Table 1: Data summary of study cohort for Composite Ventilation

Data summary of patients for Composite Ventilation, along with their numerical range (minimum and maximum values). Fourth column represents the number of missing data and their proportion to the dataset.

	Ventilated (N=224)	Not Ventilated (N=1088)	All (N=1312)	Missing Data
Age	65.0 (57.0-74.0)	62.0 (49.0-74.0)	63.0 (50.0-74.0)	0 (0%)
Gender[a]				
Male	131 (58.5%)	545 (50.1%)	676 (51.5%)	0 (0%)
Female	93 (41.5%)	543 (49.9%)	636 (48.5%)	0 (0%)
Race[a]				
Caucasians	172 (76.8%)	785 (72.2%)	957 (72.9%)	0 (0%)
African Americans	45 (20.1%)	245 (22.5%)	290 (22.1%)	0 (0%)
Others[b]	7 (3.1%)	58 (5.3%)	65 (5.0%)	0 (0%)
Social Determinants of Health (SDOH)[a]	190 (84.8%)	902 (75.5%)	1029 (78.4%)	0 (0%)
Pulse	92.0 (80.0-106.0)	88.0 (77.0-100.0)	88.0 (77.0-101.0)	151 (11.5%)
Respirations (breaths/min)	22.0 (20.0-26.0)	20.0 (18.0-24.0)	20.0 (18.0-24.0)	151 (11.5%)
Temperature (Celsius)	98.9 (98.1-100.35)	98.7 (98.1-99.8)	98.8 (98.1-99.9)	153 (11.7%)
Body Mass Index (BMI)	32.9 (28.2-38.8)	31.6 (26.6-37.1)	31.8 (26.8-37.3)	49 (3.7%)
Systolic Blood Pressure (mmHg)	127.5 (111.0-143.0)	127.0 (116.0-142.0)	127.0 (115.0-142.0)	151 (11.5%)
Diastolic Blood Pressure (mmHg)	71.5 (62.25-81.0)	75.0 (65.0-84.0)	74.0 (65.0-84.0)	151 (11.5%)
Pulse Oximetry (%)	94.0 (92.0-96.0)	96.0 (94.0-98.0)	95.0 (93.0-98.0)	128 (9.8%)
Oxygen Saturation (%)	92.0 (87.0-95.0)	93.0 (78.625-95.75)	92.6 (84.30-95.65)	1020 (77.7%)
Inspired Oxygen Concentration (%)	50.0 (36.0-100.0)	32.0 (21.0-40.0)	36.0 (21.0-50.0)	1083 (82.5%)
Hemoglobin (g/dL)	13.3 (12.2-14.6)	13.4 (12.0-14.6)	13.4 (12.0-14.6)	257 (19.6%)
Lymphocytes Absolute (10^9/L)	0.7 (0.5-1.0)	0.9 (0.6-1.4)	0.9 (0.6-1.3)	196 (14.9%)
Mean Corpuscular Hemoglobin (MCH) (pg/cell)	29.8 (28.6-31.2)	29.75 (28.3-31.2)	29.8 (28.4-31.2)	170 (13.0%)
Hematocrit (%)	39.4 (36.15-43.175)	39.6 (35.75-43.0)	39.5 (35.8-43.1)	167 (12.7%)
White Blood Cells (10^9/L)	7.45 (5.1-9.8)	6.4 (4.9-8.5)	6.5 (4.925-8.7)	170 (13.0%)
Platelets (10^9/L)	193.0 (146.0-251.0)	200.0 (157.0-261.5)	199.0 (155.0-261.0)	176 (13.4%)
Mean Corpuscular Hemoglobin Concentration (MCHC) (g/dL)	33.7 (33.1-34.2)	33.7 (33.0-34.4)	33.7 (33.025-34.3)	170 (13.0%)
Mean Corpuscular Volume (MCV) (fL)	88.5 (85.0-92.0)	88.0 (85.0-92.0)	88.0 (85.0-92.0)	170 (13.0%)
Mean Platelet Volume (MPV) (fL)	8.7 (8.0-9.5)	8.5 (7.9-9.2)	8.5 (7.9-9.3)	177 (13.5%)
Anion gap (mmol/L)	12.0 (10.0-15.0)	11.0 (10.0-13.0)	12.0 (10.0-13.0)	187 (14.3%)
CO2 (mEq/l)	23.0 (21.0-25.0)	24.0 (22.0-26.0)	24.0 (22.0-26.0)	186 (14.2%)
PCO2 (mmHg)	34.4 (30.55-38.925)	34.0 (29.75-38.45)	34.1 (29.8-38.6)	1091 (83.2%)
PO2 (mmHg)	65.0 (58.0-80.0)	70.0 (62.0-84.0)	69.0 (59.0-83.0)	1095 (83.5%)
Sodium (mmol/L)	135.0 (132.0-138.0)	137.0 (134.0-139.0)	136.0 (134.0-139.0)	1095 (83.5%)
Chloride (mmol/L)	99.0 (96.0-102.0)	101.0 (98.0-104.0)	101.0 (97.0-104.0)	187 (14.3%)

Glucose (mg/dL)	135.0 (112.0-198.0)	119.0 (103.0-150.75)	121.0 (104.0-157.0)	187 (14.3%)
Blood Urea Nitrogen (BUN) (mg/dL)	22.0 (15.0-33.0)	17.0 (12.0-27.0)	18.0 (12.0-28.0)	186 (14.2%)
Creatinine (mg/dL)	1.12 (0.905-1.59)	0.98 (0.78-1.31)	1.0 (0.8-1.35)	184 (14.0%)
Calcium (mg/dL)	8.5 (8.2-8.8)	8.7 (8.4-9.0)	8.7 (8.4-9.0)	187 (14.3%)
Potassium Bld (mmol/L)	3.9 (3.6-4.3)	3.9 (3.6-4.2)	3.9 (3.6-4.2)	189 (14.4%)
GFR MDRD Af Amer (mL/min/1.73 m²)	60.0 (48.5-60.0)	60.0 (60.0-60.0)	60.0 (57.0-60.0)	207 (15.8%)
GFR MDRD Non Af Amer (mL/min/1.73 m²)	57.0 (40.0-60.0)	60.0 (50.0-60.0)	60.0 (47.0-60.0)	207 (15.8%)
D-Dimer (ng/mL)	349.0 (211.5-578.5)	321.5 (199.25-556.5)	331.0 (201.0-563.0)	459 (35.0%)
B-type Natriuretic Peptide (BNP) (pg/mL)	118.0 (38.0-263.0)	67.0 (27.0-183.75)	72.0 (31.0-208.0)	963 (73.4%)
Troponin (ng/mL)	0.02 (0.01-0.04)	0.01 (0.01-0.03)	0.01 (0.01-0.03)	506 (38.6%)
Procalcitonin (ng/mL)	0.24 (0.11-0.51)	0.1 (0.05-0.2)	0.11 (0.06-0.26)	433 (33.0%)
Ferritin (ng/mL)	553.0 (243.5-1017.5)	317.0 (147.0-693.0)	349.0 (160.75-737.25)	564 (43.0%)
Lactic Acid Dehydrogenase (LDH) (U/L)	340.0 (259.0-462.0)	275.0 (215.25-345.0)	284.0 (219.0-365.0)	597 (45.5%)
Sed Rate (mm/h)	59.0 (38.0-83.5)	47.0 (28.75-69.25)	49.0 (29.0-72.0)	1149 (87.6%)
C-Reactive Protein (CRP) (mg/dL)	12.35 (8.025-18.175)	6.85 (2.5-11.975)	7.9 (3.3-13.425)	532 (40.5%)
Bedside glucose (mg/dL)	162.5 (126.5-259.75)	147.0 (107.0-224.25)	151.0 (109.0-230.0)	808 (61.6%)
Chronic Kidney Disease[a,c]	34 (15.2%)	89 (8.2%)	123 (9.4%)	0 (0%)
Asthma[a,c]	13 (5.8%)	61 (5.6%)	74 (5.6%)	0 (0%)
Hypertension[a,c]	102 (45.5%)	391 (35.9%)	493 (37.6%)	0 (0%)
Diabetes[a,c]	67 (29.9%)	248 (22.8%)	315 (24.0%)	0 (0%)

[a]Features are categorical, hence represented using their counts and proportion with respect to their population.
[b]Others include Hispanic, Hispanic/White, Hispanic/Black, Patient refused, Middle Eastern, American Indian or Alaska Native, Asian, Unknown, Asian/White and others

[c]Comorbidities

Table 2: Data summary of study cohort for Mortality

Data summary of patients for Mortality, along with their numerical range (minimum and maximum values). Fourth column represents the number of missing data and their proportion to the dataset.

	Deceased (N=118)	Discharged (N=1194)	All (N=1312)	Missing Data
Age	78.0(69.0-85.75)	61.0(49.0-72.0)	63.0 (50.0-74.0)	0 (0%)
Gender[a]				
Male	59 (50.0%)	617 (51.7%)	676 (51.5%)	0 (0%)
Female	59 (50.0%)	577 (48.3%)	636 (48.5%)	0 (0%)
Race[a]				
Caucasians	98 (83.1%)	859 (71.9%)	957 (72.9%)	0 (0%)
African Americans	19 (16.1%)	271 (22.7%)	290 (22.1%))	0 (0%)
Others[b]	1 (0.0%)	64 (0.1%)	65 (5.0%)	0 (0%)
Social Determinants of Health (SDOH)[a]	116 (98.3%)	976 (81.7%)	1092 (83.2%)	0 (0%)
Pulse	88.0(77.0-101.0)	88.5 (77.0-101.0)	88.0 (77.0-101.0)	140 (10.6%)
Respirations (breaths/min)	21.0(19.0-25.25)	20.0 (18.0-24.0)	20.0 (18.0-24.0)	141 (10.7%)
Temperature (Celsius)	98.6(98.1-99.35)	98.8 (98.175-99.9)	98.8 (98.1-99.9)	140 (10.6%)
Body Mass Index (BMI)	28.70 (24.475-33.925)	32.0 (27.1-37.35)	31.8 (26.8-37.3)	49 (3.7%)
Systolic Blood Pressure (mmHg)	131.5(113.5-144.25)	127.0 (115.0-142.0)	127.0 (115.0-142.0)	141 (10.7%)
Diastolic Blood Pressure (mmHg)	68.5(59.0-78.0)	75.0 (66.0-84.0)	74.0 (65.0-84.0)	141 (10.7%)
Pulse Oximetry (%)	95.0(92.0-97.0)	96.0 (93.0-98.0)	88.0 (77.0-101.0)	117 (8.9%)
Oxygen Saturation (%)	93.0(86.25-95.975)	93.0 (84.1-96.0)	93.0 (85.7-96.0)	972 (74.1%)
Inspired Oxygen Concentration (%)	70.0(40.0-100.0)	36.0 (21.0-70.0)	40.0 (28.0-90.0)	1028 (78.4%)
SPO2 (%)	94.0(91.0-96.0)	96.0 (92.0-98.0)	95.0 (92.0-97.5)	1129 (86.1%)
Hemoglobin (g/dL)	12.8(11.1-14.1)	13.4 (12.1-14.6)	13.4 (12.0-14.6)	239 (18.2%)
Lymphocytes Absolute (10^9/L)	0.8(0.5-1.3)	0.9 (0.6-1.3)	0.9 (0.6-1.3)	179 (13.6%)
Mean Corpuscular Hemoglobin (MCH) (pg/cell)	30.3(28.7-31.5)	29.7 (28.4-31.2)	29.8 (28.4-31.2)	154 (11.7%)
Hematocrit (%)	38.5(33.6-42.2)	39.70 (14.3-60.3)	39.6 (35.8-43.1)	151 (11.5%)
White Blood Cells (10^9/L)	7.4(5.5-10.1)	6.4 (4.9-8.6)	6.5 (5.0-8.7)	154 (11.7%)
Platelets (10^9/L)	188.5(144.0-242.0)	200.0 (156.0-261.25)	199.0 (155.0-261.0)	160 (12.2%)
Mean Corpuscular Hemoglobin Concentration (MCHC) (g/dL)	33.4(32.6-34.2)	33.8 (33.1-34.4)	33.7 (33.0-34.3)	154 (11.7%)
Mean Corpuscular Volume (MCV) (fL)	90.0(87.0-94.0)	88.0 (85.0-92.0)	88.0 (85.0-92.0)	154 (11.7%)
Mean Platelet Volume (MPV) (fL)	8.645 (7.9-9.4)	8.5 (7.9-9.2)	8.5 (7.9-9.3)	161 (12.3%)
Anion gap (mmol/L)	13.0(10.0-14.25)	12.0(10.0-13.0)	12.0 (10.0-14.0)	171 (13.0%)
CO2 (mEq/l)	32.8(29.2-38.0)	24.00 (5.0-54.0)	24.0 (22.0-26.0)	170 (13.0%)
PCO2 (mmHg)	32.8(29.2-38.0)	24.0(22.0-26.0)	34.75 (30.0-40.1)	1038 (79.1%)
PO2 (mmHg)	68.0(56.0-91.0)	70.0(60.0-87.0)	70.0 (60.0-88.0)	1042 (79.4%)
Sodium (mmol/L)	137.0(133.75-140.0)	136.0(134.0-139.0)	136.0 (134.0-139.0)	171 (13.0%)

Chloride (mmol/L)	101.0(98.0-104.0)	101.0(97.0-104.0)	101.0 (97.0-104.0)	171 (13.03%)
Glucose (mg/dL)	132.0(108.0-178.25)	121.0(104.0-155.0)	122.0 (104.0-157.0)	171 (13.03%)
Blood Urea Nitrogen (BUN) (mg/dL)	29.0(20.0-39.5)	17.00 (3.0-228.0)	18.0 (12.0-28.0)	170 (13.0%)
Creatinine (mg/dL)	1.25(0.9175-1.7025)	17.0(12.0-27.0)	1.0 (0.8-1.37)	168 (12.8%)
Calcium (mg/dL)	8.6(8.2-8.9)	8.7(8.4-9.0)	8.7 (8.4-9.0)	171 (13.0%)
Potassium Bld (mmol/L)	4.1(3.8-4.45)	3.9(3.6-4.2)	3.9 (3.6-4.2)	173 (13.2%)
GFR MDRD Af Amer (mL/min/1.73 m²)	59.0(40.5-60.0)	60.0(59.0-60.0)	60.0 (56.0-60.0)	191 (14.6%)
GFR MDRD Non Af Amer (mL/min/1.73 m²)	49.0(33.5-60.0)	60.0(49.0-60.0)	60.0 (46.0-60.0)	191 (14.6%)
D-Dimer (ng/mL)	457.0(329.0-1104.5)	317.0(196.5-538.75)	337.0 (202.0-571.0)	435 (33.2%)
B-type Natriuretic Peptide (BNP) (pg/mL)	206.5(67.5-347.75)	68.5(28.25-169.5)	78.5 (32.0-214.0)	942 (71.8%)
Troponin (ng/mL)	0.03(0.0125-0.07)	0.01(0.01-0.03)	0.01 (0.01-0.03)	486 (37.0%)
Procalcitonin (ng/mL)	0.26(0.0975-0.5125)	0.11(0.06-0.24)	0.11 (0.06-0.26)	411 (31.3%)
Ferritin (ng/mL)	472.5(205.5-1025.25)	341.0(160.75-729.25)	354.0 (164.75-735.25)	548 (41.8%)
Lactic Acid Dehydrogenase (LDH) (U/L)	372.0(259.25-501.0)	282.0(218.0-359.0)	286.0 (220.0-370.0)	581 (44.3%)
Sed Rate (mm/h)	50.5(34.5-82.0)	49.0(29.0-71.0)	49.0 (29.0-72.0)	1143 (87.1%)
C-Reactive Protein (CRP) (mg/dL)	11.9(7.0-19.1)	7.6(3.15-13.1)	8.0 (3.3-13.725)	516 (39.3%)
Bedside glucose (mg/dL)	154.0(113.0-218.0)	151.0(109.0-233.25)	152.0 (109.0-229.0)	763 (58.2%)
Chronic Kidney Disease[a,c]	22 (18.6%)	101 (8.5%)	123 (9.4%)	0 (0%)
Asthma[a,c]	4 (3.4%)	70 (5.8%)	74 (5.6%)	0 (0%)
Hypertension[a,c]	63 (53.4%)	430 (36.0%)	493 (37.6%)	0 (0%)
Diabetes[a,c]	43 (36.4%)	272 (22.8%)	315 (24.05)	0 (0%)

[a]Features are categorical, hence represented using their counts and proportion with respect to their population.
[b]Others include Hispanic, Hispanic/White, Hispanic/Black, Patient refused, Middle Eastern, American Indian or Alaska Native, Asian, Unknown, Asian/White and others
[c]Comorbidities

Table 3: Cost structure of clinical features

Pre-defined cost structure for each group of features (may be modified based on the healthcare facility) based on a relative cost score where 0 indicates clinical features that are least expensive and 3 indicates clinical features that are most expensive.

Group	Cost
DCM (Demographic and comorbidities: Age, Sex, Gender, Race, Respiratory Rate, BMI, Temperature, Systolic/Diastolic Blood Pressure, Pulse Oximetry, FIO2, O2 Sat, SPO2, Asthma, Chronic Kidney Disease, Diabetes, Hypertension)	0
BMP (Basic Metabolic Profile: Sodium, Chloride, Glucose, GFR MDRD Non Af Amer, Creatinine, BUN, Calcium, Potassium, Bld)	1
CBC (Complete Blood Count: Hemoglobin, Lymphocyte, MCH, Hematocrit, White Blood Cells, Platelets, MCHC, MCV, MPV)	1
D-dimer	2
LDH	2
Sed rate	2
CRP	2
BNP	3
Troponin	3
Procalcitonin	3
Ferritin	3

Table 4: Prediction performance using all clinical features
Adverse outcome prediction performance at the point of entry for the various ML models in terms of Average
Precision (AP) and Area Under Receiver Operating Curve (AUC).

Model	Outcome	AP mean (std)	AUC mean (std)
XGBoost	Composite Ventilation	0.379 (0.038)	0.723 (0.038)
Gaussian Process	Composite Ventilation	0.357 (0.037)	0.713 (0.023)
Logistic Classifier	Composite Ventilation	0.361 (0.035)	0.717 (0.013)
XGBoost	Mortality	0.354 (0.065)	0.802 (0.029)
Gaussian Process	Mortality	0.338 (0.055)	0.819 (0.012)
Logistic Classifier	Mortality	0.328 (0.067)	0.805 (0.029)

Table 5: Optimal set of features at different budget levels for predicting composite ventilation.
Total Cost is the sum of the cost of each feature group in the selected set.

Budget	Total Cost	Optimal Set of Features	AP mean (std)
1	1	DCM, BMP	0.289 (0.016)
2	2	DCM, CRP	0.314 (0.071)
3	3	DCM, BMP, LDH	0.331 (0.034)
4	4	DCM, BMP, CBC, CRP	0.353 (0.045)
5	4	DCM, BMP, CBC, CRP	0.353 (0.045)
6	4	DCM, BMP, CBC, CRP	0.353 (0.045)
7	7	DCM, BMP, CBC, D-dimer, Procalcitonin	0.363 (0.051)
8	7	DCM, BMP, CBC, D-dimer, Procalcitonin	0.363 (0.051)
9	7	DCM, BMP, CBC, D-dimer, Procalcitonin	0.363 (0.051)
10	10	DCM, BMP, CBC, CRP, BNP, Troponin	0.371 (0.03)
11	10	DCM, BMP, CBC, CRP, BNP, Troponin	0.371 (0.03)
12	10	DCM, BMP, CBC, CRP, BNP, Troponin	0.371 (0.03)
13	10	DCM, BMP, CBC, CRP, BNP, Troponin	0.371 (0.03)
14	10	DCM, BMP, CBC, CRP, BNP, Troponin	0.371 (0.03)
15	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
16	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
17	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
18	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
19	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
20	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
21	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)
22	15	DCM, BMP, D-dimer, LDH, Sedrate, CRP, BNP, Procalcitonin	0.382 (0.047)

Table 6: Optimal set of features at different budget levels for predicting mortality.
Total Cost is the sum of the cost of each feature group in the selected set.

Budget	Total Cost	Optimal Set of Features	AP mean (std)
1	1	DCM, BMP	0.285 (0.048)
2	2	DCM, LDH	0.311 (0.06)
3	3	DCM, BMP, LDH	0.317 (0.05)
4	4	DCM, LDH, CRP	0.34 (0.07)
5	4	DCM, LDH, CRP	0.34 (0.07)
6	4	DCM, LDH, CRP	0.34 (0.07)
7	4	DCM, LDH, CRP	0.34 (0.07)
8	8	DCM, BMP, LDH, CRP, Troponin	0.343 (0.079)
9	8	DCM, BMP, LDH, CRP, Troponin	0.343 (0.079)
10	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
11	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
12	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
13	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
14	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
15	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
16	10	DCM, BMP, LDH, Sedrate, CRP, Procalcitonin	0.351 (0.08)
17	17	DCM, BMP, CBC, D-dimer, LDH, CRP, BNP, Procalcitonin, Ferritin	0.355 (0.075)
18	17	DCM, BMP, CBC, D-dimer, LDH, CRP, BNP, Procalcitonin, Ferritin	0.355 (0.075)
19	17	DCM, BMP, CBC, D-dimer, LDH, CRP, BNP, Procalcitonin, Ferritin	0.355 (0.075)