Supplementary Information

A Details of data pre-processing for labeling the complications

We used the KDIGO criteria to classify AKI encounters [1]. The definition has three components, and if any of them are satisfied, then the patient is assigned a diagnosis of AKI. The three criteria were either an increase in serum creatinine of 0.3 mg/dl within 48 hours, an increase of 1.5 times the baseline serum creatinine measurement, or urine output of less than 0.5 ml/kg/hr for 6 hours [1]. We only assessed the first two definitions, since urine output was not available in our dataset as it is usually measured in the intensive setting only. The patient's first record of serum creatinine was treated as the baseline for that patient. Patients with reported chronic kidney disease were excluded from the training and testing AKI subsets.

The Berlin definition was employed to identify the timing and incidence of ARDS [2]. The full ARDS labeling process is illustrated by the flow diagram in Figure S1. Textual chest X-ray reports and CT scan reports were processed using natural language processing (NLP) techniques to identify three categorized key terms: opacity, bilaterality, and ARDS. The lexicon developed was in reference to the Herasevich [3] and ASSIST [4] sniffers, which was further refined and validated based on clinical expertise. To minimize the influence of uncertainty profiles, the negation expression "no" was searched 40 characters prior to the identification of opacity. The ARDS diagnosis was confirmed if either one of the two criteria is satisfied: (1) the ARDS term is present or (2) both terms of bilaterality and opacity are present in the report. We identified the first radiology observation of bilateral opacity, as subsequent reports usually refer to the ones previously conducted for the identical patient instead of repeating the full interpretation and findings. Manual inspection of portions of the reports was done to validate the efficacy of the algorithm.

For the oxygenation criteria, 13,862 arterial partial pressure of oxygen (PaO_2) measurements acquired through arterial blood gas tests (ABG) were recorded for 358 unique patients. We have confirmed with SEHA clinicians that such test is only conducted for patients suspected of ARDS or with severe symptoms, and therefore, patients without one can be ruled out of ARDS directly. Each PaO_2 measurement was matched with the closet prior record of FiO_2 (the fraction of inspired oxygen) for the given patient to obtain the P/F ratio. For patients with missing FiO_2 measurements, we assumed that they were not on oxygen therapy and were assigned a value of 0.2095 (20.95% of oxygen in air). The patients were then labeled as potentially having ARDS if their P/F ratio $\leq$ 300 mm Hg.

The earliest recorded time —either arrival time, admission time, or the first time the patient tested positive for COVID-19 —was utilized in lieu of the precise point of clinical insult of respiratory symptoms for the timing criteria of the Berlin definition. To rule out pulmonary edema of other origin, patients with cardiac edema prior to the onset of ARDS were identified from the vitals and excluded. With the criteria and steps delineated herein, 243 patients were identified as having ARDS across both training sets as well as test sets.

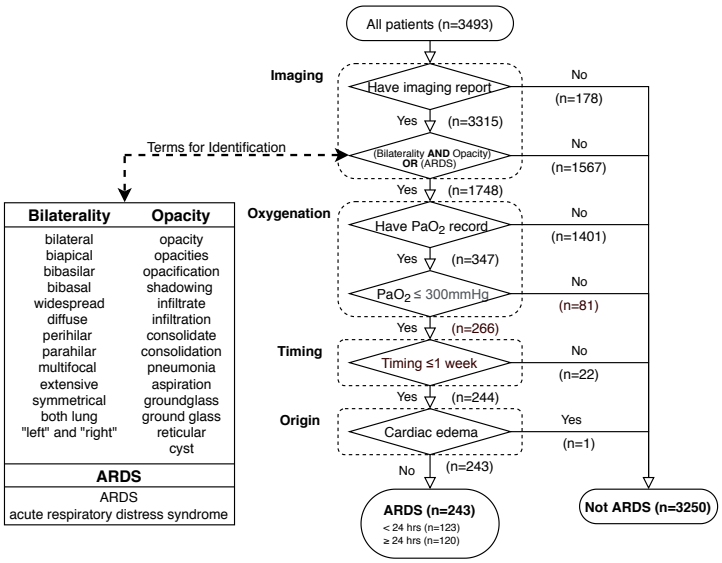

Figure S1: The ARDS labeling process in our dataset, in accordance with the four criteria of the Berlin definition [2]: imaging, oxygenation, timing, and origin. The lexicon developed for identifying bilateral opacity in radiology reports is also shown within the table on the left.

References

[1] A. Khwaja. "KDIGO clinical practice guidelines for acute kidney injury". In: *Nephron Clinical Practice* 120.4 (2012), pp. c179–c184. DOI: 10.1159/000339789.

[2] T. A. D. T. Force. "Acute Respiratory Distress Syndrome: The Berlin Definition". In: *JAMA* 307.23 (June 2012), pp. 2526–2533. DOI: 10.1001/jama.2012.5669.

[3] V. Herasevich et al. "Validation of an electronic surveillance system for acute lung injury". In: *Intensive Care Medicine* 35.6 (2009), pp. 1018–1023. DOI: 10.1007/s00134-009-1460-1.

[4] H. C. Azzam et al. "Validation Study of an Automated Electronic Acute Lung Injury Screening Tool". In: *Journal of the American Medical Informatics Association* 16.4 (July 2009), pp. 503–508. DOI: 10.1197/jamia.M3120.