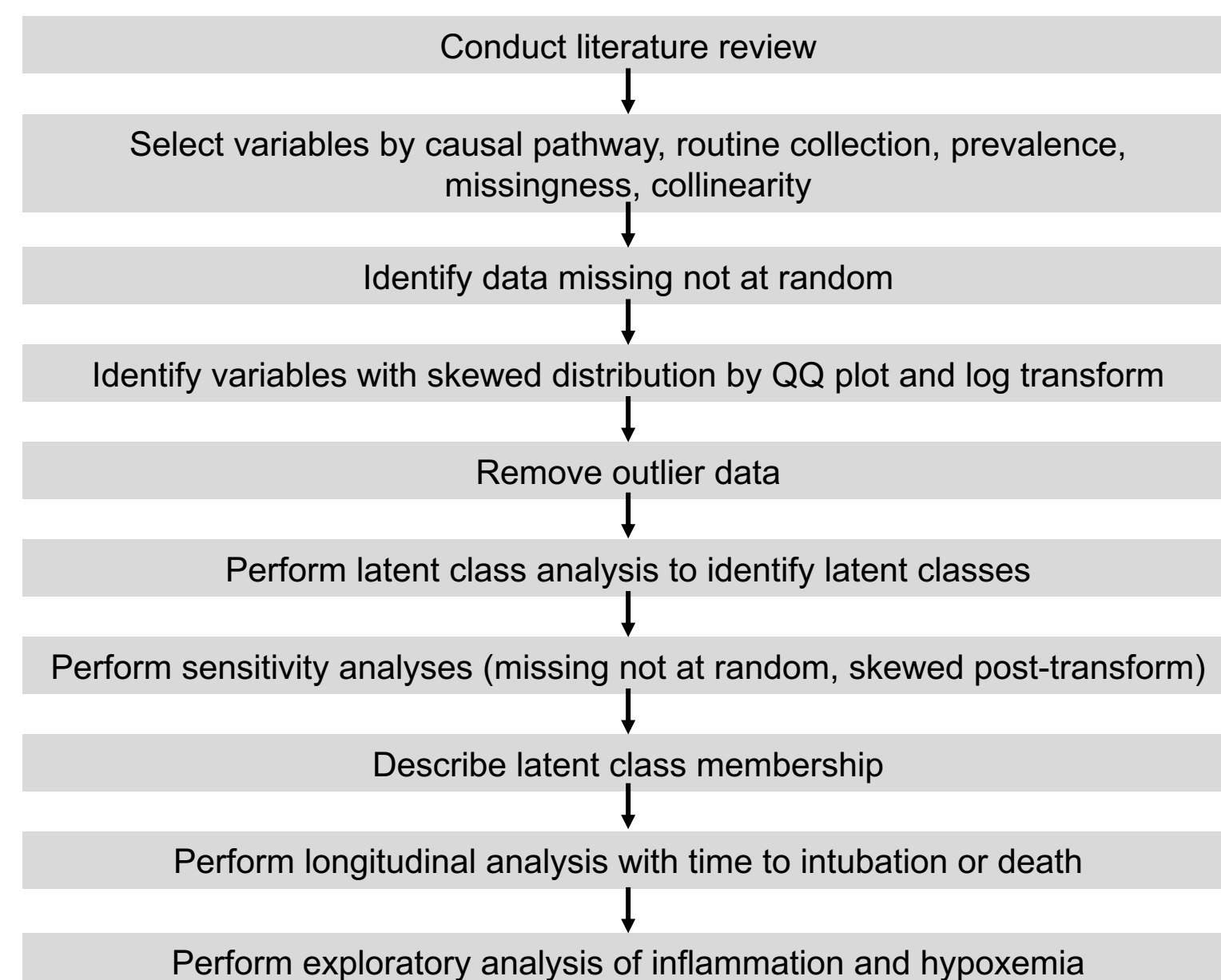
Identifying subgroups among non-mechanically ventilated patients with COVID-19 acute lung injury (ALI) may facilitate triage decisions and enrichment of clinical trials.^{1,2,3}

Hypothesis

There is more than 1 subtype of patients with COVID-19 ALI, including one characterized by “cytokine storm.”

METHODS

Single center retrospective cohort study of 1,339 adults admitted to Columbia University Irving Medical Center with COVID-19 ALI, defined as SpO₂ < 93% on room air and no mechanical ventilation or death within 24 hours of admission, between March and June 2020.



RESULTS

There are 3 subgroups in COVID ALI.

# of Classes*	Entropy	VLMR p-Value	Number of Individuals per Latent Class					
			1	2	3	4	5	6
2	0.82	<0.01	797	542				
3	0.82	<0.01	591	394	354			
4	0.85	0.11	566	387	352	34		
5	0.86	0.27	540	394	298	74	33	

*Average latent class membership probabilities > 0.9 for all classes in 2- and 3-class models.

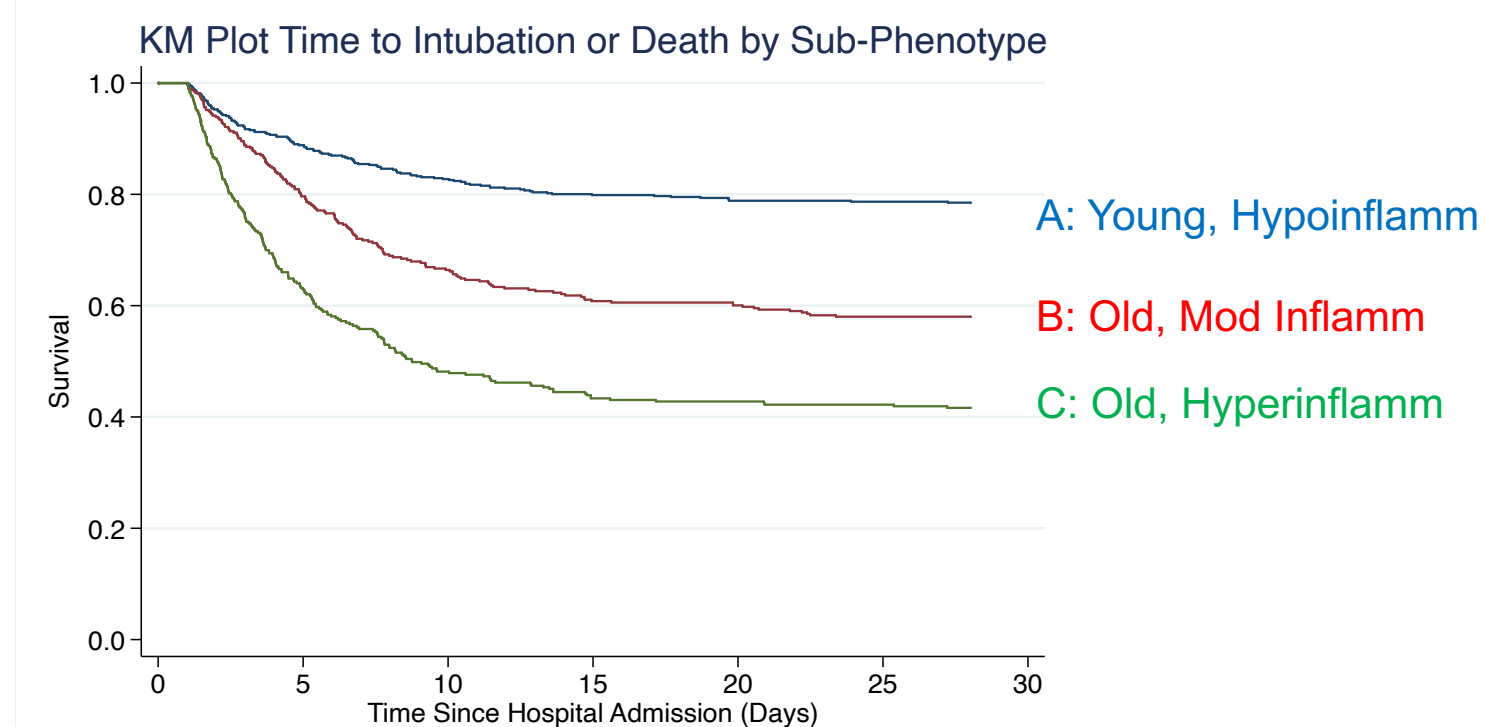
The above 3 subgroups differ in clinical and lab variables.

	TOTAL	Subgroup A	Subgroup B	Subgroup C	P-Value
Number of Patients	1339	591	394	354	
Age in years, median	70	59	79	76	<0.01
CKD*, %	20%	5%	36%	26%	<0.01
IL-6, median	51	34	55	96	<0.01
D-Dimer, median	1.5	1.0	1.6	4.6	<0.01
PaO ₂ /FiO ₂ , median	260	279	269	194	<0.01

*CKD is representative, all comorbidities followed a similar pattern.

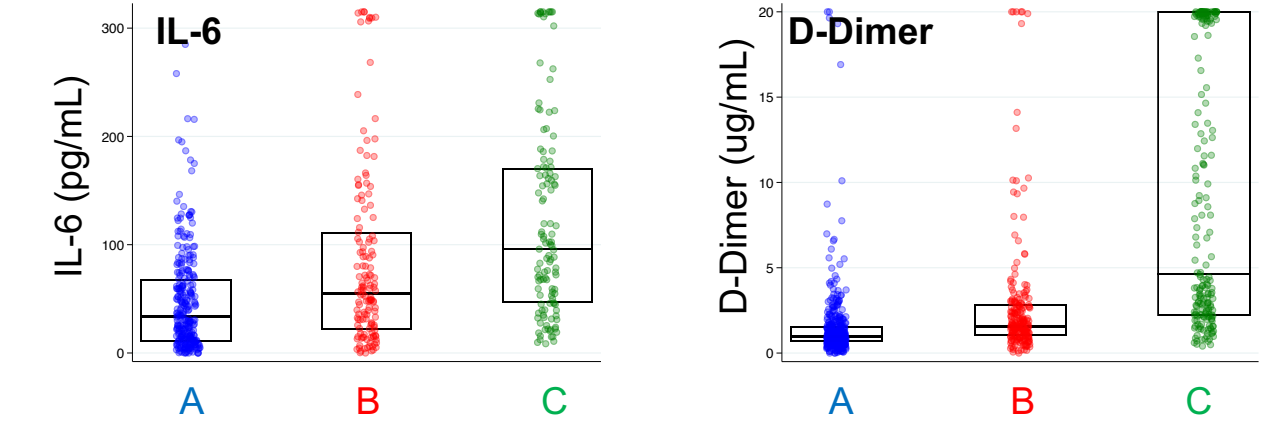
Younger Old Old
 Low Comorb High Comorb Mod Comorb
 Hypoinflamm Mod Inflamm Hyperinflamm
 Mild ARDS Mild ARDS Mod ARDS

The 3 subgroups differ in time to intubation or death.

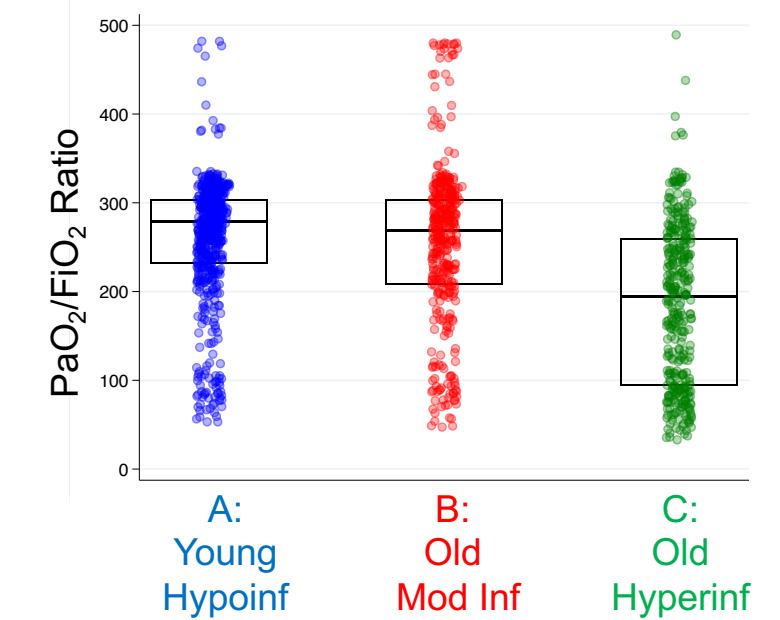


RESULTS

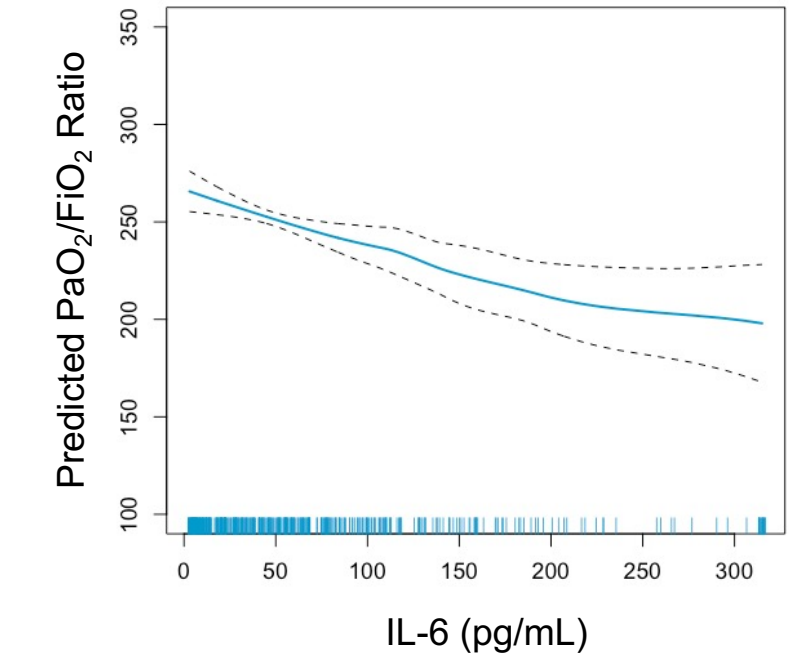
Inflammation increases across subgroups, with no evidence of clustered outliers in a “cytokine storm.”



Respiratory status worsens across subgroups.



Systemic inflammation is directly and linearly associated with severity of hypoxemia.



CONCLUSIONS

- We identified three distinct clinical subgroups of COVID ALI with increasingly worse outcomes.
- There is no evidence of a cytokine storm subgroup. Instead, systemic inflammation appears directly and linearly associated with severity of hypoxemia across COVID ALI subgroups.
- Identification of subgroups of patients not requiring mechanical ventilation on the first day of hospitalization can allow for risk stratification upon presentation.

REFERENCES

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