Online Supplement

Table S1. Search Strategy for identification of studies reporting the validity of ICD-10 codes for identification of patients with pulmonary embolism

((PTE[TI] OR "Pulmonary Embolism"[MAJR] OR "Pulmonary Embolism"[TI] OR "Pulmonary embolus"[TI] OR "Pulmonary Embolism/etiology"[MAJR] OR "Pulmonary Embolism/diagnosis"[MAJR] OR "Pulmonary Embolism/diagnosis"[MAJR] OR (pulmonar*[TI] AND (thrombos*[TI] OR thrombot*[TI] OR thromboem*[TI] OR emboli*[TI] OR "Thrombosis"[Mesh] OR "Embolism"[Mesh]))) OR ((deep*[TI] AND (vein*[TI] OR venous*[TI] OR "Veins"[Mesh]) AND (thrombos*[TI] OR thrombot*[TI] OR thromboem*[TI] OR emboli*[TI] OR "Thrombosis"[Mesh])) OR ("deep vein thrombosis"[TI] OR "deep venous thrombosis"[TI] OR "DVT*"[TI])) OR (VTE[TI] OR "Venous Thromboembolism"[TI] OR "Venous Thromboembolism"[TI] OR "Venous Thrombosis"[TI] OR ((vein*[TI] OR venous*[TI] OR "Veins"[Mesh])) AND (thrombos*[TI] OR thromboem*[TI] OR emboli*[TI] OR "Thrombosis"[Mesh])))) AND (("International Classification of Diseases"[Mesh] AND 10) OR "ICD-10" OR "ICD 10")

Diagnostic Procedures B325	Table S2. Examples of	Table S2. Examples of CPT/ICD-10 codes for diagnostic or therapeutic procedures*				
B32S Computerized Tomography (CT Scan) of Right Pulmonary Artery using High Osmolar Contrast B32S0ZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using High Osmolar Contrast B32S1ZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Low Osmolar Contrast B32SYZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Right Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Material(S), Including Noncontrast Images, if Performed, And Image Postprocessing CT CT 70498 Computed Tomography (CT) scan Abdomen with contrast material Computed Tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging		Codes	Definition			
Right Pulmonary Artery using High Osmolar Contrast B3250ZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using High Osmolar Contrast B3251ZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Low Osmolar Contrast B325YZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast B325YZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast B327 Computerized Tomography (CT Scan) of Right Pulmonary Artery using High Osmolar Contrast B3270ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B3271ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B3271ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast (Computed Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast (Computed Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast (Computed Tomography (CT) Scan) of Left Pulmonary Artery using Other Contrast (Computed Tomography (CT) Scan chest with contrast material (S), including Noncontrast images, if performed, and image postprocessing Ventilation/ Ventilation/ Ventilation/	Diagnostic Procedures					
Right Pulmonary Artery using High Osmolar Contrast B3251ZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Low Osmolar Contrast B325YZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast B325ZZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computed Tomography (CT Scan) of Left Pulmonary Artery T1275 Computed Tomography (CT Scan) of Left Pulmonary Artery Computed Tomography (CT Scan) of Left Pulmonary Artery Computed Tomography (CT Scan) of Left Pulmonary Artery T1275 Computed Tomography (CT Scan) of Left Pulmonary Artery Computed Tomography (CT) scan chest with contrast material T4160 Computed Tomography (CT) scan chest with contrast material T4860 Computed Tomography (CT) scan chest with contrast material T4860 Computed Tomography (CT) scan chest with contrast material T4860 Computed Tomography (CT) scan chest with contrast material T4860 Computed Tomography (CT) scan chest with contrast material T4860 Computed Tomography (CT) scan chest with contrast		B32S	Right Pulmonary Artery using High			
Right Pulmonary Artery using Low Osmolar Contrast B32SYZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Contrast B32SZZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery using Other Computerized Tomography (CT Scan) of Right Pulmonary Artery Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32TOZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast B32TZZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomography (CT Scan) of Left Pulmonary Artery Computed Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomography (CT Scan) of Left Pulmonary Artery Computed Tomography (CT) Scan Abdomen with Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Computed Tomography (CT) Scan Abdomen with Contrast material 74160 Pulmonary Perfusion perfusion imaging		B32S0ZZ	Right Pulmonary Artery using High			
Right Pulmonary Artery using Other Contrast B32SZZZ Computerized Tomography (CT Scan) of Right Pulmonary Artery B32T Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T0ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, if Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed Tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		B32S1ZZ	Right Pulmonary Artery using Low			
Right Pulmonary Artery B32T Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T0ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast B32TZZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomography (CT Scan) of Left Pulmonary Artery Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 74160 Computed Tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		B32SYZZ	Right Pulmonary Artery using Other			
CTPA B32T0ZZ B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using High Osmolar Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan Abdomen with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed Tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging		B32SZZZ				
Left Pulmonary Artery using High Osmolar Contrast B32T1ZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast B32TZZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging		B32T	Left Pulmonary Artery using High			
Left Pulmonary Artery using Low Osmolar Contrast B32TYZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery using Other Contrast B32TZZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 7498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		B32T0ZZ	Left Pulmonary Artery using High			
Left Pulmonary Artery using Other Contrast B32TZZZ Computerized Tomography (CT Scan) of Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		B32T1ZZ	Left Pulmonary Artery using Low Osmolar			
Left Pulmonary Artery 71275 Computed Tomographic Angiography, Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		B32TYZZ	Left Pulmonary Artery using Other			
Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image Postprocessing 71260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging		B32TZZZ				
T1260 Computed Tomography (CT) scan chest with contrast material 74160 Computed Tomography (CT) scan Abdomen with contrast material 70498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ 78580 ⁵⁴ Pulmonary perfusion perfusion imaging		71275	Chest (Noncoronary), With Contrast Material(S), Including Noncontrast Images, If Performed, And Image			
CT Abdomen with contrast material Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging	СТ	71260	Computed Tomography (CT) scan chest			
70498 Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing Ventilation/ Pulmonary perfusion perfusion imaging		74160	Computed Tomography (CT) scan			
Ventilation/ Pulmonary perfusion perfusion imaging		70498	neck, with contrast material(s), including noncontrast images, if performed, and			
	Ventilation/	78580 ⁵⁴				
	perfusion imaging	78582 ⁵⁴	Pulmonary ventilation (eg, aerosol or gas)			

		and
		perfusion imaging
	78584 ⁵⁴	Pulmonary perfusion with vent single
		breath
		(Deleted code effective Jan 1, 2012)
	78585 ⁵⁴	Pulmonary perfusion w/ washout, w or
		w/o single breath
		(Deleted code effective Jan 1, 2012)
	78588 ⁵⁵	Pulmonary perfusion imaging,
		particulate, with ventilation; rebreathing
		and washout, with or without single
		breath
		(Deleted code effective Jan 1, 2012)
	78598	Quantitative differential pulmonary
		perfusion and ventilation (eg, aerosol or
	7574454	gas), including imaging when performed
	75741 ⁵⁴	Angiography, pulmonary, unilateral,
		selective, radiological supervision and
	75743 ⁵⁴	interpretation Angiography, pulmonary, bilateral,
	73743	selective, radiological supervision, and
Pulmonary		interpretation
angiography	75746 ⁵⁴	Angiography, pulmonary by nonselective
a8.08.0p/	737.10	catheter or venous injection, radiological
		supervision and interpretation
	75746 ⁵⁴	Angiography, pulmonary by nonselective
		catheter or venous injection, radiological
		supervision and interpretation
Therapeutic procedur		
	3E03317 ⁵⁶	Introduction of Other Thrombolytic into
	T.C.	Peripheral Vein, Percutaneous Approach
	3E04017 ⁵⁶	Introduction of Other Thrombolytic into
Systemic thrombolysis	56	Central Vein, Open Approach
	3E04317 ⁵⁶	Introduction of Other Thrombolytic into
	702 02 57. 58	Central Vein, Percutaneous Approach
	Z92.82 ^{57, 58}	Status post administration of tPA (rtPA) in
		a different facility within the last 24 hours prior to admission to current facility
IVC filter	06H03DZ	Insertion of Intraluminal Device into
	00110302	Inferior Vena Cava, Percutaneous
		Approach
	06H00DZ	Insertion of Intraluminal Device into
		Inferior Vena Cava, Open Approach
	06V03DZ	Restriction of Inferior Vena Cava with
		Intraluminal Device, Percutaneous
		Approach
	06V00DZ	Restriction of Inferior Vena Cava with

		Intraluminal Device, Open Approach
	37191 ⁵⁹	
	3/191	Other Transcatheteral Procedures (IVC
		filter placement)
	3E06017 ⁵⁶	Introduction of Other Thrombolytic into
	T.C.	Central Artery, Open Approach
	3E06317 ⁵⁶	Introduction of Other Thrombolytic into
		Central Artery, Percutaneous Approach
	3E03017	Introduction of other thrombolytic into
Cathotor directed		peripheral vein, open approach
Catheter-directed	3E03317	Introduction of other thrombolytic into
therapies		peripheral vein, percutaneous approach
	37201 ⁶⁰	Transcatheter Arterial Infusion for
	5.252	Thrombolysis
		(Deleted code effective Jan 1, 2013)
	37211 ⁶⁰	Transcatheter therapy, arterial infusion
	3/211	for thrombolysis other than coronary
	0200077	
	02CQ0ZZ	Extirpation of Matter from Right
		Pulmonary Artery, Open Approach
	02CR0ZZ	Extirpation of Matter from Left
Surgical		Pulmonary Artery, Open Approach
embolectomy	33910 ⁶¹	Pulmonary artery embolectomy
	33915 ⁶²	Pulmonary artery embolectomy
	33916 ⁶¹	Surgical Procedures on the Pulmonary
		Artery
	02CP3ZZ	Extirpation of Matter from Pulmonary
		Trunk, Percutaneous Approach
	02CQ3ZZ	Extirpation of Matter from Right
	0-0-0-0-0	Pulmonary Artery, Percutaneous
		Approach
	02CR3ZZ	Extirpation of Matter from Left
	UZCKSZZ	
		Pulmonary Artery, Percutaneous
	0=40.460	Approach
	37184 ⁶⁰	Primary percutaneous transluminal
Percutaneous		mechanical thrombectomy, noncoronary,
embolectomy		arterial or arterial bypass graft, including
		fluoroscopic guidance and
		intraprocedural pharmacological
		thrombolytic injection(s)
	37184 ⁶⁰	Primary percutaneous transluminal
		mechanical thrombectomy, noncoronary,
		arterial or arterial bypass graft, including
		fluoroscopic guidance and
		intraprocedural pharmacological
		thrombolytic injection(s)
Extracorporeal	5A1522F	Extracorporeal Oxygenation, Membrane,
Membrane	5/(15/2)	Central
	EA1532C	
Oxygenation (ECMO)	5A1522G	Extracorporeal Oxygenation, Membrane,

		Peripheral Veno-arterial
	5A1522H	Extracorporeal Oxygenation, Membrane, Peripheral Veno-venous
	33946	Extracorporeal membrane oxygenation (ECMO)/ extracorporeal life support (ECLS) provided by physician; initiation, veno-venous
	33947	Extracorporeal membrane oxygenation (ECMO)/ extracorporeal life support (ECLS) provided by physician; initiation, veno-arterial.
	33948	Extracorporeal membrane oxygenation (ECMO)/ extracorporeal life support (ECLS) provided by physician; daily management, each day, veno-venous.
	33952	Extracorporeal membrane oxygenation (ECMO)/ extracorporeal life support (ECLS) provided by physician; insertion of peripheral (arterial and/or venous) cannula(e), percutaneous, 6 years and older (includes fluoroscopic guidance, when performed)
	33954	Extracorporeal membrane oxygenation (ECMO)/ extracorporeal life support (ECLS) provided by physician; insertion of peripheral (arterial and/or venous) cannula(e), open, 6 years and older.