

## Novel Machine Learning Can Predict Acute Asthma Exacerbation

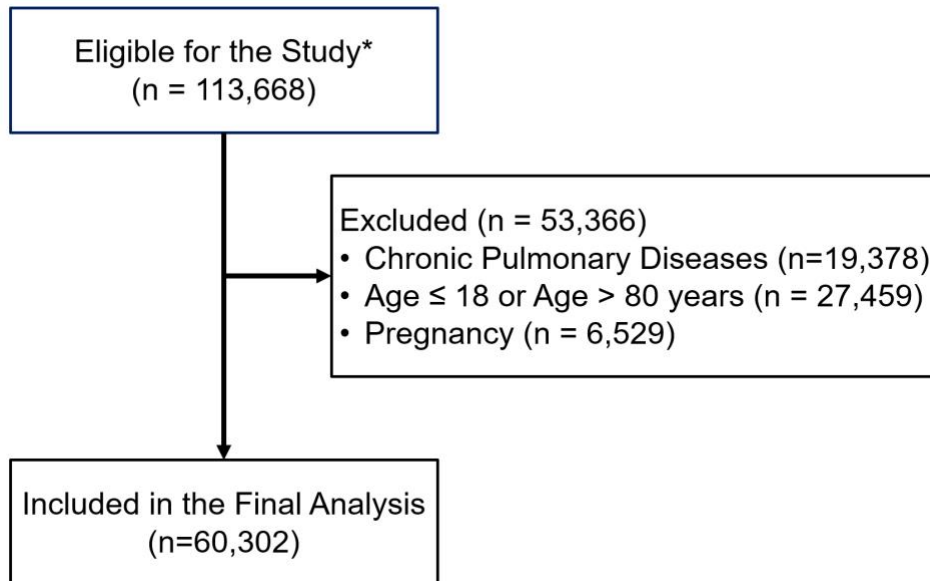
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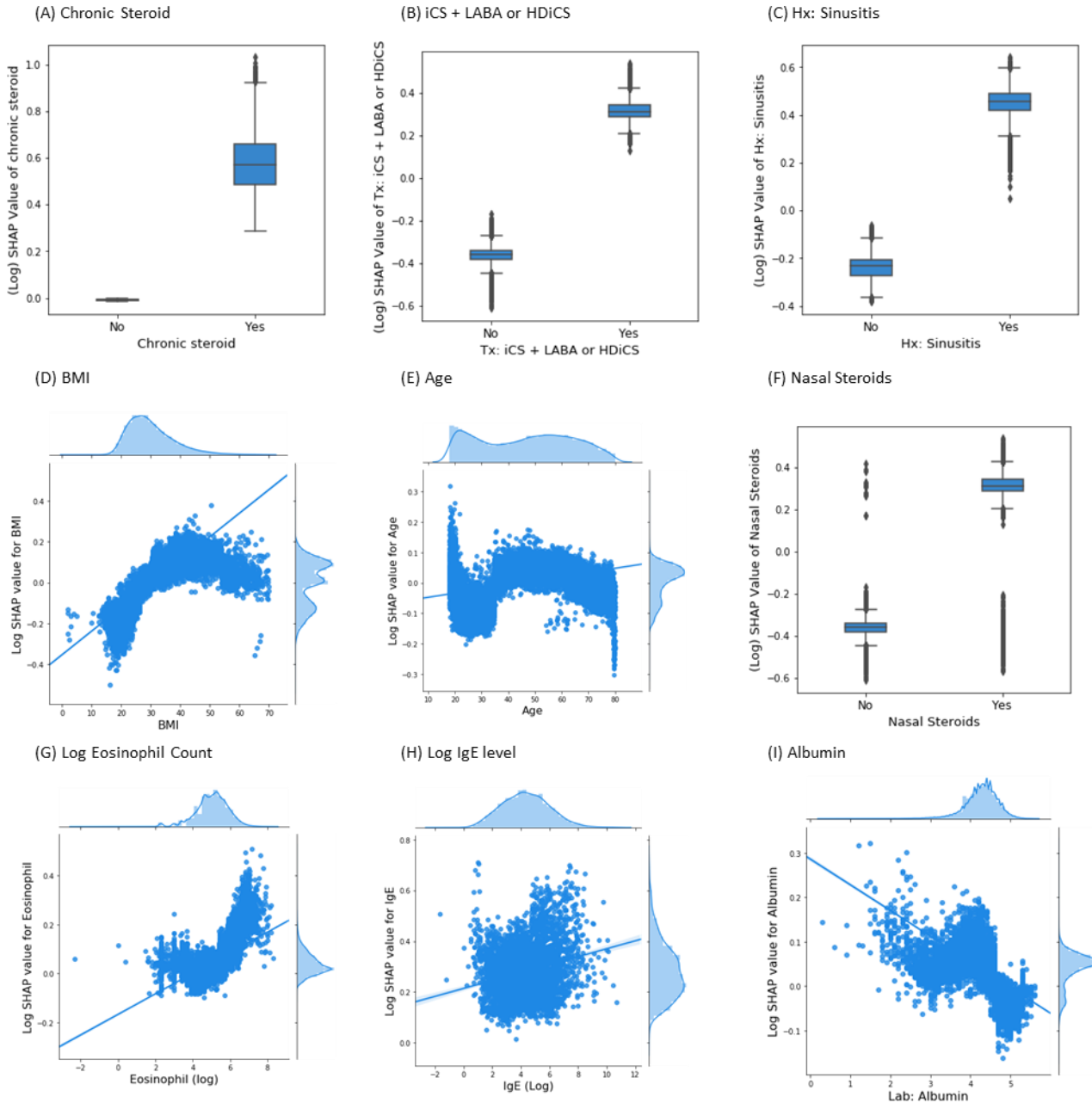
**e-Figure 1:** Flow chart of patient in final analysis.



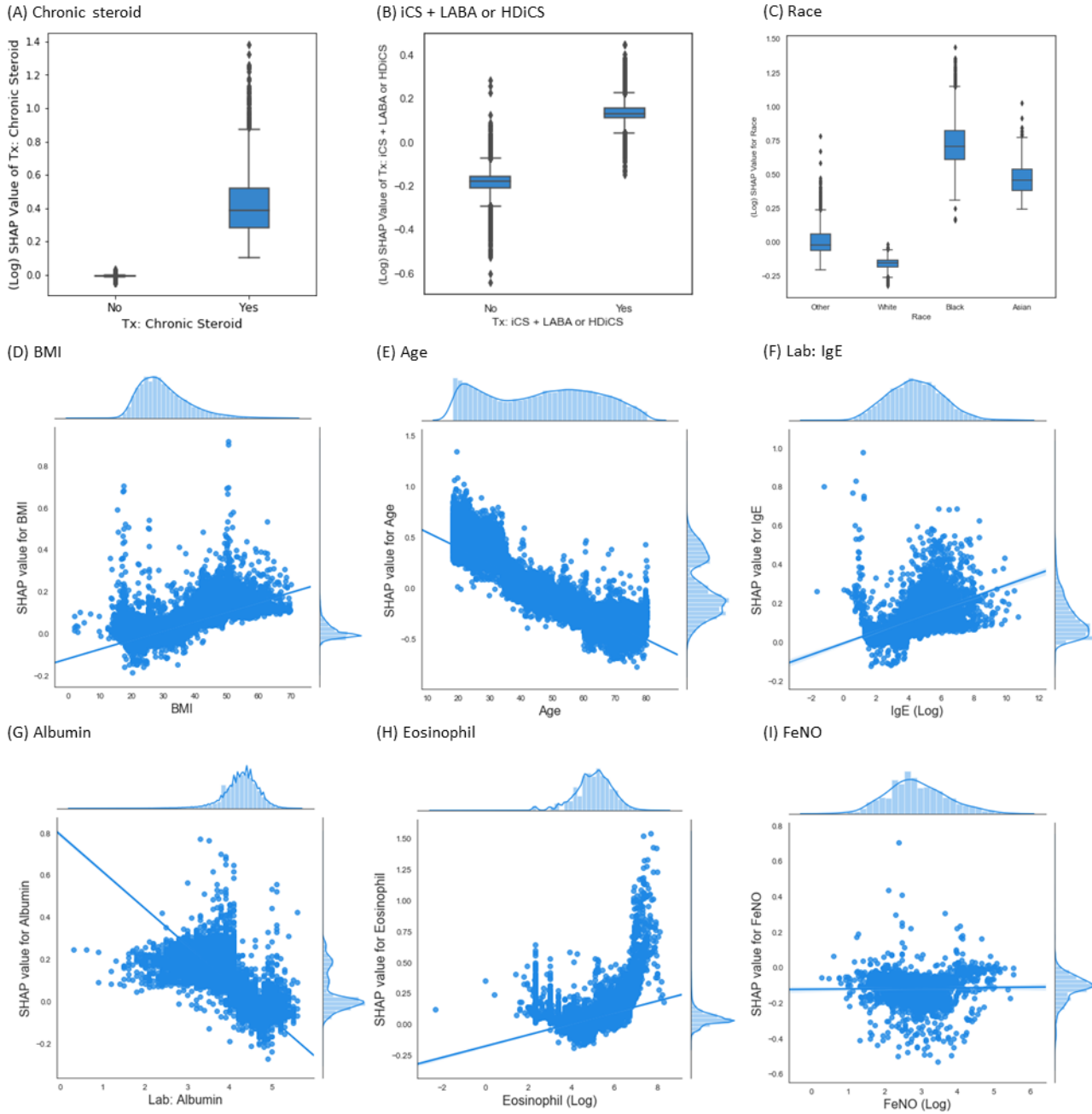
\*To be considered eligible, patients should carry the ICD10-CM of J45\* or ICD9-CM of 493\* and be treated with asthma medications for 6 or more months. They also should be non-smokers or ex-smokers with 10 pack-year smoking history or less.

**e-Figure 2-4: Relative risk of different outcome with independent variables in different prediction models.** S1: Non-severe exacerbation prediction model, S2: ED visits prediction model and S3: hospitalization prediction model. The x-axis indicated the value of the covariable, the y-axis indicated the relative risk of exacerbation

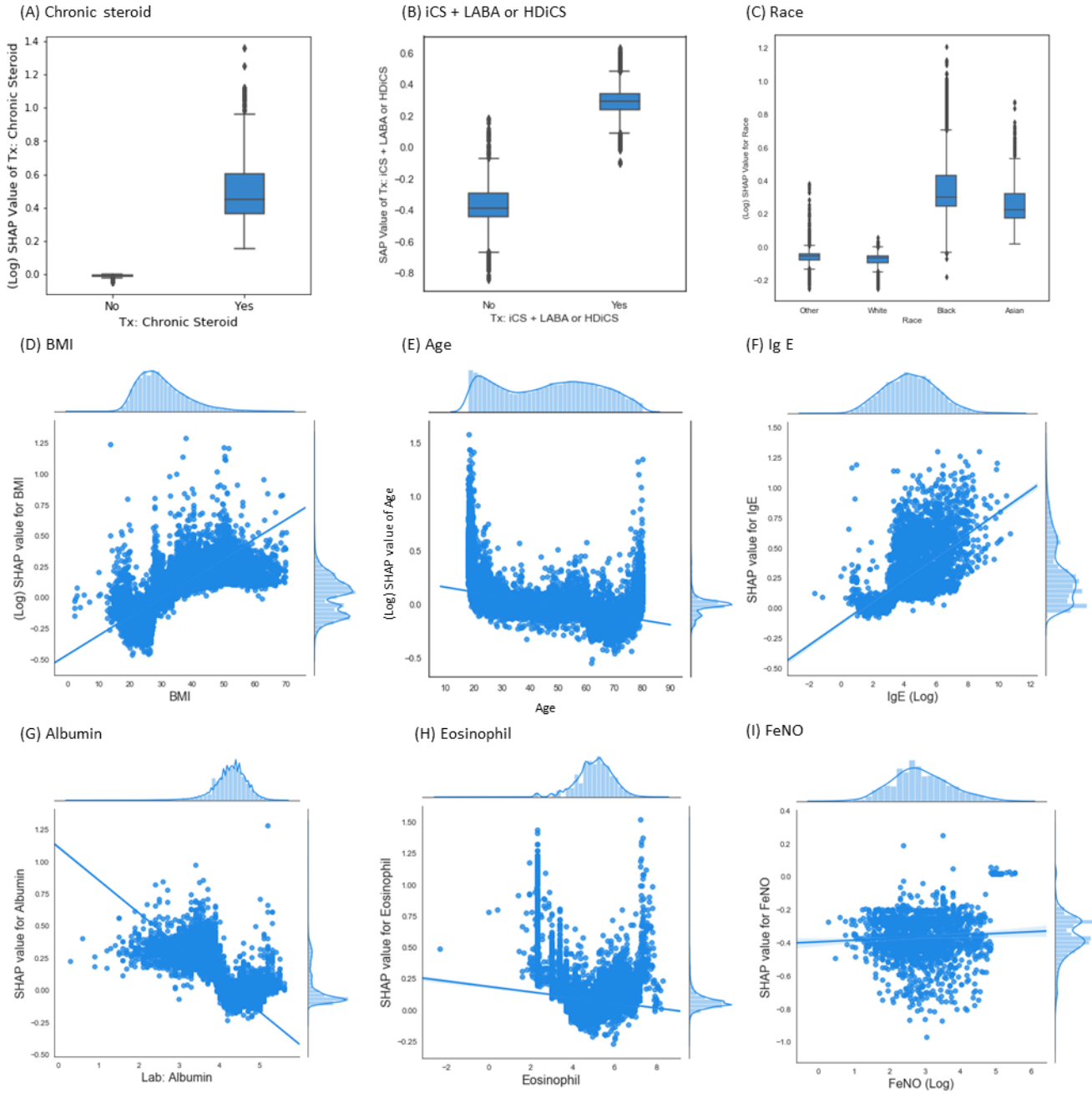
**e-Figure 2: relative risk of non-severe exacerbation with independent variables**



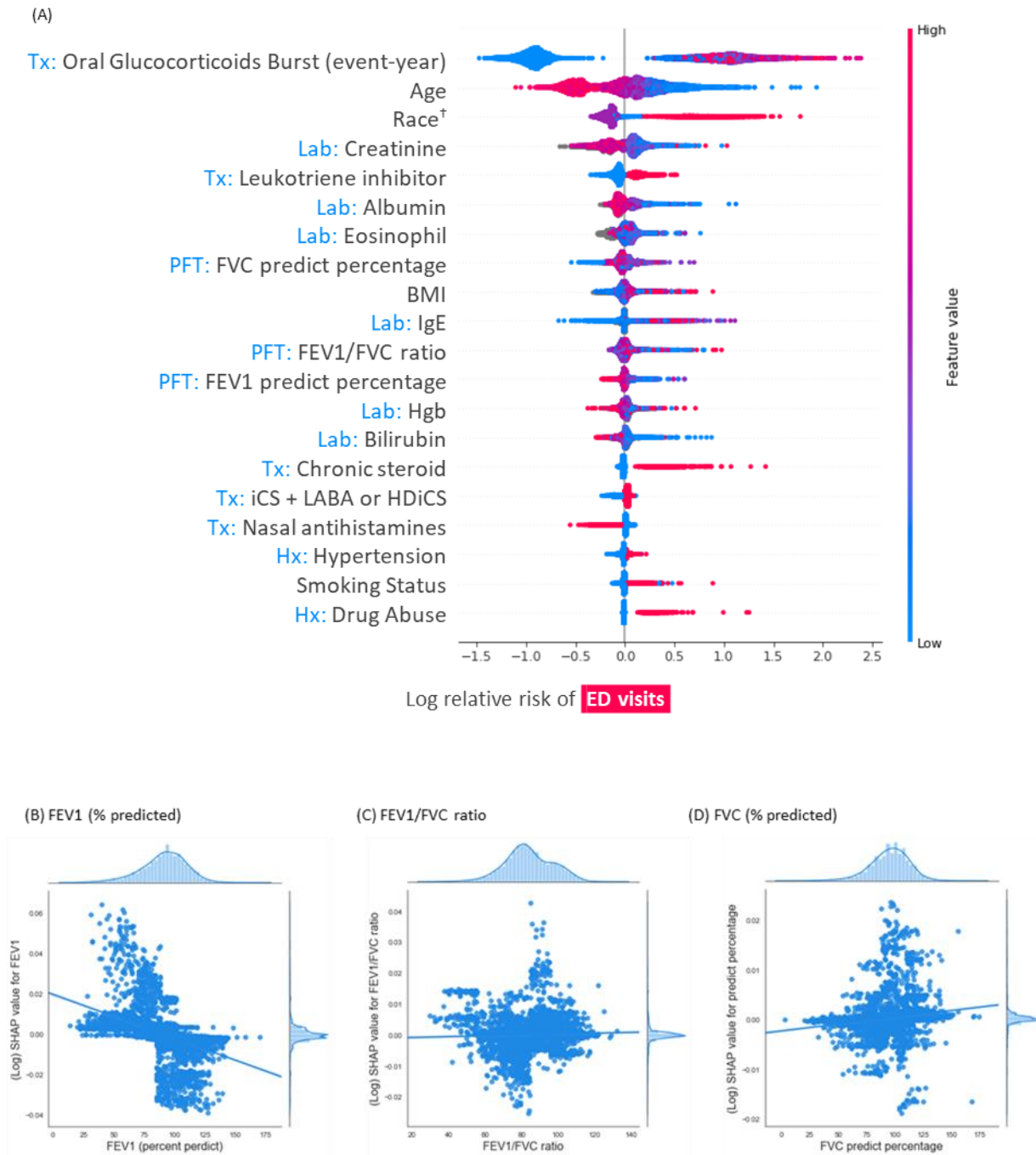
**e-Figure 3:** Relative risk of ED visits with independent variables



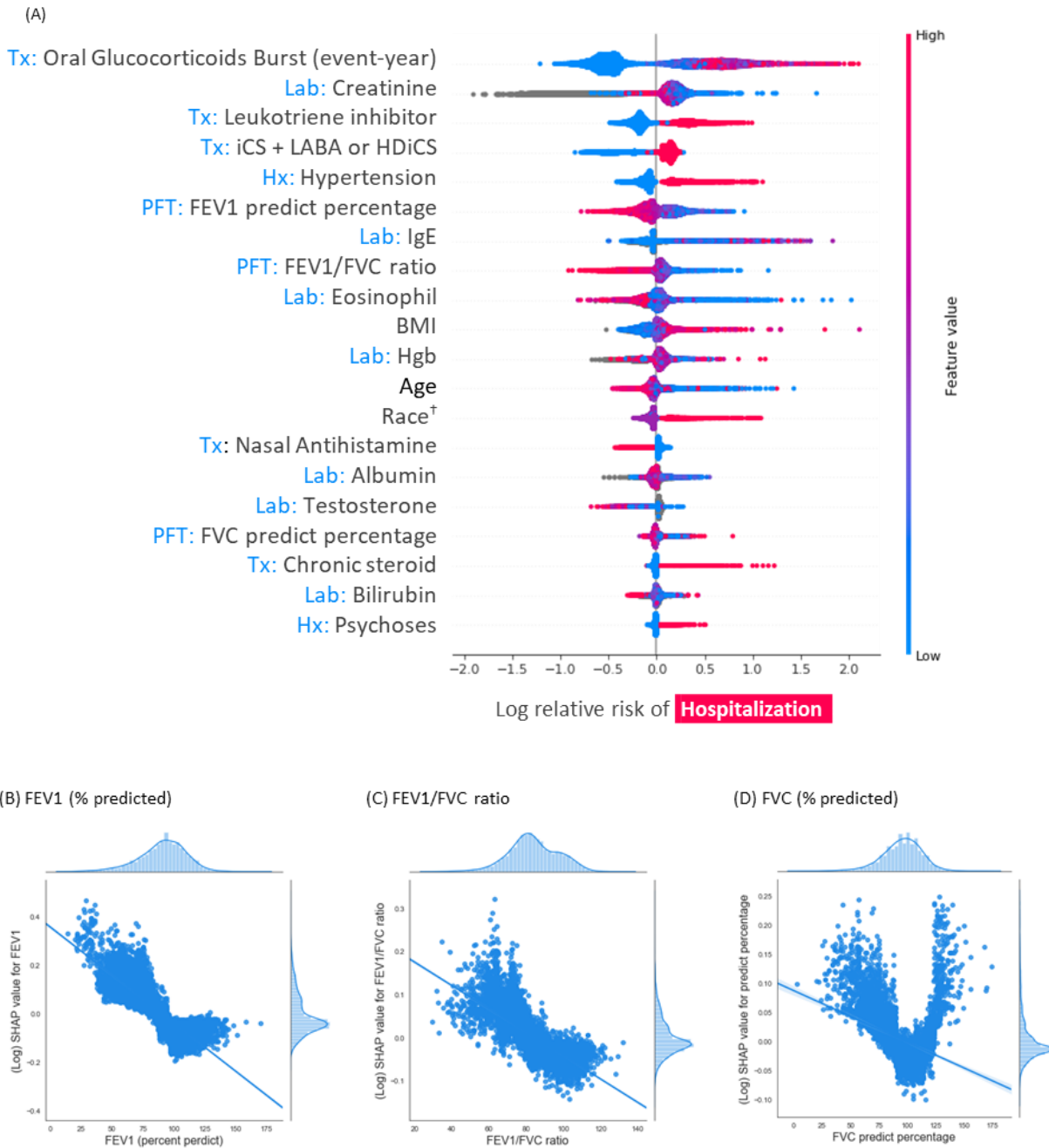
**e-Figure 4: Relative risk of hospitalization with independent variables**



**e-Figure 5: Relative risk of ED visit with independent variables in patients with PFT data:** (A) SHAP summary plot for ED visit prediction model in patients with PFTs ranking from the covariable with highest impact. Oral Glucocorticoids burst frequency had the highest impact among all the covariables. The plot was colored according to the value of covariables with pink color indicated higher value and blue color indicated lower value. FEV1, FVC and FEV1/FVC were all in top 20 features. (B-D) Independent distribution plots demonstrated the relationship between PFT and relative risk of ED visits.



**e-Figure 6: Relative risk of hospitalization with independent variables in patients with PFT data:** (A) SHAP summary plot for hospitalization prediction model ranking from the covariable with highest impact. FEV1 had the 5<sup>th</sup> highest impact among all the covariables, and FEV1, FVC and FEV1/FVC ratios were all amongst the top impact ones. (B-D) Independent distribution plots demonstrated the relationship between PFT and relative risk of hospitalization.

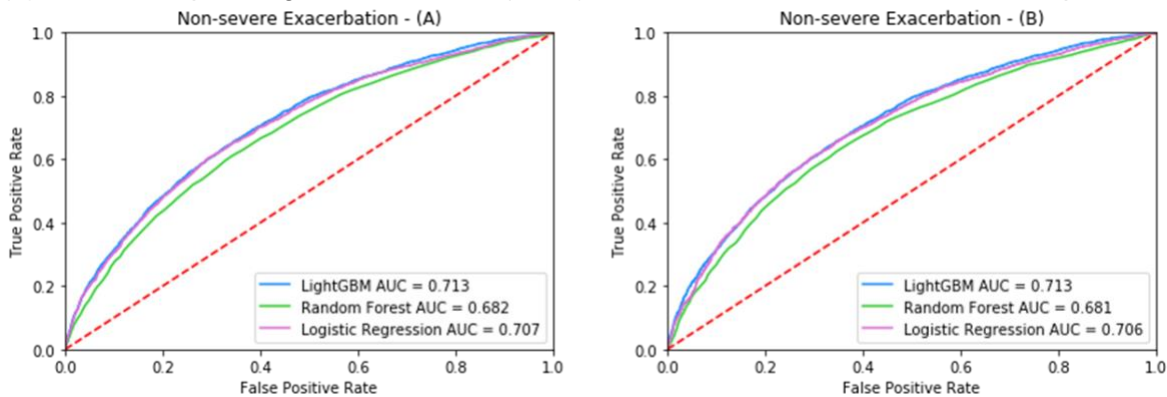


(E) Example of a predicted high-risk patients

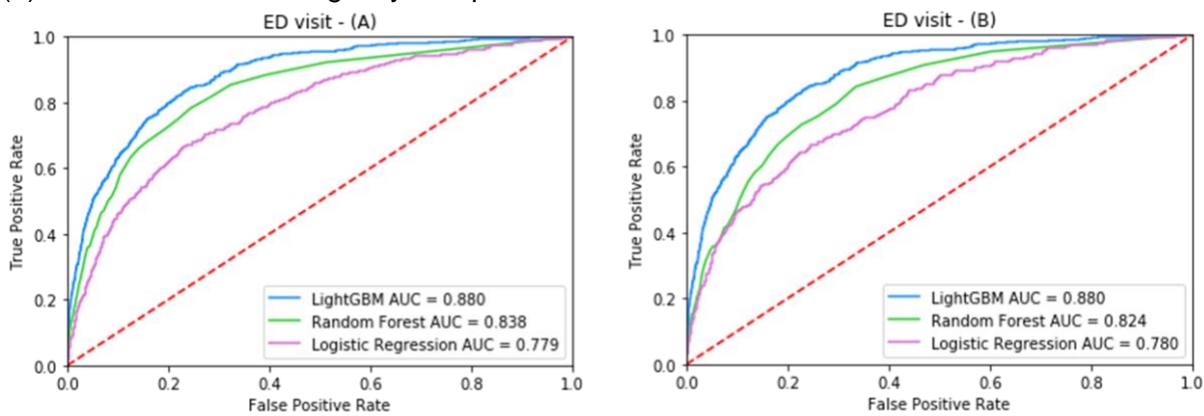
**e-Figure 7: Receiver-operating-characteristics – area under the curve (AUC-ROC) of prediction models:**

To handle the missing values in logistic regression and random forest algorithms: we used two strategies: (A) the variables with more than 80% missing values (IgE, progesterone, testosterone, DHEAS, estradiol, and FeNO) were excluded. For the variables with less than 80% missing values (eosinophil, albumin, bilirubin, Hgb, BMI and creatinine), the missing data was imputed with median value. (B) The variables with more than 80% missing values were excluded, then we excluded patients with missing data and yield N= 34,431 patients.

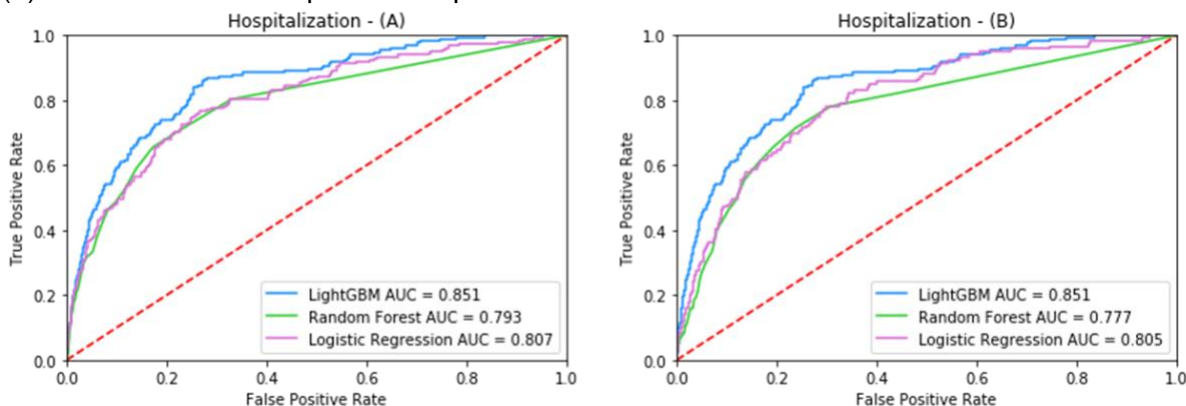
(1) Receiver-operating-characteristics (ROC) curves for non-severe exacerbation prediction model:



(2) ROC curves for emergency visit prediction models:



(3) ROC curves for hospitalization prediction models





**e-Table 1. List of covariables in prediction models including demographic, comorbidities, lab values and received treatments.**

Age	Hx: Rheumatoid arthritis collagen vascular diseases
BMI	Hx: Sinusitis
Gender	Hx: Sleep Apnea
Race	Hx: Malignancy without metastasis
Hispanic	Hx: UC
Smoking Status	Hx: Hypothyroidism
Hx: Alcohol abuse	Lab: Albumin
Hx: AIDS	Lab: Bilirubin
Hx: Anemia	Lab: Creatinine
Hx: Blood_Loss	Lab: DHEAS
Hx: Coagulopathy	Lab: Eosinophil
Hx: CROHNS_DISEASE	Lab: Estradiol
Hx: Depression	Lab: FeNO
Hx: Diabetes	Lab: Hgb
Hx: Drug Abuse	Lab: IgE
Hx: Intubation	Lab: Progesterone
Hx: GERD	Lab: Testosterone
Hx: Hypertension	Tx: Nasal Antihistamines
Hx: Liver Disease	Tx: Oral Glucocorticoids Bursts (frequency) *
Hx: Lymphoma	Tx: Anit-IgE
Hx: Menopause	Tx: Chronic Steroid
Hx: Metastatic cancer	Tx: iCS
Hx: Nasal Polyps	Tx: iCS + LABA or HDiCS
Hx: Paralysis	Tx: LTRAs
Hx: Peptic Ulcer	Tx: Nasal Steroids
Hx: Peripheral vascular disease	Tx: SABA
Hx: Psychoses	Tx: Theophylline
Hx: Pulmonary Circulation Disorders	
Hx: Renal Failure	

\*Oral GLUCOCORTICOID burst is not covariable in non-severe exacerbation prediction model

**e-Table 2.** Brier score of all different models.

	<b>LGBM</b>	<b>Logistic regression</b>	<b>Random Forest</b>
Non-severe	0.197	0.198	0.208
ED	0.031	0.0001	0.034
Hospitalization	0.014	0.014	0.015

**e-Table 3.** AUC comparison of performance for prediction models with and without PFT data.

<b>Prediction Models</b>	<b>AUC:</b>	<b>AUC:</b>
	<b>PFTs Included</b>	<b>No PFTs</b>
Non-severe exacerbation	0.74 (0.71-0.76)	0.71 (0.70-0.72)
Emergency department visit	0.84 (0.81-0.88)	0.88 (0.86-0.89)
Hospitalization	0.86 (0.81-0.9)	0.85 (0.82-0.88)

**e-Table 4:** Performance of original model and validation result of using 2019 dataset

		<b>Non-severe exacerbations</b>	<b>ER visits</b>	<b>Hospitalization</b>
LGBM	2019	0.65	0.86	0.87
	Original (2010 – 2018)	0.71	0.88	0.85
RF <sup>a</sup>	2019	0.64	0.84	0.85
	Original (2010 – 2018)	0.68	0.84	0.79
LR <sup>a</sup>	2019	0.66	0.83	0.89
	Original (2010 – 2018)	0.71	0.78	0.81

**e-Appendix 1.**  
**Cleveland Clinic Health System eResearch Extraction Tool**

**A1.1 – Search Criteria:**

- Female=2; male =1, non-identifiable gender= exclude
- ICD code; x means 0 to 9, xx means 00 to 99, xxx means 000 to 999

**A1.2 – Inclusion Criteria:**

- All patient seen at the Cleveland Health System (CCHS) between 01/01/2010 and 12/31/2018 with either an International Classification of Diseases, 9<sup>th</sup> Revision, Clinical Modification (ICD 9 CM) or an ICD 910 CM code of asthma.
  - Asthma ICD9 CM codes: 493.00, 493.01, 493.02, 493.11, 493.12, 493.20, 493.21, 493.22, 493.81, 493.82, 493.90, 493.91, 493.92
  - Asthma ICD 10 CM codes: J45.20, J45.21, J45.22, J45.30, J45.31, J45.32, J45.40, J45.41, J45.42, J45.50, J45.51, J45.52, J45.901, J45.902, J45.909, J45.990, J45.991, J45.998

**A1.3 – Exclusion Criteria:**

- We excluded pregnant women; and patients who carry, in addition to an asthma ICD code, any additional ICD code for any “other chronic lung disease” as listed in **Table A1.1**.

**A1.4 – Data Elements Collected**

*A1.4.1 – Demographics*

- Age in years
- Gender
- Race and ethnicity
- Age in years at asthma diagnosis

*A1.4.2 – Clinical Characteristics*

- Height (cm)
- Weight (KG)
- Body mass index
- Oxygen saturation (pulse ox)
- Asthma severity defined by ICD-10
- 

*A1.4.3 – Other chronic lung diseases (to be excluded). [Table A1.1]*

- Acute and chronic bronchitis
- Exposures to fumes, exhausts and vapors
- Cystic fibrosis
- Bronchiectasis
- Chronic Obstructive Lung Disease (COPD)
- Scoliosis and kyphoscoliosis

*A1.4.4 – Comorbidities identified by ICD codes. [Table A1.2]*

- Congestive heart failure
- Diabetes
- Neuromuscular disorders
- Other neurological disorders such as stroke
- Peripheral vascular diseases
- Peptic ulcer disease
- Hypothyroidism
- Renal failure
- Acquired Immunodeficiency Syndrome
- Metastatic cancer

- hypertension
- Pulmonary circulation disorders
- Valvular heart disease
- Connective tissue disease
- Coagulopathy
- Weight loss
- Fluid and electrolyte disorders
- Acute blood loss
- Anemia
- Alcohol use
- Drug use
- Non-metastatic solid tumors
- Lymphoma and leukemia
- Gastro-esophageal reflux disease
- Nasal polyps
- Obstructive sleep apnea
- Sinusitis
- Inflammatory bowel disease
- Tobacco use
- psychosis
- Obesity
- Depression

*A1.4.5 – Healthcare utilization.*

- Office visit
- Emergency room visit
- Hospitalization
- 

*A1.4.6 – Other conditions [Table A.3].*

- Pregnancy
- Menopausal status

*A1.4.7 – Lab measures*

- Glucose
- BUN
- Creatinine
- Bilirubin
- Complete blood count
- Immunoglobulin E level
- sex hormone level
- Insulin level

*A1.5.8 – Lung function*

- Forced vital capacity (FVC)
- Forced expiratory volume in 1 sec (FEV1)
- FEV1/FVC ratio

*A1.5.9 – Medications*

- Asthma inhalers
- Short acting beta agonists
- Long acting beta agonists
- Inhaled Corticosteroids
- Oral glucocorticoids
- Leukotriene inhibitors
- Anti IgE antibody (Omalizumab)
- Other asthma biologics (anti IL5)
- Theophylline
- Nasal steroids
- Nasal antihistamines
- Statins
- Birth Control Pills
- hormonal replacement therapy
- Testosterone
- Beta blockers
- Metformin
- Insulin
- Other diabetes medications

**Table A1.1** – ICD codes of all “Other Chronic Lung Disease” conditions.

Other Chronic Lung Disease	ICD 9	ICD 10
Bronchitis not specified as acute or chronic	491	J42
Simple chronic bronchitis	491.0	J41.0
Mucopurulent chronic bronchitis	491.1	J41.1, J41.8
Obstructive chronic bronchitis without exacerbation	491.20	J44.9
Obstructive chronic bronchitis with (acute) exacerbation	491.21	J44.1
Obstructive chronic bronchitis with acute bronchitis	491.22	J44.0
Other chronic bronchitis	491.8	J41.8
Unspecified chronic bronchitis	491.9	J42
Emphysema	492	J43.0, J43.1, J43.2
Emphysematous bleb	492.0	J43.9
Other emphysema	492.8	J43.8
Chronic respiratory conditions due to fumes and vapors	506.4	J68.4
Bronchiectasis	494	J47.0
Bronchiectasis without acute exacerbation	494.0	J47.9
Bronchiectasis with acute exacerbation	494.1	J47.1
Chronic airway obstruction, not elsewhere classified	496	J44.9
Respiratory conditions due to fumes and vapors	506	J68.2
Bronchitis and pneumonitis due to fumes and vapor	506.0	J68.0
Acute Pulmonary edema due to fumes and vapors	506.1	J68.1
Upper respiratory Inflammation due to fumes and vapors	506.2	J68.2
Other Acute and Subacute respiratory conditions due to fumes	506.3	J68.3, J68.8
Chronic respiratory conditions due to fumes and vapor	506.4	J68.4
Unspecified respiratory conditions due to fumes and vapors	506.9	J68.9
Cystic fibrosis without meconium ileus	277.00	E84.9
Cystic fibrosis with meconium ileus	277.01	E84.11
Cystic fibrosis with pulmonary manifestations	277.02	E84.0
Cystic fibrosis with gastrointestinal manifestations	277.03	E84.1, E84.19
Cystic Fibrosis with other manifestations	277.09	E84.8
Scoliosis (and kyphoscoliosis) idiopathic	737.30	M41.20
Resolving infantile idiopathic scoliosis	737.31	M41.00
Progressive infantile idiopathic scoliosis	737.32	M41.00
Scoliosis due to radiation	737.33	M96.5
Thoracogenic scoliosis	737.34	M41.30
Other kyphoscoliosis and scoliosis	737.39	M41.80, M41.9

**Table A1.2 – Comorbid conditions: ICD 9 CM and ICD 10 CM codes**

Comorbidity	ICD9	ICD10
Congestive heart failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.0-428.9	I09.81, I11.0, I13.0, I50.x, I50.xx.
Valvular disease	093.20-093.24, 394.0-397.1, 424.0-424.91, 746.3-746.6, V42.2, V43.3	A52.03, I05.0 - I05.2, I05.8, I06.0 - I06.2, I06.8, I06.9, I08.0, I08.8, I08.9, I07.1, I07.2, I07.8, I09.89, I34.0, I34.8, I35.0 - I35.2, I35.8, I35.9, I36, I36.8, I37.0, I37.8, I38, I39, Q23.0-Q23.3, Z95.3, Z95.2
Pulmonary circulation	416.0-416.9, 417.9	I27.0, I27.1, I27.82, I27.2, I27.89, I28.9
Peripheral vascular disorders	440.0-440.9, 441.00-441.9, 442.0-442.9, 443.1-443.9, 447.1, 557.1, 557.9, V43.4	I70.0, I70.1, I70.209, I70.219, I70.229, I70.25, I70.269, I70.299- I70.599, I70.8, I70.90-I70.92, I71.00-I71.03, I71.1- I71.9, I72.0- I72.4, I72.8, I72.9, I73.1, I77.71- I77.74, I77.79, I79.8, I73.81, I73.89, I73.9, I77.1, K55.1, K55.9, Z95.828
Hypertension (uncomplicated)	401.1, 401.9, 642.00-642.04	I10, O10.019, O10.919, O10.011 - O10.013, O10.02, O10.911 - O10.913, O10.92, O10.03, O10.93
Hypertension, (complicated)	401.0, 402.00 - 402.90, 403.00 - 403.90, 404.00, 404.10, 404.90, 405.01- 405.99, 642.10 -462.24, 642.70 - 642.94	I11.9, I12.9, I13.10, I15.0, I15.8, O10.419, O10.13, O10.23, O10.33, O11.9, O16.1, O16.2, O16.3
Paralysis	342.0-342.12, 342.9-344.9, 438.20-438.53	G81.00-G81.04, G81.10-G81.14, G81.90-G81.94, G81.90-G81.94, G80.0-G80.2, G80.8, G80.9, G82.20, G82.50-G82.54, G83.0, G83.10-G83.14, G83.20-G83.24, G83.30, G83.4, G83.5, G83.81-G83.89, G83.9, I69.959, I69.951-I69.954, I69.939, I69.931-I69.934, I69.949, I69.941-I69.944, , I69.961-I69.969
Other neurological disorders	330.0 - 331.9, 332.0, 333.4, 333.5, 334.0-335.9, 340, 341.1 - 341.9, 345.00-45.11, 345.2-345.3, 345.40-345.91, 348.1, 348.3-348.39, 780.31, 780.39, 784.3	E75.0- E75.6, G10, G11.1 – G11.9, G12.0- G12.9, G20, G25.4, G25.5, G30.01- G31.09, G30.9, G31.1, G31.81, G31.82, G31.83, G31.84, G31.85, G31.89, G31.9, G35, G37.0- G37.9, G40.0 – G40.919, G40.A- G40.A19, G40.B – G40.B19, F84.2, G91.0, G91.2, G93.1, G93.9, G94, R56.00, R56.9, R47.01
Chronic pulmonary disease	490-492.8, 494-494.1, 495.0-505, 506.4	J40, J41.0- J41.8, J42, J43.0 - J43.9, J44.0 - J44.9, J47.1 - J47.9, J60, J61, J62.0, J62.8, J63.0- J63.6, J64, J66.0- J66.8, J67.0 - J67.9, J68.4
Diabetes, uncomplicated	250.00-250.03	E10.9, E11.9,
Diabetes, complicated	250.10-250.93	E11.0 - E11.8, E10.0 - E10.8
Hypothyroidism	243-244.2, 244.8, 244.9	E00.9, E01.8, E03.0, E03.1, E03.2, E03.3, E03.4, E03.5, E03.8, E03.9, E89.0
Peptic ulcer disease excluding bleeding	531.41 - 531.91, 532.41 - 532.91, 533 - 533.91, 534.41 - 534.90, V12.71	K25.3, K25.4 - K25.9, K26.3 - K26.9, K27.3 -K27.9, K28.3 - K28.9, Z87.11
AIDS stands for acute immunodeficiency syndrome; GERD for gastroesophageal reflux disease; PCOS for polycystic ovarian syndrome		

**Table A1.2 – Comorbid conditions: ICD 9 CM and ICD 10 CM codes (continued)**

Renal failure	403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 585.1-585.9, 586, V42.0, V45.11, V45.12, V56.0-V56.2, V56.8	I12.0, I13.11, I13.2, N18.1, N18.2, N18.3, N18.4, N18.5, N18.6, N18.9, N19, Z49.01, Z49.02, Z49.31, Z49.32, Z91.15, Z94.0, Z99.2
Liver disease	070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 456.0, 456.1, 456.20, 456.21, 571.0, 571.2, 571.3, 571.40-571.49, 571.5, 571.6, 571.8, 571.9, 572.3, 572.8, V42.7	B18.0, B18.1, B18.2, B18.8, B18.9, I85.0, I85.00, I85.01, I85.1, I85.10, I85.11, 45.21, K70.0, K70.1, K70.10, K70.11, K70.2, K70.3, K70.30, K70.31, K70.4 - K70.41, K70.9, K72.0 - K72.9, K72.90, K72.91, K73.0 - K73.9, K74.0 - K74.6, K74.60, K74.69, K75.2 - K75.8, K75.81, K75.89, K75.9, K76.0 - K76.8, K76.81, K76.89, K76.9, Z94.4
AIDS	042-044.9	B20, B9735, R75, Z21
Lymphoma	200.00-202.38, 202.50-203.01, 203.8-203.81, 238.6, 273.3, V10.71, V10.72, V10.79	C81.0 - C81.99, C82.0 - C82.99, C83.0 - C83.99, C90.0 - C90.32, D47.Z9, Z85.71, Z85.79,
Metastatic cancer	196.0-199.1	C77.0 - C77.9, C78.0 - C78.89, C79.0 - C79.9, C80.0, C80.1, C80.2
Solid tumor without metastasis	140.0-172.9, 174.0-175.9, 179-195.8, V10.00-V10.59, V10.81- V10.9	C00.0 - C00.8, C01, C02, C02.1 - C02.9, C03.0, C03.1, C03.9, C04.0 - C04.9, C05.0 - C05.9, C06.0 - C06.9, C07, C08, C08.9, C09.0 - C09.9, C10.0 - C10.9, C11.0 - C11.9, C13.0 - C13.9, C14.0 - C14.8, C15.3 - C15.9, C16.0 - C16.9, C17.0 - C17.9, C18.0 - C18.9, C19, C20, C21.0 - C21.8, C22.0 - C22.9, C23, C24.0 - C24.9, C25.0 - C25.9, C26.0 - C26.9, C30.0 - C30.9, C31.0 - C31.9, C32.0 - C32.9, C33, C34.00 - C34.90, C37, C38.0 - C38.8, C39.0 - C39.9, C41.0 - C41.9, C43.0 - C43.9, C48.0 - C48.2, C49.0 - C49.9, C50.019 - C50.929, C51.0 - C51.9, C52, C53.0 - C53.9, C54.1- C54.9, C55, C56.0 - C56.9, C57.00- C57.9, C58, C60.0 - C60.9, C61, C62.00 - C62.90, C63.0- C63.9, C64.1 - C64.9, C67.0 - C67.9, C69.10 - C69.90, C71.0 - C71.9, C72.0 - C72.9, C73, C75.0 - C75.9, C76.1 - C76.9, Z85.0 - Z85.9 (Except Z85.71, Z85.79)
Rheumatoid arthritis/collagen vascular diseases	701.0, 710.0-710.9, 714.0-714.9, 720.0-720.9, 725	L90.0, L94.0 - L94.9, M05.0 - M05.9, M06.0 - M06.9, M08.0 - M08.9, M12.0 - M12.9, M32.0, M32.1, M32.10 - M32.19, M32.8, M32.9, M33.0- M33.09, M33.1, M33.10 - M33.19, M33.2, M33.20 - M33.29, M33.9, M33.90 -M33.99, M34.0 - M34.8, M34.81-M34.89, M34.9, M35.00 - M35.09, M35.1 - M35.9, M45.0 - M45.9, M46.0 - M46.9
AIDS stands for acute immunodeficiency syndrome; GERD for gastroesophageal reflux disease; PCOS for polycystic ovarian syndrome		

**Table A1.2 – Comorbid conditions: ICD 9 CM and ICD 10 CM codes (continued)**

Coagulopathy	286.0-286.9, 287.1-287.5, 289.81	D65, D66, D67, D68.0, D68.1 - D68.9, D69.1 - D69.9
Weight loss	260-263.9	E40, E41, E42, E43, E44.0, E44.1, E45, E46,
Fluid and electrolyte disorders	276.0-276.9	E86.0, E86.1, E86.9, E87.0 - E87.7, E87.70, E87.71, E87.79, E87.8
Blood loss anemia	2800, 648.20-648.24	D50.0, O99.011, O99.012, O99.013, O99.02, O99.019, O99.03, O90.81
Deficiency anemias	280.1-281.9, 285.2-285.29, 285.9	D50.8, D50.1 - D50.9, D51.0 - D51.9, D52.0 - D52.9, D53.0 - D53.9, D63.0 - D63.8, D64.0-D64.9
Alcohol abuse	291.0-291.9, 303.00- 303.93, 305.00-305.03, V113	F10.1, F10.10 - F10.29, F10.920, F10.921, F10.929, F10.94, F10.95, F10.950, F10.951, F10.959, F10.96, F10.97, F10.98, F10.980 - F10.982, F10.988, F10.99, Z65.8
Drug abuse	292.0 - 292.9, 304.00-304.93, 305.20-305.93, 648.30 - 648.34	F11.1 - F11.9, F12.1 - F12.9, F13.1 - F13.9, F14.1- F14.9, F15.1 - F15.9, F16.1 - F16.9, F18.1 -F18.9, F19.x - F19.9, O99.320 - O99.325,
Psychoses	295.00-298.9, 299.10, 299.11	F20.0 - F20.9, F22, F23, F24, F25.0 - F25.9, F28, F29, F30.1- F30.9, F44.0- F44.9, F84.3
Depression	300.4, 301.12, 309.0, 309.1, 311	F34.1, F43.21, F32.9, F33.0 - F33.9, 9
Obesity	278.00 - 278.03, 649.10 - 649.13,	E66.9, E66.01, E66.2, O99.210 -O99.215, Z13.89
Sinusitis	461.0 - 461.9, 473.0-473.9	J01.00 - J01.90, J32.0 - J32.9
Rhinitis	472.0 - 477.9	J31.0 - J30.9
Nasal polyps	471.0, 471.8, 471.9	J33.0, J33.8, J33.9
GERD	530.11, 530.81	K21.0, K21.9
Sleep apnea	780.57, 786.03, 327.23	G47.30, R06.81, G4.33
PCOD	256.4	E28.2
Crohn's disease	555.0- 555.9	K50.0 – K50.919
Ulcerative Colitis	556.0 - 556.9	K51.0 – K51.919



**Table A1.3 – Other conditions: ICD 9 CM and ICD 10 CM codes for Pregnancy and Menopause**

	ICD9:	ICD 10
Menopause	256.31; 627.0 - 627.9	E2.831.0, E2.831.9, E2.839, N92.4, N95.0-N95.9, Z79.890
Pregnancy without complication	633.01, V61.6, V61.7, V72.42	O30.x, O30.xx, O30.xxx, Z32.01, Z33.x, Z34.x, Z34.xx, Z39.x,
Pregnancy with complications	633.10 - 633.91, 640.80 - 640.93, 643.20 - 643.93, 645.xx - 649.xx, 651.xx, 653.xx to 656.xx, 659.40, 659.41, 659.43, 664.xx to 665.xx, 671.xx, 674.00, 674.20, 677, 760.xx - 761.xx, 779.6	O00.x, O0.x, O0.xx, O0.xxx, O0.xxxx, O01.x, O02.x, O02.xx, O03.x, O03.xx, O04.x, O04.xx, O07.xx, Z3.32, O08.x, O08.xx, O09.x, O09.xx, O09.xxx, O12.x, O12.xx, O21.x, O22.xx, O23.x, O23.xx, O23.xxx, O25.x, O25.xx, O26.x, O26.xx, O26.xxx, O28.x, O29.x, O29.xx, O29.xxx, O31.x, O31.xx, O31.xxx, O34.x, O34.xx, O34.xxx, O35.x, O35.xx, O35.xxx, O36.x, O36.xx, O36.xxx, O43.x, O43.xx, O43.xxx, O88.x, O88.xx, O88.xxx, O91.x, O91.xx, O91.xxx, O92.x, O92.xx, O92.xxx, O98.x, O98.xx, O98.xxx, O99.x, O99.xx, O99.xxx, O9A.x, O9A.xx, O9A.xxx, Z37.x, Z37.xx, Z3A.49, O20.x, O44.x, O44.xx, O45.x, O45.xx, O45.xxx, O46.x, O46.xx, O46.xxx, O10.x, O10.xx, O10.xxx, O11.x, O13.x, O14.x, O14.xx, O15.x, O15.xx, O16.x, O47.x, O47.xx, O60.x, O60.xx, O48.x, O24.x, O24.xx, O24.xxx, O99.x, O99.xx, O99.xxx, A34, O25.x, O25.xx, O26.x, O26.xx, O26.xxx, O35.x, O35.4xxx, O35.6xxx, O35.7xxx, O35.8xxx, O36.4xxx, O61.x, O71.x, O71.xx, O72.x, O73.x, O74.x, O75.x, O75.xx, O76, O77.0, O82, O85, O86.x, O86.xx, O87.x, O88.x, O88.xx, O88.xxx, O89.x, O89.xx, O90.x, O90.xx, O91.x, O91.xx, O91.xxx, O92.x, O92.xx, O92.xxx, O94, O98.x, O98.xx, O99.x, O99.xx, O99.xxx, O9A.x, O9A.xx, O9A.xxx, Z37.0