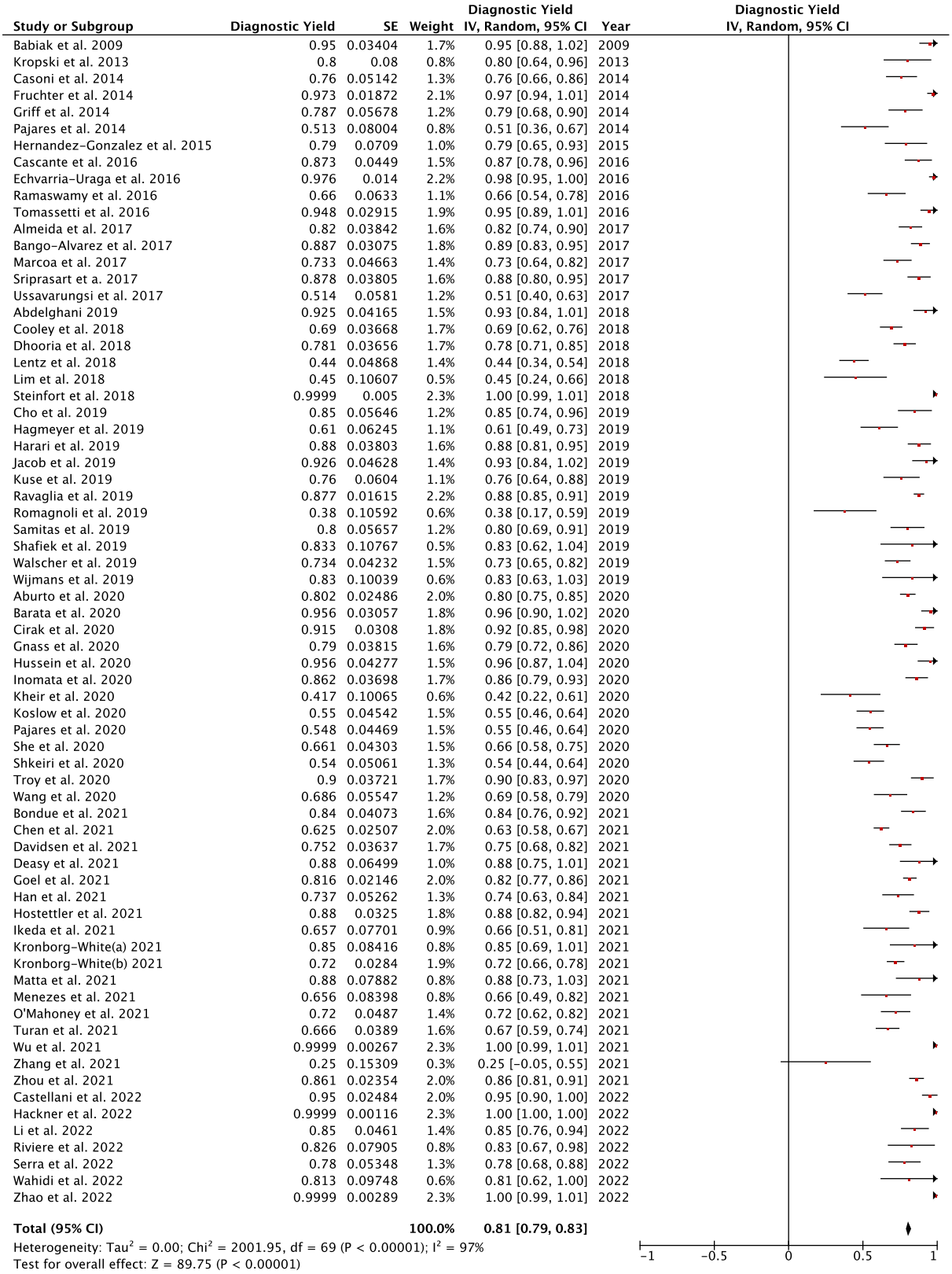
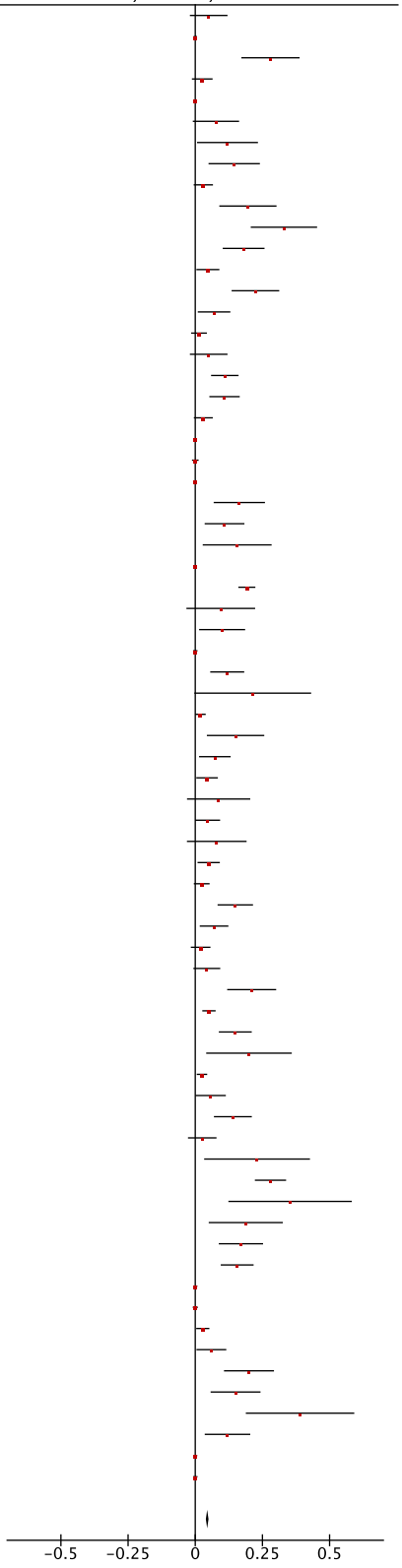
Supplementary Figure 1: Diagnostic Yield



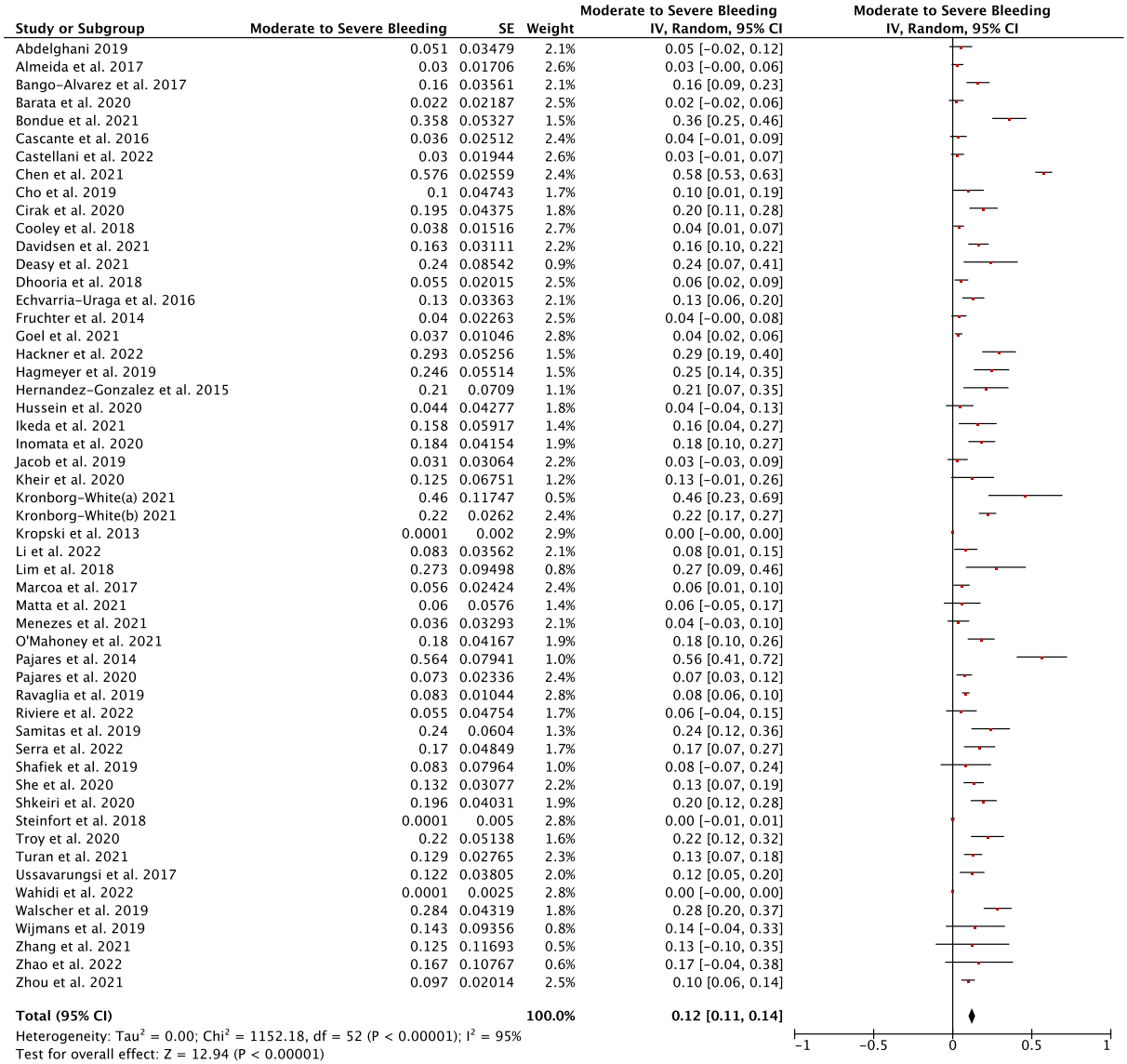
Supplementary Figure 2: Incidence of Pneumothorax

Study or Subgroup	Pneumothorax	SE	Weight	Pneumothorax IV, Random, 95% CI	Year
Babiak et al. 2009	0.05	0.03446	0.8%	0.05 [-0.02, 0.12]	2009
Kropski et al. 2013	0.0001	0.002	3.7%	0.00 [-0.00, 0.00]	2013
Casoni et al. 2014	0.28	0.05405	0.4%	0.28 [0.17, 0.39]	2014
Fruchter et al. 2014	0.026	0.01838	1.8%	0.03 [-0.01, 0.06]	2014
Griff et al. 2014	0.0001	0.00139	3.7%	0.00 [-0.00, 0.00]	2014
Pajares et al. 2014	0.077	0.04269	0.5%	0.08 [-0.01, 0.16]	2014
Hernandez-Gonzalez et al. 2015	0.12	0.05657	0.3%	0.12 [0.01, 0.23]	2015
Cascante et al. 2016	0.145	0.04748	0.5%	0.14 [0.05, 0.24]	2016
Echvarria-Uraga et al. 2016	0.03	0.01706	1.9%	0.03 [-0.00, 0.06]	2016
Ramaswamy et al. 2016	0.196	0.05305	0.4%	0.20 [0.09, 0.30]	2016
Tomassetti et al. 2016	0.33	0.06174	0.3%	0.33 [0.21, 0.45]	2016
Almeida et al. 2017	0.18	0.03842	0.7%	0.18 [0.10, 0.26]	2017
Bango-Alvarez et al. 2017	0.047	0.02056	1.6%	0.05 [0.01, 0.09]	2017
Marcoa et al. 2017	0.224	0.04395	0.5%	0.22 [0.14, 0.31]	2017
Sriprasart et a. 2017	0.07	0.02966	1.0%	0.07 [0.01, 0.13]	2017
Ussavarungsi et al. 2017	0.014	0.01366	2.3%	0.01 [-0.01, 0.04]	2017
Abdelghani 2019	0.05	0.03446	0.8%	0.05 [-0.02, 0.12]	2018
Cooley et al. 2018	0.11	0.02481	1.3%	0.11 [0.06, 0.16]	2018
Dhooria et al. 2018	0.109	0.02755	1.1%	0.11 [0.06, 0.16]	2018
Lentz et al. 2018	0.03	0.01673	2.0%	0.03 [-0.00, 0.06]	2018
Lim et al. 2018	0.0001	0.00213	3.7%	0.00 [-0.00, 0.00]	2018
Steinfort et al. 2018	0.0001	0.005	3.5%	0.00 [-0.01, 0.01]	2018
Cho et al. 2019	0.0001	0.00158	3.7%	0.00 [-0.00, 0.00]	2019
Hagmeyer et al. 2019	0.164	0.04741	0.5%	0.16 [0.07, 0.26]	2019
Harari et al. 2019	0.109	0.03648	0.7%	0.11 [0.04, 0.18]	2019
Jacob et al. 2019	0.156	0.06414	0.3%	0.16 [0.03, 0.28]	2019
Kuse et al. 2019	0.0001	0.00141	3.7%	0.00 [-0.00, 0.00]	2019
Ravaglia et al. 2019	0.192	0.0149	2.2%	0.19 [0.16, 0.22]	2019
Romagnoli et al. 2019	0.095	0.06399	0.3%	0.10 [-0.03, 0.22]	2019
Samitas et al. 2019	0.1	0.04243	0.6%	0.10 [0.02, 0.18]	2019
Shafiek et al. 2019	0.0001	0.00289	3.6%	0.00 [-0.01, 0.01]	2019
Walscher et al. 2019	0.119	0.03101	0.9%	0.12 [0.06, 0.18]	2019
Wijmans et al. 2019	0.214	0.10961	0.1%	0.21 [-0.00, 0.43]	2019
Aburto et al. 2020	0.0195	0.00863	3.0%	0.02 [0.00, 0.04]	2020
Barata et al. 2020	0.15	0.05323	0.4%	0.15 [0.05, 0.25]	2020
Cirak et al. 2020	0.073	0.02873	1.0%	0.07 [0.02, 0.13]	2020
Gnass et al. 2020	0.044	0.01921	1.7%	0.04 [0.01, 0.08]	2020
Hussein et al. 2020	0.087	0.05877	0.3%	0.09 [-0.03, 0.20]	2020
Inomata et al. 2020	0.046	0.02246	1.4%	0.05 [0.00, 0.09]	2020
Kheir et al. 2020	0.08	0.05538	0.3%	0.08 [-0.03, 0.19]	2020
Koslow et al. 2020	0.05	0.0199	1.7%	0.05 [0.01, 0.09]	2020
Pajares et al. 2020	0.024	0.01374	2.3%	0.02 [-0.00, 0.05]	2020
She et al. 2020	0.149	0.03237	0.9%	0.15 [0.09, 0.21]	2020
Shkeiri et al. 2020	0.07	0.02591	1.2%	0.07 [0.02, 0.12]	2020
Troy et al. 2020	0.02	0.01737	1.9%	0.02 [-0.01, 0.05]	2020
Wang et al. 2020	0.043	0.02425	1.3%	0.04 [-0.00, 0.09]	2020
Bondue et al. 2021	0.21	0.04526	0.5%	0.21 [0.12, 0.30]	2021
Chen et al. 2021	0.051	0.01139	2.6%	0.05 [0.03, 0.07]	2021
Davidsen et al. 2021	0.149	0.02999	1.0%	0.15 [0.09, 0.21]	2021
Deasy et al. 2021	0.2	0.08	0.2%	0.20 [0.04, 0.36]	2021
Goel et al. 2021	0.025	0.00865	3.0%	0.03 [0.01, 0.04]	2021
Han et al. 2021	0.057	0.02771	1.1%	0.06 [0.00, 0.11]	2021
Hostettler et al. 2021	0.14	0.0347	0.8%	0.14 [0.07, 0.21]	2021
Ikeda et al. 2021	0.026	0.02582	1.2%	0.03 [-0.02, 0.08]	2021
Kronborg-White(a) 2021	0.23	0.09919	0.1%	0.23 [0.04, 0.42]	2021
Kronborg-White(b) 2021	0.28	0.0284	1.0%	0.28 [0.22, 0.34]	2021
Matta et al. 2021	0.353	0.11591	0.1%	0.35 [0.13, 0.58]	2021
Menezes et al. 2021	0.188	0.06907	0.2%	0.19 [0.05, 0.32]	2021
O'Mahoney et al. 2021	0.17	0.04074	0.6%	0.17 [0.09, 0.25]	2021
Turan et al. 2021	0.156	0.02993	1.0%	0.16 [0.10, 0.21]	2021
Wu et al. 2021	0.0001	0.00267	3.7%	0.00 [-0.01, 0.01]	2021
Zhang et al. 2021	0.0001	0.00354	3.6%	0.00 [-0.01, 0.01]	2021
Zhou et al. 2021	0.028	0.01123	2.7%	0.03 [0.01, 0.05]	2021
Castellani et al. 2022	0.06	0.02706	1.1%	0.06 [0.01, 0.11]	2022
Hackner et al. 2022	0.2	0.04619	0.5%	0.20 [0.11, 0.29]	2022
Li et al. 2022	0.15	0.0461	0.5%	0.15 [0.06, 0.24]	2022
Riviere et al. 2022	0.39	0.1017	0.1%	0.39 [0.19, 0.59]	2022
Serra et al. 2022	0.12	0.04195	0.6%	0.12 [0.04, 0.20]	2022
Wahidi et al. 2022	0.0001	0.0025	3.7%	0.00 [-0.00, 0.00]	2022
Zhao et al. 2022	0.0001	0.00289	3.6%	0.00 [-0.01, 0.01]	2022
Total (95% CI)			**100.0%**	**0.05 [0.04, 0.05]**	

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 799.78$, df = 69 ($P < 0.00001$); $I^2 = 91\%$
Test for overall effect: $Z = 13.87$ ($P < 0.00001$)

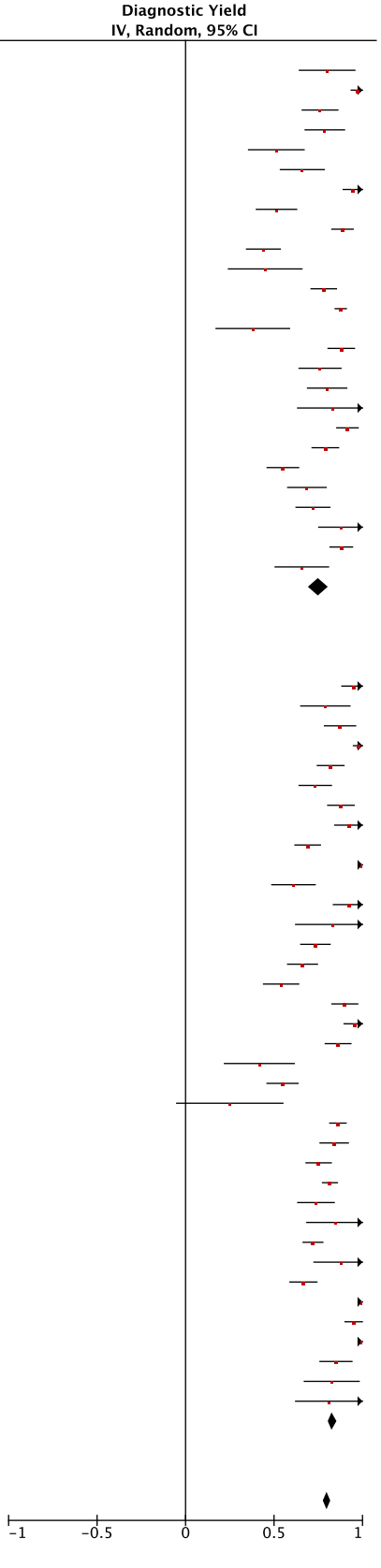


Supplementary Figure 3: Moderate-severe Bleeding



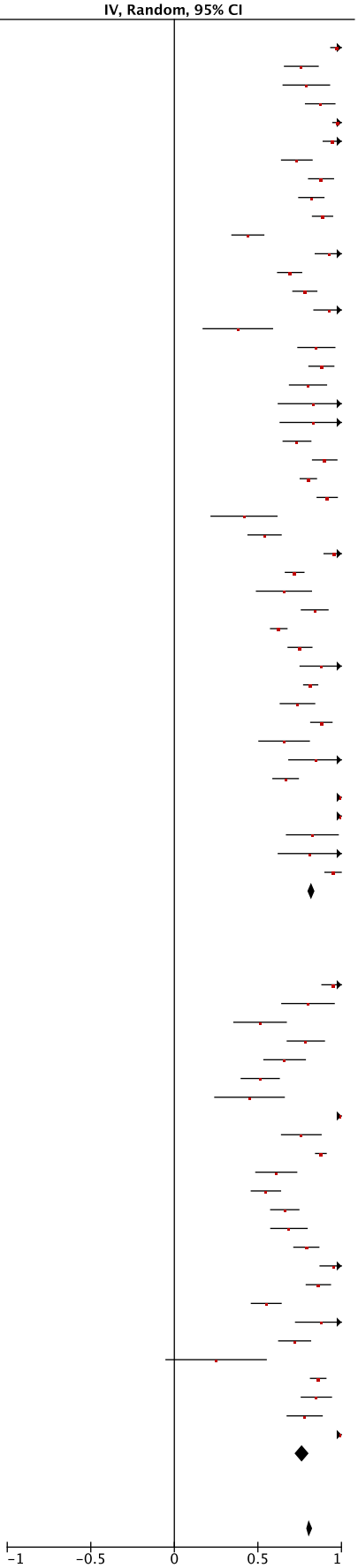
Supplementary Figure 4: Diagnostic Yield by GA vs sedation

Study or Subgroup	Diagnostic Yield	SE	Weight	Diagnostic Yield IV, Random, 95% CI	Year
8.1.1 Sedation					
Kropski et al. 2013	0.8	0.08	1.0%	0.80 [0.64, 0.96]	2013
Fruchter et al. 2014	0.973	0.01872	2.2%	0.97 [0.94, 1.01]	2014
Casoni et al. 2014	0.76	0.05142	1.5%	0.76 [0.66, 0.86]	2014
Griff et al. 2014	0.787	0.05678	1.4%	0.79 [0.68, 0.90]	2014
Pajares et al. 2014	0.513	0.08004	1.0%	0.51 [0.36, 0.67]	2014
Ramaswamy et al. 2016	0.66	0.0633	1.3%	0.66 [0.54, 0.78]	2016
Tomassetti et al. 2016	0.948	0.02915	2.0%	0.95 [0.89, 1.01]	2016
Ussavarungsi et al. 2017	0.514	0.0581	1.4%	0.51 [0.40, 0.63]	2017
Bango-Alvarez et al. 2017	0.887	0.03075	2.0%	0.89 [0.83, 0.95]	2017
Lentz et al. 2018	0.44	0.04868	1.6%	0.44 [0.34, 0.54]	2018
Lim et al. 2018	0.45	0.10607	0.7%	0.45 [0.24, 0.66]	2018
Dhooria et al. 2018	0.781	0.03656	1.9%	0.78 [0.71, 0.85]	2018
Ravaglia et al. 2019	0.877	0.01615	2.3%	0.88 [0.85, 0.91]	2019
Romagnoli et al. 2019	0.38	0.10592	0.7%	0.38 [0.17, 0.59]	2019
Harari et al. 2019	0.88	0.03803	1.8%	0.88 [0.81, 0.95]	2019
Kuse et al. 2019	0.76	0.0604	1.3%	0.76 [0.64, 0.88]	2019
Samitas et al. 2019	0.8	0.05657	1.4%	0.80 [0.69, 0.91]	2019
Wijmans et al. 2019	0.83	0.10039	0.8%	0.83 [0.63, 1.03]	2019
Cirak et al. 2020	0.915	0.0308	2.0%	0.92 [0.85, 0.98]	2020
Gnass et al. 2020	0.79	0.03815	1.8%	0.79 [0.72, 0.86]	2020
Koslow et al. 2020	0.55	0.04542	1.7%	0.55 [0.46, 0.64]	2020
Wang et al. 2020	0.686	0.05547	1.4%	0.69 [0.58, 0.79]	2020
O'Mahoney et al. 2021	0.72	0.0487	1.6%	0.72 [0.62, 0.82]	2021
Deasy et al. 2021	0.88	0.06499	1.3%	0.88 [0.75, 1.01]	2021
Hostettler et al. 2021	0.88	0.0325	1.9%	0.88 [0.82, 0.94]	2021
Ikeda et al. 2021	0.657	0.07701	1.1%	0.66 [0.51, 0.81]	2021
Subtotal (95% CI)			**39.1%**	**0.75 [0.69, 0.80]**	
Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 307.16$, df = 25 ($P < 0.00001$); $I^2 = 92\%$					
Test for overall effect: $Z = 26.25$ ($P < 0.00001$)					
8.1.2 GA					
Babiak et al. 2009	0.95	0.03404	1.9%	0.95 [0.88, 1.02]	2009
Hernandez-Gonzalez et al. 2015	0.79	0.0709	1.2%	0.79 [0.65, 0.93]	2015
Cascante et al. 2016	0.873	0.0449	1.7%	0.87 [0.78, 0.96]	2016
Echvarria-Uraga et al. 2016	0.976	0.014	2.3%	0.98 [0.95, 1.00]	2016
Almeida et al. 2017	0.82	0.03842	1.8%	0.82 [0.74, 0.90]	2017
Marcoa et al. 2017	0.733	0.04663	1.6%	0.73 [0.64, 0.82]	2017
Sriprasart et a. 2017	0.878	0.03805	1.8%	0.88 [0.80, 0.95]	2017
Abdelghani 2019	0.925	0.04165	1.7%	0.93 [0.84, 1.01]	2018
Cooley et al. 2018	0.69	0.03668	1.9%	0.69 [0.62, 0.76]	2018
Steinfort et al. 2018	0.9999	0.005	2.4%	1.00 [0.99, 1.01]	2018
Hagmeyer et al. 2019	0.61	0.06245	1.3%	0.61 [0.49, 0.73]	2019
Jacob et al. 2019	0.926	0.04628	1.6%	0.93 [0.84, 1.02]	2019
Shafiek et al. 2019	0.833	0.10767	0.7%	0.83 [0.62, 1.04]	2019
Walscher et al. 2019	0.734	0.04232	1.7%	0.73 [0.65, 0.82]	2019
She et al. 2020	0.661	0.04303	1.7%	0.66 [0.58, 0.75]	2020
Shkeiri et al. 2020	0.54	0.05061	1.5%	0.54 [0.44, 0.64]	2020
Troy et al. 2020	0.9	0.03721	1.8%	0.90 [0.83, 0.97]	2020
Barata et al. 2020	0.956	0.03057	2.0%	0.96 [0.90, 1.02]	2020
Inomata et al. 2020	0.862	0.03698	1.8%	0.86 [0.79, 0.93]	2020
Kheir et al. 2020	0.417	0.10065	0.8%	0.42 [0.22, 0.61]	2020
Pajares et al. 2020	0.548	0.04469	1.7%	0.55 [0.46, 0.64]	2020
Zhang et al. 2021	0.25	0.15309	0.4%	0.25 [-0.05, 0.55]	2021
Zhou et al. 2021	0.861	0.02354	2.1%	0.86 [0.81, 0.91]	2021
Bondue et al. 2021	0.84	0.04073	1.8%	0.84 [0.76, 0.92]	2021
Davidsen et al. 2021	0.752	0.03637	1.9%	0.75 [0.68, 0.82]	2021
Goel et al. 2021	0.816	0.02146	2.2%	0.82 [0.77, 0.86]	2021
Han et al. 2021	0.737	0.05262	1.5%	0.74 [0.63, 0.84]	2021
Kronborg-White(a) 2021	0.85	0.08416	1.0%	0.85 [0.69, 1.01]	2021
Kronborg-White(b) 2021	0.72	0.0284	2.0%	0.72 [0.66, 0.78]	2021
Matta et al. 2021	0.88	0.07882	1.0%	0.88 [0.73, 1.03]	2021
Turan et al. 2021	0.666	0.0389	1.8%	0.67 [0.59, 0.74]	2021
Zhao et al. 2022	0.9999	0.00289	2.4%	1.00 [0.99, 1.01]	2022
Castellani et al. 2022	0.95	0.02484	2.1%	0.95 [0.90, 1.00]	2022
Hackner et al. 2022	0.9999	0.00116	2.4%	1.00 [1.00, 1.00]	2022
Li et al. 2022	0.85	0.0461	1.6%	0.85 [0.76, 0.94]	2022
Riviere et al. 2022	0.826	0.07905	1.0%	0.83 [0.67, 0.98]	2022
Wahidi et al. 2022	0.813	0.09748	0.8%	0.81 [0.62, 1.00]	2022
Subtotal (95% CI)			**60.9%**	**0.83 [0.81, 0.85]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 950.45$, df = 36 ($P < 0.00001$); $I^2 = 96\%$					
Test for overall effect: $Z = 72.99$ ($P < 0.00001$)					
Total (95% CI)			**100.0%**	**0.80 [0.78, 0.82]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1681.70$, df = 62 ($P < 0.00001$); $I^2 = 96\%$					
Test for overall effect: $Z = 75.70$ ($P < 0.00001$)					
Test for subgroup differences: $Chi^2 = 7.31$, df = 1 ($P = 0.007$), $I^2 = 86.3\%$					

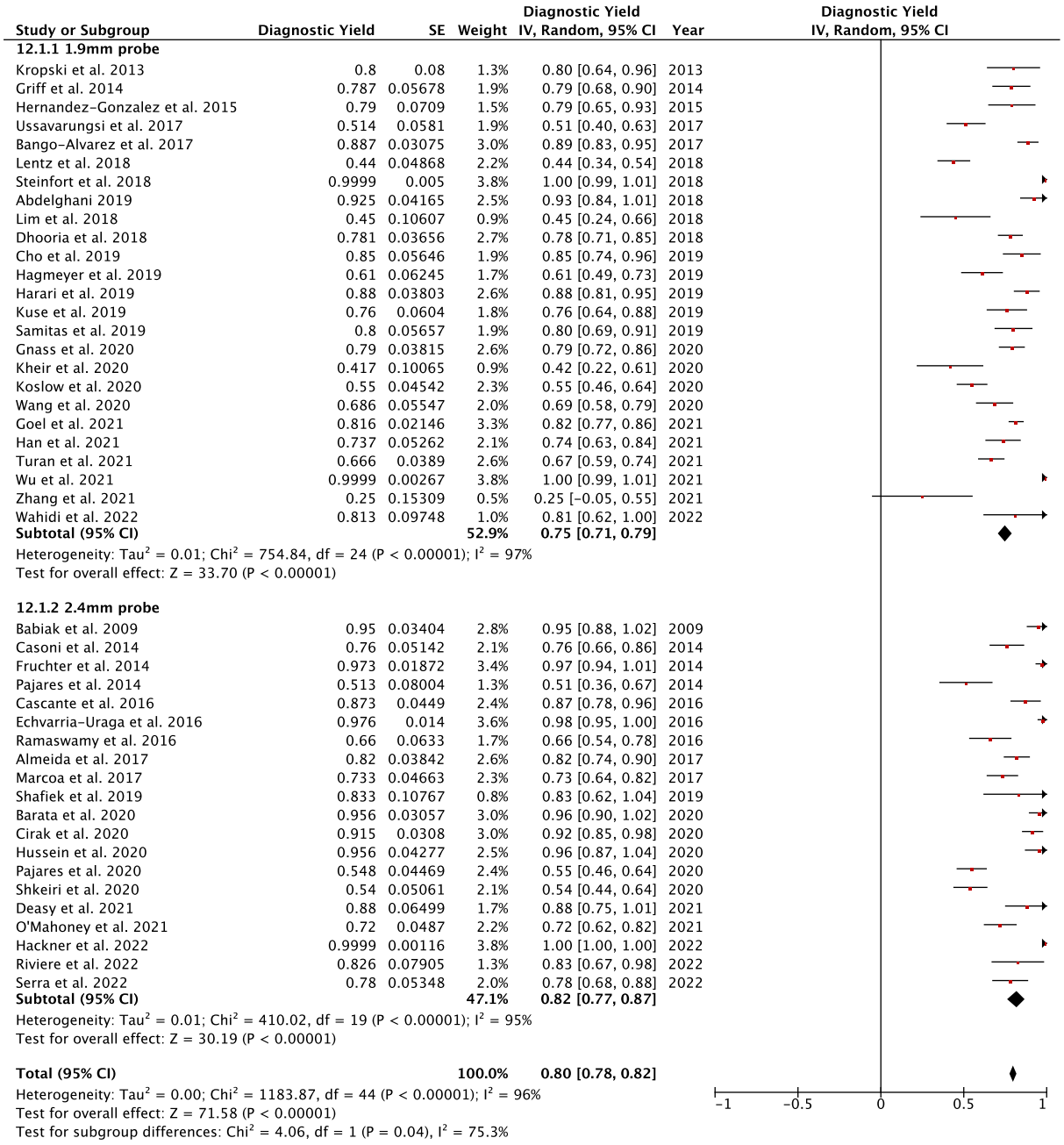


Supplementary Figure 5: Diagnostic Yield by ILD MDT prior to cryobiopsy vs no MDT

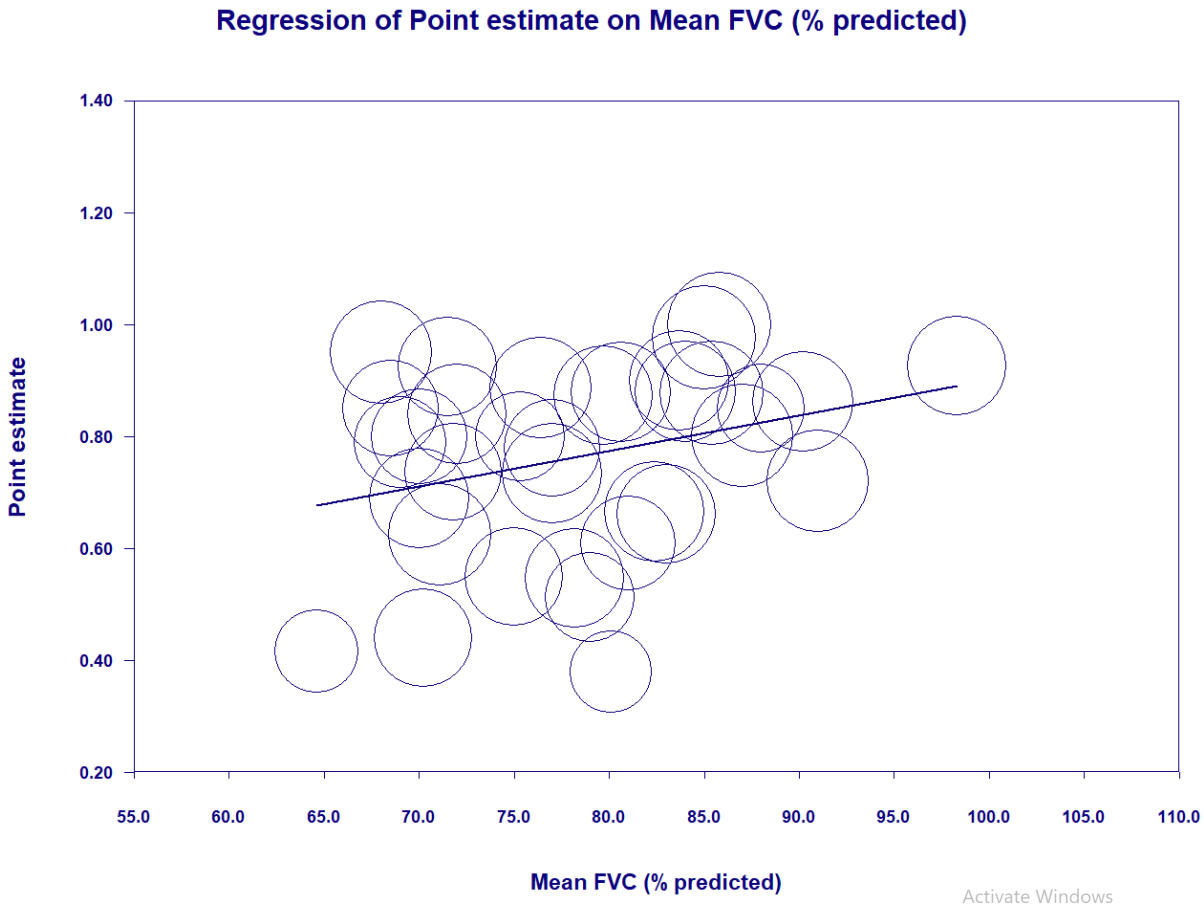
Study or Subgroup	Diagnostic Yield	SE	Weight	Diagnostic Yield IV, Random, 95% CI	Year
9.1.1 ILD MDT prior					
Fruchter et al. 2014	0.973	0.01872	2.1%	0.97 [0.94, 1.01]	2014
Casoni et al. 2014	0.76	0.05142	1.3%	0.76 [0.66, 0.86]	2014
Hernandez-Gonzalez et al. 2015	0.79	0.0709	1.0%	0.79 [0.65, 0.93]	2015
Cascante et al. 2016	0.873	0.0449	1.5%	0.87 [0.78, 0.96]	2016
Echvarria-Uraga et al. 2016	0.976	0.014	2.2%	0.98 [0.95, 1.00]	2016
Tomassetti et al. 2016	0.948	0.02915	1.9%	0.95 [0.89, 1.01]	2016
Marcoa et al. 2017	0.733	0.04663	1.4%	0.73 [0.64, 0.82]	2017
Sriprasart et a. 2017	0.878	0.03805	1.6%	0.88 [0.80, 0.95]	2017
Almeida et al. 2017	0.82	0.03842	1.6%	0.82 [0.74, 0.90]	2017
Bango-Alvarez et al. 2017	0.887	0.03075	1.8%	0.89 [0.83, 0.95]	2017
Lentz et al. 2018	0.44	0.04868	1.4%	0.44 [0.34, 0.54]	2018
Abdelghani 2019	0.925	0.04165	1.5%	0.93 [0.84, 1.01]	2018
Cooley et al. 2018	0.69	0.03668	1.7%	0.69 [0.62, 0.76]	2018
Dhooria et al. 2018	0.781	0.03656	1.7%	0.78 [0.71, 0.85]	2018
Jacob et al. 2019	0.926	0.04628	1.4%	0.93 [0.84, 1.02]	2019
Romagnoli et al. 2019	0.38	0.10592	0.6%	0.38 [0.17, 0.59]	2019
Cho et al. 2019	0.85	0.05646	1.2%	0.85 [0.74, 0.96]	2019
Harari et al. 2019	0.88	0.03803	1.6%	0.88 [0.81, 0.95]	2019
Samitas et al. 2019	0.8	0.05657	1.2%	0.80 [0.69, 0.91]	2019
Shafiek et al. 2019	0.833	0.10767	0.5%	0.83 [0.62, 1.04]	2019
Wijmans et al. 2019	0.83	0.10039	0.6%	0.83 [0.63, 1.03]	2019
Walscher et al. 2019	0.734	0.04232	1.5%	0.73 [0.65, 0.82]	2019
Troy et al. 2020	0.9	0.03721	1.7%	0.90 [0.83, 0.97]	2020
Aburto et al. 2020	0.802	0.02486	2.0%	0.80 [0.75, 0.85]	2020
Cirak et al. 2020	0.915	0.0308	1.8%	0.92 [0.85, 0.98]	2020
Kheir et al. 2020	0.417	0.10065	0.6%	0.42 [0.22, 0.61]	2020
Shkeiri et al. 2020	0.54	0.05061	1.3%	0.54 [0.44, 0.64]	2020
Barata et al. 2020	0.956	0.03057	1.8%	0.96 [0.90, 1.02]	2020
Kronborg-White(b) 2021	0.72	0.0284	1.9%	0.72 [0.66, 0.78]	2021
Menezes et al. 2021	0.656	0.08398	0.8%	0.66 [0.49, 0.82]	2021
Bondue et al. 2021	0.84	0.04073	1.6%	0.84 [0.76, 0.92]	2021
Chen et al. 2021	0.625	0.02507	2.0%	0.63 [0.58, 0.67]	2021
Davidsen et al. 2021	0.752	0.03637	1.7%	0.75 [0.68, 0.82]	2021
Deasy et al. 2021	0.88	0.06499	1.0%	0.88 [0.75, 1.01]	2021
Goel et al. 2021	0.816	0.02146	2.0%	0.82 [0.77, 0.86]	2021
Han et al. 2021	0.737	0.05262	1.3%	0.74 [0.63, 0.84]	2021
Hostettler et al. 2021	0.88	0.0325	1.8%	0.88 [0.82, 0.94]	2021
Ikeda et al. 2021	0.657	0.07701	0.9%	0.66 [0.51, 0.81]	2021
Kronborg-White(a) 2021	0.85	0.08416	0.8%	0.85 [0.69, 1.01]	2021
Turan et al. 2021	0.666	0.0389	1.6%	0.67 [0.59, 0.74]	2021
Wu et al. 2021	0.9999	0.00267	2.3%	1.00 [0.99, 1.01]	2021
Hackner et al. 2022	0.9999	0.00116	2.3%	1.00 [1.00, 1.00]	2022
Riviere et al. 2022	0.826	0.07905	0.8%	0.83 [0.67, 0.98]	2022
Wahidi et al. 2022	0.813	0.09748	0.6%	0.81 [0.62, 1.00]	2022
Castellani et al. 2022	0.95	0.02484	2.0%	0.95 [0.90, 1.00]	2022
Subtotal (95% CI)			**65.9%**	**0.82 [0.80, 0.84]**	
Heterogeneity: Tau² = 0.00; Chi² = 1270.41, df = 44 (P < 0.00001); I² = 97%					
Test for overall effect: Z = 69.44 (P < 0.00001)					
9.1.2 No MDT prior					
Babiak et al. 2009	0.95	0.03404	1.7%	0.95 [0.88, 1.02]	2009
Kropski et al. 2013	0.8	0.08	0.8%	0.80 [0.64, 0.96]	2013
Pajares et al. 2014	0.513	0.08004	0.8%	0.51 [0.36, 0.67]	2014
Griff et al. 2014	0.787	0.05678	1.2%	0.79 [0.68, 0.90]	2014
Ramaswamy et al. 2016	0.66	0.0633	1.1%	0.66 [0.54, 0.78]	2016
Ussavarungsi et al. 2017	0.514	0.0581	1.2%	0.51 [0.40, 0.63]	2017
Lim et al. 2018	0.45	0.10607	0.5%	0.45 [0.24, 0.66]	2018
Steinfort et al. 2018	0.9999	0.005	2.3%	1.00 [0.99, 1.01]	2018
Kuse et al. 2019	0.76	0.0604	1.1%	0.76 [0.64, 0.88]	2019
Ravaglia et al. 2019	0.877	0.01615	2.2%	0.88 [0.85, 0.91]	2019
Hagmeyer et al. 2019	0.61	0.06245	1.1%	0.61 [0.49, 0.73]	2019
Pajares et al. 2020	0.548	0.04469	1.5%	0.55 [0.46, 0.64]	2020
She et al. 2020	0.661	0.04303	1.5%	0.66 [0.58, 0.75]	2020
Wang et al. 2020	0.686	0.05547	1.2%	0.69 [0.58, 0.79]	2020
Gnass et al. 2020	0.79	0.03815	1.6%	0.79 [0.72, 0.86]	2020
Hussein et al. 2020	0.956	0.04277	1.5%	0.96 [0.87, 1.04]	2020
Inomata et al. 2020	0.862	0.03698	1.7%	0.86 [0.79, 0.93]	2020
Koslow et al. 2020	0.55	0.04542	1.5%	0.55 [0.46, 0.64]	2020
Matta et al. 2021	0.88	0.07882	0.8%	0.88 [0.73, 1.03]	2021
O'Mahoney et al. 2021	0.72	0.0487	1.4%	0.72 [0.62, 0.82]	2021
Zhang et al. 2021	0.25	0.15309	0.3%	0.25 [-0.05, 0.55]	2021
Zhou et al. 2021	0.861	0.02354	2.0%	0.86 [0.81, 0.91]	2021
Li et al. 2022	0.85	0.0461	1.4%	0.85 [0.76, 0.94]	2022
Serra et al. 2022	0.78	0.05348	1.3%	0.78 [0.68, 0.88]	2022
Zhao et al. 2022	0.9999	0.00289	2.3%	1.00 [0.99, 1.01]	2022
Subtotal (95% CI)			**34.1%**	**0.76 [0.72, 0.81]**	
Heterogeneity: Tau² = 0.01; Chi² = 717.09, df = 24 (P < 0.00001); I² = 97%					
Test for overall effect: Z = 35.78 (P < 0.00001)					
Total (95% CI)			**100.0%**	**0.81 [0.79, 0.83]**	
Heterogeneity: Tau² = 0.00; Chi² = 2001.95, df = 69 (P < 0.00001); I² = 97%					
Test for overall effect: Z = 89.75 (P < 0.00001)					
Test for subgroup differences: Chi² = 5.35, df = 1 (P = 0.02), I² = 81.3%					



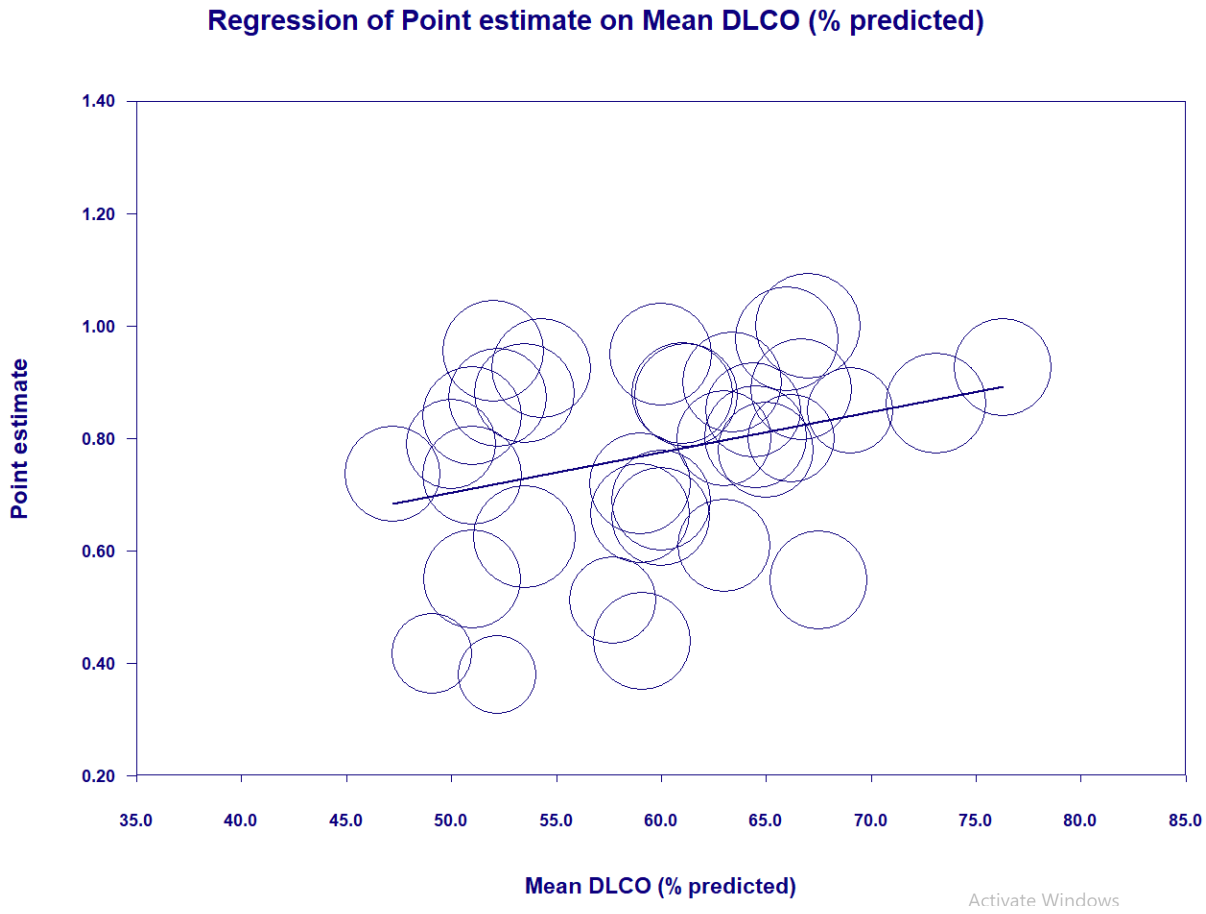
Supplementary Figure 6: Diagnostic Yield by 2.4mm vs 1.9mm Size Cryoprobe



Supplementary Figure 7: Diagnostic Yield vs Mean Forced Vital Capacity

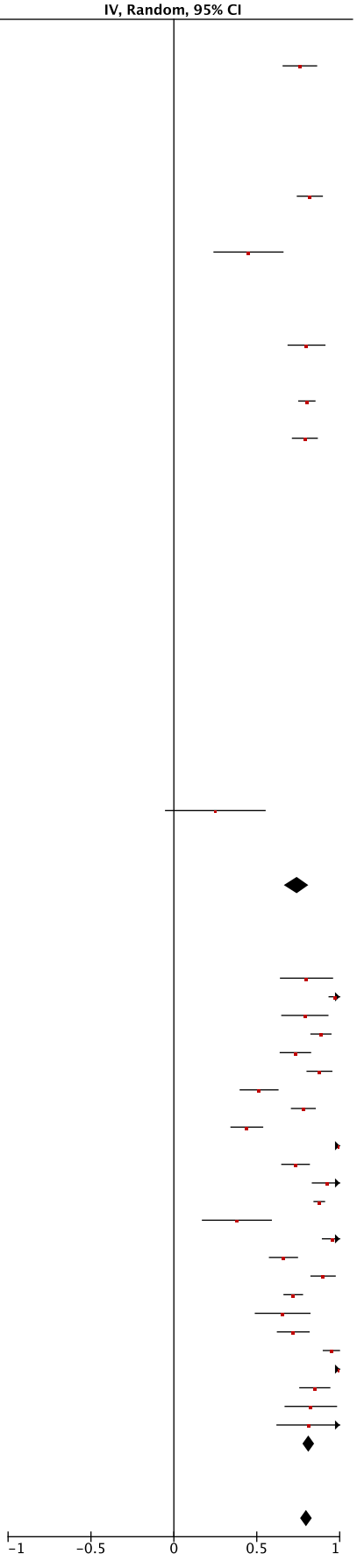


Supplementary Figure 8: Diagnostic Yield vs Mean Diffusion Capacity for Carbon Monoxide



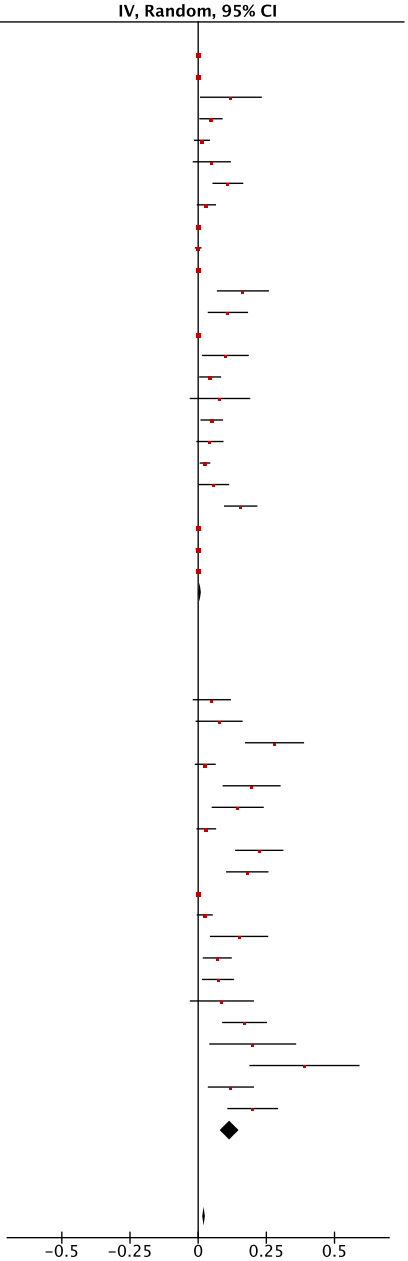
Supplementary Figure 9: Diagnostic Yield by Single Lobe vs One or More Lobes

Study or Subgroup	Diagnostic Yield	SE	Weight	Diagnostic Yield IV, Random, 95% CI	Year
3.1.1 Single lobe biopsy					
Babiak et al. 2009	0.95	0.03404	0.0%	0.95 [0.88, 1.02]	2009
Casoni et al. 2014	0.76	0.05142	3.1%	0.76 [0.66, 0.86]	2014
Griff et al. 2014	0.787	0.05678	0.0%	0.79 [0.68, 0.90]	2014
Pajares et al. 2014	0.513	0.08004	0.0%	0.51 [0.36, 0.67]	2014
Cascante et al. 2016	0.873	0.0449	0.0%	0.87 [0.78, 0.96]	2016
Echvarria-Uraga et al. 2016	0.976	0.014	0.0%	0.98 [0.95, 1.00]	2016
Ramaswamy et al. 2016	0.66	0.0633	0.0%	0.66 [0.54, 0.78]	2016
Tomassetti et al. 2016	0.948	0.02915	0.0%	0.95 [0.89, 1.01]	2016
Almeida et al. 2017	0.82	0.03842	3.5%	0.82 [0.74, 0.90]	2017
Abdelghani 2019	0.925	0.04165	0.0%	0.93 [0.84, 1.01]	2018
Cooley et al. 2018	0.69	0.03668	0.0%	0.69 [0.62, 0.76]	2018
Lim et al. 2018	0.45	0.10607	1.6%	0.45 [0.24, 0.66]	2018
Cho et al. 2019	0.85	0.05646	0.0%	0.85 [0.74, 0.96]	2019
Hagmeyer et al. 2019	0.61	0.06245	0.0%	0.61 [0.49, 0.73]	2019
Harari et al. 2019	0.88	0.03803	0.0%	0.88 [0.81, 0.95]	2019
Kuse et al. 2019	0.76	0.0604	0.0%	0.76 [0.64, 0.88]	2019
Samitas et al. 2019	0.8	0.05657	2.9%	0.80 [0.69, 0.91]	2019
Shafiek et al. 2019	0.833	0.10767	0.0%	0.83 [0.62, 1.04]	2019
Wijmans et al. 2019	0.83	0.10039	0.0%	0.83 [0.63, 1.03]	2019
Aburto et al. 2020	0.802	0.02486	3.9%	0.80 [0.75, 0.85]	2020
Cirak et al. 2020	0.915	0.0308	0.0%	0.92 [0.85, 0.98]	2020
Gnass et al. 2020	0.79	0.03815	3.5%	0.79 [0.72, 0.86]	2020
Hussein et al. 2020	0.956	0.04277	0.0%	0.96 [0.87, 1.04]	2020
Inomata et al. 2020	0.862	0.03698	0.0%	0.86 [0.79, 0.93]	2020
Kheir et al. 2020	0.417	0.10065	0.0%	0.42 [0.22, 0.61]	2020
Koslow et al. 2020	0.55	0.04542	0.0%	0.55 [0.46, 0.64]	2020
Pajares et al. 2020	0.548	0.04469	0.0%	0.55 [0.46, 0.64]	2020
Shkeiri et al. 2020	0.54	0.05061	0.0%	0.54 [0.44, 0.64]	2020
Wang et al. 2020	0.686	0.05547	0.0%	0.69 [0.58, 0.79]	2020
Bondue et al. 2021	0.84	0.04073	0.0%	0.84 [0.76, 0.92]	2021
Chen et al. 2021	0.625	0.02507	0.0%	0.63 [0.58, 0.67]	2021
Davidsen et al. 2021	0.752	0.03637	0.0%	0.75 [0.68, 0.82]	2021
Deasy et al. 2021	0.88	0.06499	0.0%	0.88 [0.75, 1.01]	2021
Goel et al. 2021	0.816	0.02146	0.0%	0.82 [0.77, 0.86]	2021
Han et al. 2021	0.737	0.05262	0.0%	0.74 [0.63, 0.84]	2021
Hostettler et al. 2021	0.88	0.0325	0.0%	0.88 [0.82, 0.94]	2021
Ikeda et al. 2021	0.657	0.07701	0.0%	0.66 [0.51, 0.81]	2021
Kronborg-White(a) 2021	0.85	0.08416	0.0%	0.85 [0.69, 1.01]	2021
Matta et al. 2021	0.88	0.07882	0.0%	0.88 [0.73, 1.03]	2021
Turan et al. 2021	0.666	0.0389	0.0%	0.67 [0.59, 0.74]	2021
Wu et al. 2021	0.9999	0.00267	0.0%	1.00 [0.99, 1.01]	2021
Zhang et al. 2021	0.25	0.15309	1.0%	0.25 [-0.05, 0.55]	2021
Zhou et al. 2021	0.861	0.02354	0.0%	0.86 [0.81, 0.91]	2021
Serra et al. 2022	0.78	0.05348	0.0%	0.78 [0.68, 0.88]	2022
Zhao et al. 2022	0.9999	0.00289	0.0%	1.00 [0.99, 1.01]	2022
Subtotal (95% CI)			**19.5%**	**0.74 [0.67, 0.82]**	
Heterogeneity: Tau² = 0.01; Chi² = 23.81, df = 6 (P = 0.0006); I² = 75%					
Test for overall effect: Z = 19.71 (P < 0.00001)					
3.1.2 Single or multiple lobe biopsy					
Kropski et al. 2013	0.8	0.08	2.2%	0.80 [0.64, 0.96]	2013
Fruchter et al. 2014	0.973	0.01872	4.0%	0.97 [0.94, 1.01]	2014
Hernandez-Gonzalez et al. 2015	0.79	0.0709	2.5%	0.79 [0.65, 0.93]	2015
Bango-Alvarez et al. 2017	0.887	0.03075	3.7%	0.89 [0.83, 0.95]	2017
Marcoa et al. 2017	0.733	0.04663	3.2%	0.73 [0.64, 0.82]	2017
Sriprasart et a. 2017	0.878	0.03805	3.5%	0.88 [0.80, 0.95]	2017
Ussavarungsi et al. 2017	0.514	0.0581	2.9%	0.51 [0.40, 0.63]	2017
Dhooria et al. 2018	0.781	0.03656	3.6%	0.78 [0.71, 0.85]	2018
Lentz et al. 2018	0.44	0.04868	3.2%	0.44 [0.34, 0.54]	2018
Steinfort et al. 2018	0.9999	0.005	4.2%	1.00 [0.99, 1.01]	2018
Walscher et al. 2019	0.734	0.04232	3.4%	0.73 [0.65, 0.82]	2019
Jacob et al. 2019	0.926	0.04628	3.2%	0.93 [0.84, 1.02]	2019
Ravaglia et al. 2019	0.877	0.01615	4.1%	0.88 [0.85, 0.91]	2019
Romagnoli et al. 2019	0.38	0.10592	1.6%	0.38 [0.17, 0.59]	2019
Barata et al. 2020	0.956	0.03057	3.7%	0.96 [0.90, 1.02]	2020
She et al. 2020	0.661	0.04303	3.4%	0.66 [0.58, 0.75]	2020
Troy et al. 2020	0.9	0.03721	3.5%	0.90 [0.83, 0.97]	2020
Kronborg-White(b) 2021	0.72	0.0284	3.8%	0.72 [0.66, 0.78]	2021
Menezes et al. 2021	0.656	0.08398	2.1%	0.66 [0.49, 0.82]	2021
O'Mahoney et al. 2021	0.72	0.0487	3.2%	0.72 [0.62, 0.82]	2021
Castellani et al. 2022	0.95	0.02484	3.9%	0.95 [0.90, 1.00]	2022
Hackner et al. 2022	0.9999	0.00116	4.2%	1.00 [1.00, 1.00]	2022
Li et al. 2022	0.85	0.0461	3.3%	0.85 [0.76, 0.94]	2022
Riviere et al. 2022	0.826	0.07905	2.3%	0.83 [0.67, 0.98]	2022
Wahidi et al. 2022	0.813	0.09748	1.8%	0.81 [0.62, 1.00]	2022
Subtotal (95% CI)			**80.5%**	**0.81 [0.78, 0.85]**	
Heterogeneity: Tau² = 0.01; Chi² = 677.81, df = 24 (P < 0.00001); I² = 96%					
Test for overall effect: Z = 45.32 (P < 0.00001)					
Total (95% CI)			**100.0%**	**0.80 [0.76, 0.83]**	
Heterogeneity: Tau² = 0.01; Chi² = 872.12, df = 31 (P < 0.00001); I² = 96%					
Test for overall effect: Z = 45.87 (P < 0.00001)					
Test for subgroup differences: Chi² = 3.07, df = 1 (P = 0.08), I² = 67.4%					

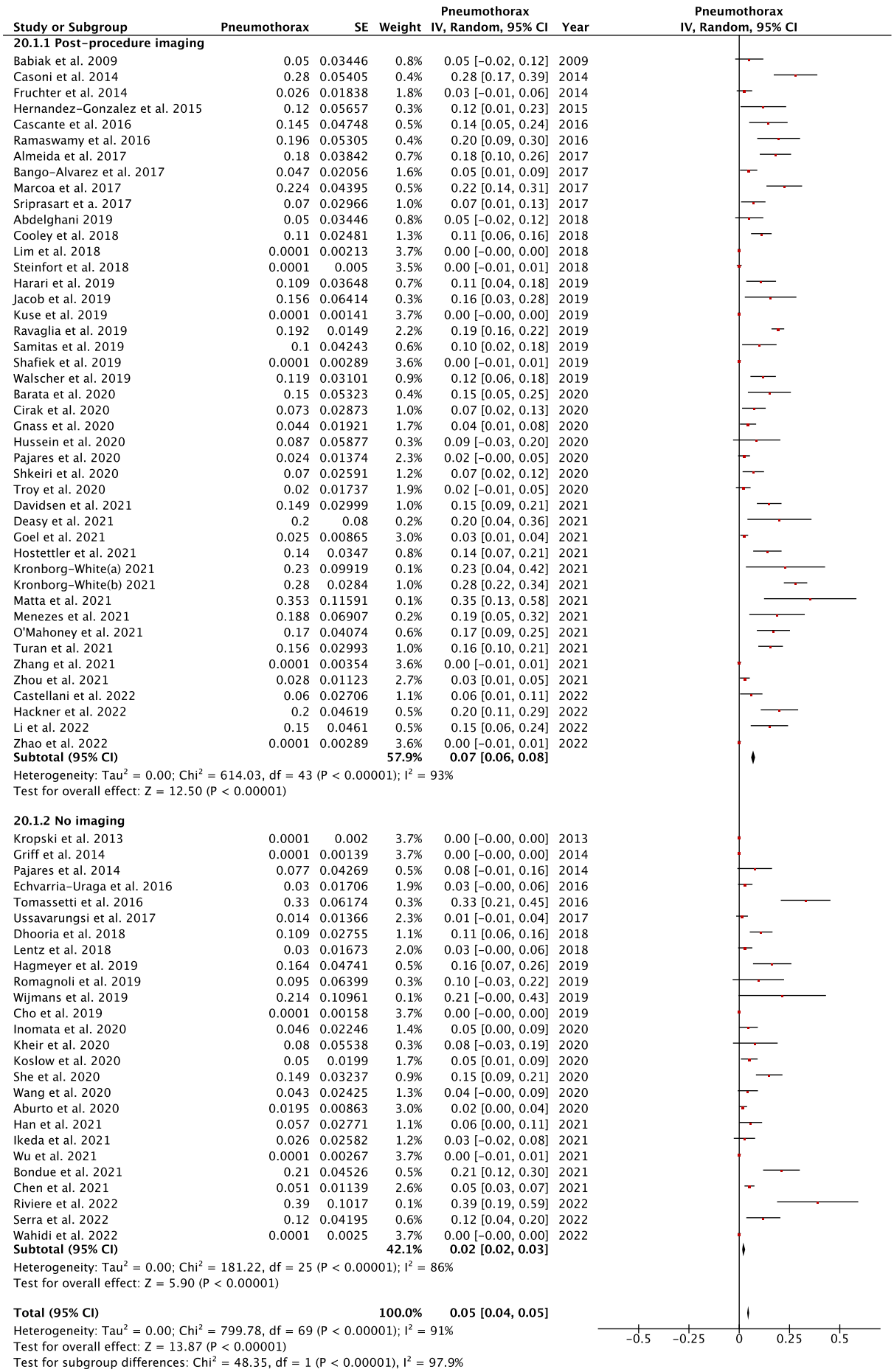


Supplementary Figure 10: Pneumothorax by 1.9mm vs 2.4mm Cryoprobe Size

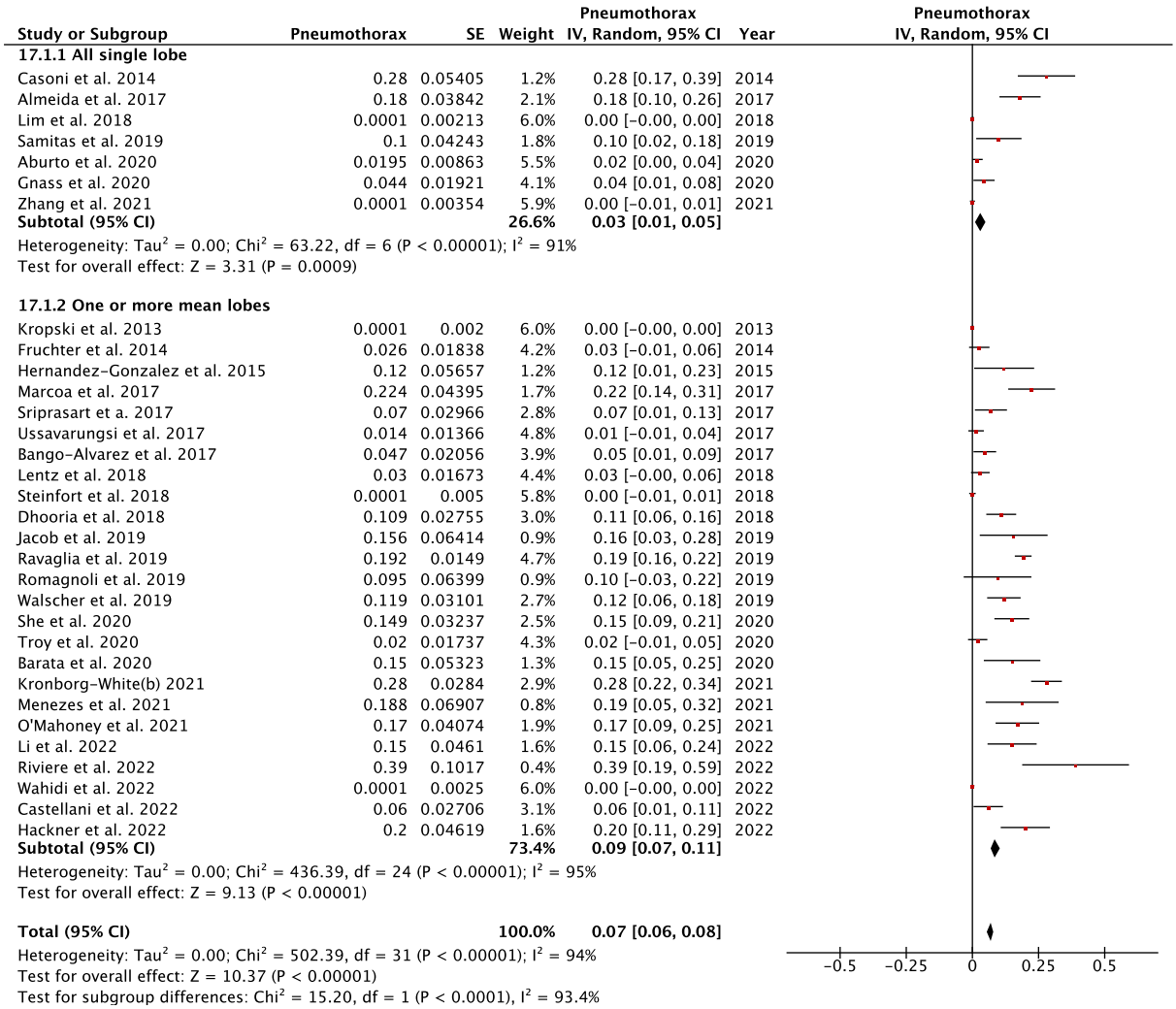
Study or Subgroup	Pneumothorax	SE	Weight	Pneumothorax IV, Random, 95% CI	Year
21.1.1 1.9mm					
Kropski et al. 2013	0.0001	0.002	6.7%	0.00 [-0.00, 0.00]	2013
Griff et al. 2014	0.0001	0.00139	6.8%	0.00 [-0.00, 0.00]	2014
Hernandez-Gonzalez et al. 2015	0.12	0.05657	0.3%	0.12 [0.01, 0.23]	2015
Bango-Alvarez et al. 2017	0.047	0.02056	1.6%	0.05 [0.01, 0.09]	2017
Ussavarungsi et al. 2017	0.014	0.01366	2.8%	0.01 [-0.01, 0.04]	2017
Abdelghani 2019	0.05	0.03446	0.7%	0.05 [-0.02, 0.12]	2018
Dhooria et al. 2018	0.109	0.02755	1.0%	0.11 [0.06, 0.16]	2018
Lentz et al. 2018	0.03	0.01673	2.1%	0.03 [-0.00, 0.06]	2018
Lim et al. 2018	0.0001	0.00213	6.7%	0.00 [-0.00, 0.00]	2018
Steinfort et al. 2018	0.0001	0.005	5.8%	0.00 [-0.01, 0.01]	2018
Cho et al. 2019	0.0001	0.00158	6.8%	0.00 [-0.00, 0.00]	2019
Hagmeyer et al. 2019	0.164	0.04741	0.4%	0.16 [0.07, 0.26]	2019
Harari et al. 2019	0.109	0.03648	0.6%	0.11 [0.04, 0.18]	2019
Kuse et al. 2019	0.0001	0.00141	6.8%	0.00 [-0.00, 0.00]	2019
Samitas et al. 2019	0.1	0.04243	0.4%	0.10 [0.02, 0.18]	2019
Gnass et al. 2020	0.044	0.01921	1.7%	0.04 [0.01, 0.08]	2020
Kheir et al. 2020	0.08	0.05538	0.3%	0.08 [-0.03, 0.19]	2020
Koslow et al. 2020	0.05	0.0199	1.7%	0.05 [0.01, 0.09]	2020
Wang et al. 2020	0.043	0.02425	1.2%	0.04 [-0.00, 0.09]	2020
Goel et al. 2021	0.025	0.00865	4.3%	0.03 [0.01, 0.04]	2021
Han et al. 2021	0.057	0.02771	1.0%	0.06 [0.00, 0.11]	2021
Turan et al. 2021	0.156	0.02993	0.8%	0.16 [0.10, 0.21]	2021
Wu et al. 2021	0.0001	0.00267	6.5%	0.00 [-0.01, 0.01]	2021
Zhang et al. 2021	0.0001	0.00354	6.3%	0.00 [-0.01, 0.01]	2021
Wahidi et al. 2022	0.0001	0.0025	6.6%	0.00 [-0.00, 0.00]	2022
Subtotal (95% CI)			**79.8%**	**0.01 [0.00, 0.01]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 113.25$, df = 24 ($P < 0.00001$); $I^2 = 79\%$					
Test for overall effect: $Z = 3.19$ ($P = 0.001$)					
21.1.2 2.4mm					
Babiak et al. 2009	0.05	0.03446	0.7%	0.05 [-0.02, 0.12]	2009
Pajares et al. 2014	0.077	0.04269	0.4%	0.08 [-0.01, 0.16]	2014
Casoni et al. 2014	0.28	0.05405	0.3%	0.28 [0.17, 0.39]	2014
Fruchter et al. 2014	0.026	0.01838	1.9%	0.03 [-0.01, 0.06]	2014
Ramaswamy et al. 2016	0.196	0.05305	0.3%	0.20 [0.09, 0.30]	2016
Cascante et al. 2016	0.145	0.04748	0.4%	0.14 [0.05, 0.24]	2016
Echvarria-Uraga et al. 2016	0.03	0.01706	2.1%	0.03 [-0.00, 0.06]	2016
Marcoa et al. 2017	0.224	0.04395	0.4%	0.22 [0.14, 0.31]	2017
Almeida et al. 2017	0.18	0.03842	0.5%	0.18 [0.10, 0.26]	2017
Shafiek et al. 2019	0.0001	0.00289	6.5%	0.00 [-0.01, 0.01]	2019
Pajares et al. 2020	0.024	0.01374	2.7%	0.02 [-0.00, 0.05]	2020
Barata et al. 2020	0.15	0.05323	0.3%	0.15 [0.05, 0.25]	2020
Shkeiri et al. 2020	0.07	0.02591	1.1%	0.07 [0.02, 0.12]	2020
Cirak et al. 2020	0.073	0.02873	0.9%	0.07 [0.02, 0.13]	2020
Hussein et al. 2020	0.087	0.05877	0.2%	0.09 [-0.03, 0.20]	2020
O'Mahoney et al. 2021	0.17	0.04074	0.5%	0.17 [0.09, 0.25]	2021
Deasy et al. 2021	0.2	0.08	0.1%	0.20 [0.04, 0.36]	2021
Riviere et al. 2022	0.39	0.1017	0.1%	0.39 [0.19, 0.59]	2022
Serra et al. 2022	0.12	0.04195	0.5%	0.12 [0.04, 0.20]	2022
Hackner et al. 2022	0.2	0.04619	0.4%	0.20 [0.11, 0.29]	2022
Subtotal (95% CI)			**20.2%**	**0.11 [0.08, 0.15]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 184.92$, df = 19 ($P < 0.00001$); $I^2 = 90\%$					
Test for overall effect: $Z = 6.57$ ($P < 0.00001$)					
Total (95% CI)			**100.0%**	**0.02 [0.02, 0.03]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 310.66$, df = 44 ($P < 0.00001$); $I^2 = 86\%$					
Test for overall effect: $Z = 7.33$ ($P < 0.00001$)					
Test for subgroup differences: $Chi^2 = 37.43$, df = 1 ($P < 0.00001$), $I^2 = 97.3\%$					



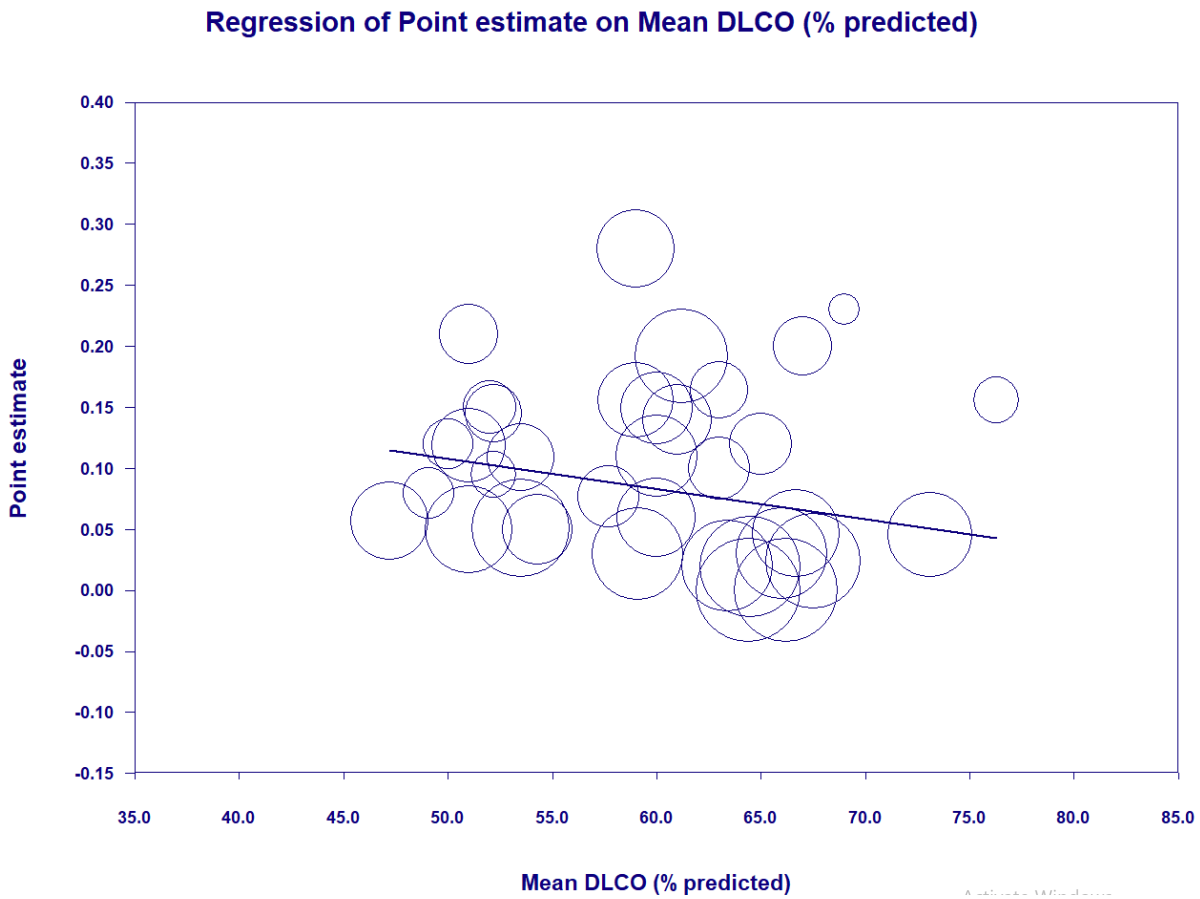
Supplementary Figure 11: Pneumothorax by Post-Procedure Imaging


Study or Subgroup
Pneumothorax
SE
Weight
Pneumothorax IV, Random, 95% CI
Year
Pneumothorax IV, Random, 95% CI
20.1.1 Post-procedure imaging
Babiak et al. 2009 0.05 0.03446 0.8% 0.05 [-0.02, 0.12] 2009
Casoni et al. 2014 0.28 0.05405 0.4% 0.28 [0.17, 0.39] 2014
Fruchter et al. 2014 0.026 0.01838 1.8% 0.03 [-0.01, 0.06] 2014
Hernandez-Gonzalez et al. 2015 0.12 0.05657 0.3% 0.12 [0.01, 0.23] 2015
Cascante et al. 2016 0.145 0.04748 0.5% 0.14 [0.05, 0.24] 2016
Ramaswamy et al. 2016 0.196 0.05305 0.4% 0.20 [0.09, 0.30] 2016
Almeida et al. 2017 0.18 0.03842 0.7% 0.18 [0.10, 0.26] 2017
Bango-Alvarez et al. 2017 0.047 0.02056 1.6% 0.05 [0.01, 0.09] 2017
Marcoa et al. 2017 0.224 0.04395 0.5% 0.22 [0.14, 0.31] 2017
Sriprasart et a. 2017 0.07 0.02966 1.0% 0.07 [0.01, 0.13] 2017
Abdelghani 2019 0.05 0.03446 0.8% 0.05 [-0.02, 0.12] 2018
Cooley et al. 2018 0.11 0.02481 1.3% 0.11 [0.06, 0.16] 2018
Lim et al. 2018 0.0001 0.00213 3.7% 0.00 [-0.00, 0.00] 2018
Steinfort et al. 2018 0.0001 0.005 3.5% 0.00 [-0.01, 0.01] 2018
Harari et al. 2019 0.109 0.03648 0.7% 0.11 [0.04, 0.18] 2019
Jacob et al. 2019 0.156 0.06414 0.3% 0.16 [0.03, 0.28] 2019
Kuse et al. 2019 0.0001 0.00141 3.7% 0.00 [-0.00, 0.00] 2019
Ravaglia et al. 2019 0.192 0.0149 2.2% 0.19 [0.16, 0.22] 2019
Samitas et al. 2019 0.1 0.04243 0.6% 0.10 [0.02, 0.18] 2019
Shafiek et al. 2019 0.0001 0.00289 3.6% 0.00 [-0.01, 0.01] 2019
Walscher et al. 2019 0.119 0.03101 0.9% 0.12 [0.06, 0.18] 2019
Barata et al. 2020 0.15 0.05323 0.4% 0.15 [0.05, 0.25] 2020
Cirak et al. 2020 0.073 0.02873 1.0% 0.07 [0.02, 0.13] 2020
Gnass et al. 2020 0.044 0.01921 1.7% 0.04 [0.01, 0.08] 2020
Hussein et al. 2020 0.087 0.05877 0.3% 0.09 [-0.03, 0.20] 2020
Pajares et al. 2020 0.024 0.01374 2.3% 0.02 [-0.00, 0.05] 2020
Shkeiri et al. 2020 0.07 0.02591 1.2% 0.07 [0.02, 0.12] 2020
Troy et al. 2020 0.02 0.01737 1.9% 0.02 [-0.01, 0.05] 2020
Davidsen et al. 2021 0.149 0.02999 1.0% 0.15 [0.09, 0.21] 2021
Deasy et al. 2021 0.2 0.08 0.2% 0.20 [0.04, 0.36] 2021
Goel et al. 2021 0.025 0.00865 3.0% 0.03 [0.01, 0.04] 2021
Hostettler et al. 2021 0.14 0.0347 0.8% 0.14 [0.07, 0.21] 2021
Kronborg-White(a) 2021 0.23 0.09919 0.1% 0.23 [0.04, 0.42] 2021
Kronborg-White(b) 2021 0.28 0.0284 1.0% 0.28 [0.22, 0.34] 2021
Matta et al. 2021 0.353 0.11591 0.1% 0.35 [0.13, 0.58] 2021
Menezes et al. 2021 0.188 0.06907 0.2% 0.19 [0.05, 0.32] 2021
O'Mahoney et al. 2021 0.17 0.04074 0.6% 0.17 [0.09, 0.25] 2021
Turan et al. 2021 0.156 0.02993 1.0% 0.16 [0.10, 0.21] 2021
Zhang et al. 2021 0.0001 0.00354 3.6% 0.00 [-0.01, 0.01] 2021
Zhou et al. 2021 0.028 0.01123 2.7% 0.03 [0.01, 0.05] 2021
Castellani et al. 2022 0.06 0.02706 1.1% 0.06 [0.01, 0.11] 2022
Hackner et al. 2022 0.2 0.04619 0.5% 0.20 [0.11, 0.29] 2022
Li et al. 2022 0.15 0.0461 0.5% 0.15 [0.06, 0.24] 2022
Zhao et al. 2022 0.0001 0.00289 3.6% 0.00 [-0.01, 0.01] 2022
Subtotal (95% CI) 57.9% 0.07 [0.06, 0.08]
Heterogeneity: Tau² = 0.00; Chi² = 614.03, df = 43 (P < 0.00001); I² = 93%
Test for overall effect: Z = 12.50 (P < 0.00001)
20.1.2 No imaging
Kropski et al. 2013 0.0001 0.002 3.7% 0.00 [-0.00, 0.00] 2013
Griff et al. 2014 0.0001 0.00139 3.7% 0.00 [-0.00, 0.00] 2014
Pajares et al. 2014 0.077 0.04269 0.5% 0.08 [-0.01, 0.16] 2014
Echvarria-Uraga et al. 2016 0.03 0.01706 1.9% 0.03 [-0.00, 0.06] 2016
Tomassetti et al. 2016 0.33 0.06174 0.3% 0.33 [0.21, 0.45] 2016
Ussavarungsi et al. 2017 0.014 0.01366 2.3% 0.01 [-0.01, 0.04] 2017
Dhooria et al. 2018 0.109 0.02755 1.1% 0.11 [0.06, 0.16] 2018
Lentz et al. 2018 0.03 0.01673 2.0% 0.03 [-0.00, 0.06] 2018
Hagmeyer et al. 2019 0.164 0.04741 0.5% 0.16 [0.07, 0.26] 2019
Romagnoli et al. 2019 0.095 0.06399 0.3% 0.10 [-0.03, 0.22] 2019
Wijmans et al. 2019 0.214 0.10961 0.1% 0.21 [-0.00, 0.43] 2019
Cho et al. 2019 0.0001 0.00158 3.7% 0.00 [-0.00, 0.00] 2019
Inomata et al. 2020 0.046 0.02246 1.4% 0.05 [0.00, 0.09] 2020
Kheir et al. 2020 0.08 0.05538 0.3% 0.08 [-0.03, 0.19] 2020
Koslow et al. 2020 0.05 0.0199 1.7% 0.05 [0.01, 0.09] 2020
She et al. 2020 0.149 0.03237 0.9% 0.15 [0.09, 0.21] 2020
Wang et al. 2020 0.043 0.02425 1.3% 0.04 [-0.00, 0.09] 2020
Aburto et al. 2020 0.0195 0.00863 3.0% 0.02 [0.00, 0.04] 2020
Han et al. 2021 0.057 0.02771 1.1% 0.06 [0.00, 0.11] 2021
Ikeda et al. 2021 0.026 0.02582 1.2% 0.03 [-0.02, 0.08] 2021
Wu et al. 2021 0.0001 0.00267 3.7% 0.00 [-0.01, 0.01] 2021
Bondue et al. 2021 0.21 0.04526 0.5% 0.21 [0.12, 0.30] 2021
Chen et al. 2021 0.051 0.01139 2.6% 0.05 [0.03, 0.07] 2021
Riviere et al. 2022 0.39 0.1017 0.1% 0.39 [0.19, 0.59] 2022
Serra et al. 2022 0.12 0.04195 0.6% 0.12 [0.04, 0.20] 2022
Wahidi et al. 2022 0.0001 0.0025 3.7% 0.00 [-0.00, 0.00] 2022
Subtotal (95% CI) 42.1% 0.02 [0.02, 0.03]
Heterogeneity: Tau² = 0.00; Chi² = 181.22, df = 25 (P < 0.00001); I² = 86%
Test for overall effect: Z = 5.90 (P < 0.00001)
Total (95% CI) 100.0% 0.05 [0.04, 0.05]
Heterogeneity: Tau² = 0.00; Chi² = 799.78, df = 69 (P < 0.00001); I² = 91%
Test for overall effect: Z = 13.87 (P < 0.00001)
Test for subgroup differences: Chi² = 48.35, df = 1 (P < 0.00001), I² = 97.9%
-0.5
-0.25
0
0.25
0.5

Supplementary Figure 12: Pneumothorax by Single vs One or More Lobes

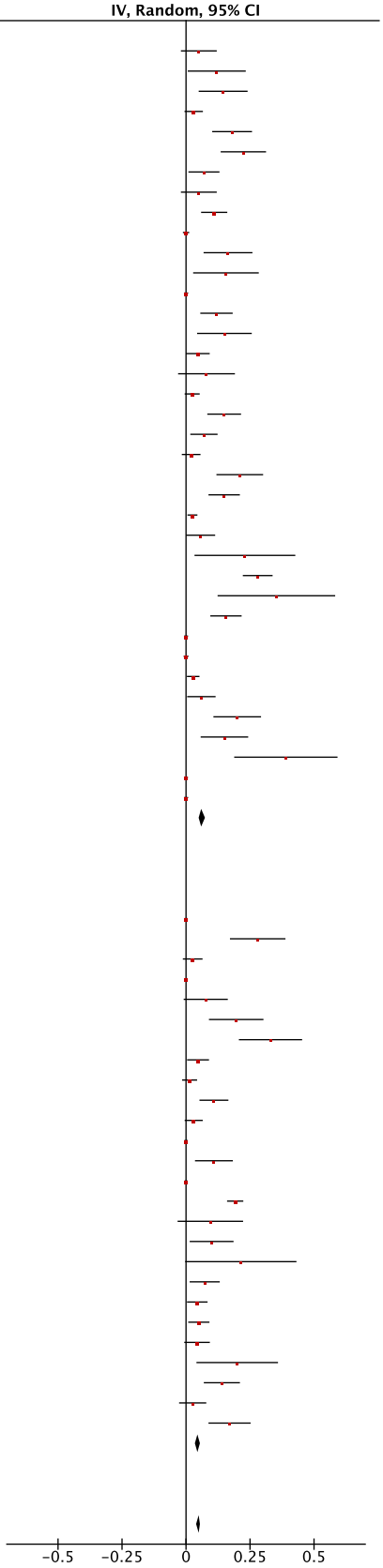


Supplementary Figure 13: Pneumothorax by Mean Diffusion Capacity for Carbon Monoxide

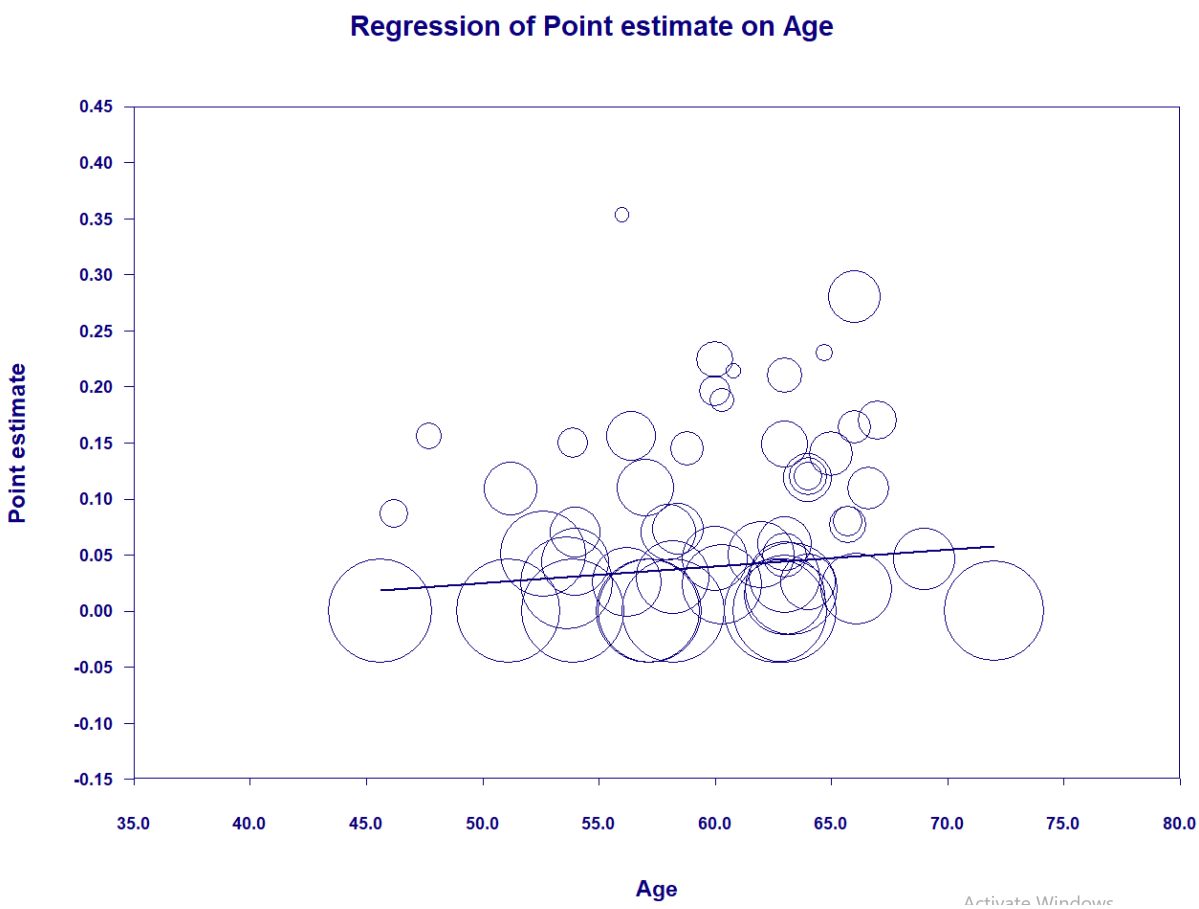


Supplementary Figure 14: Pneumothorax by General Anaesthesia vs Sedation

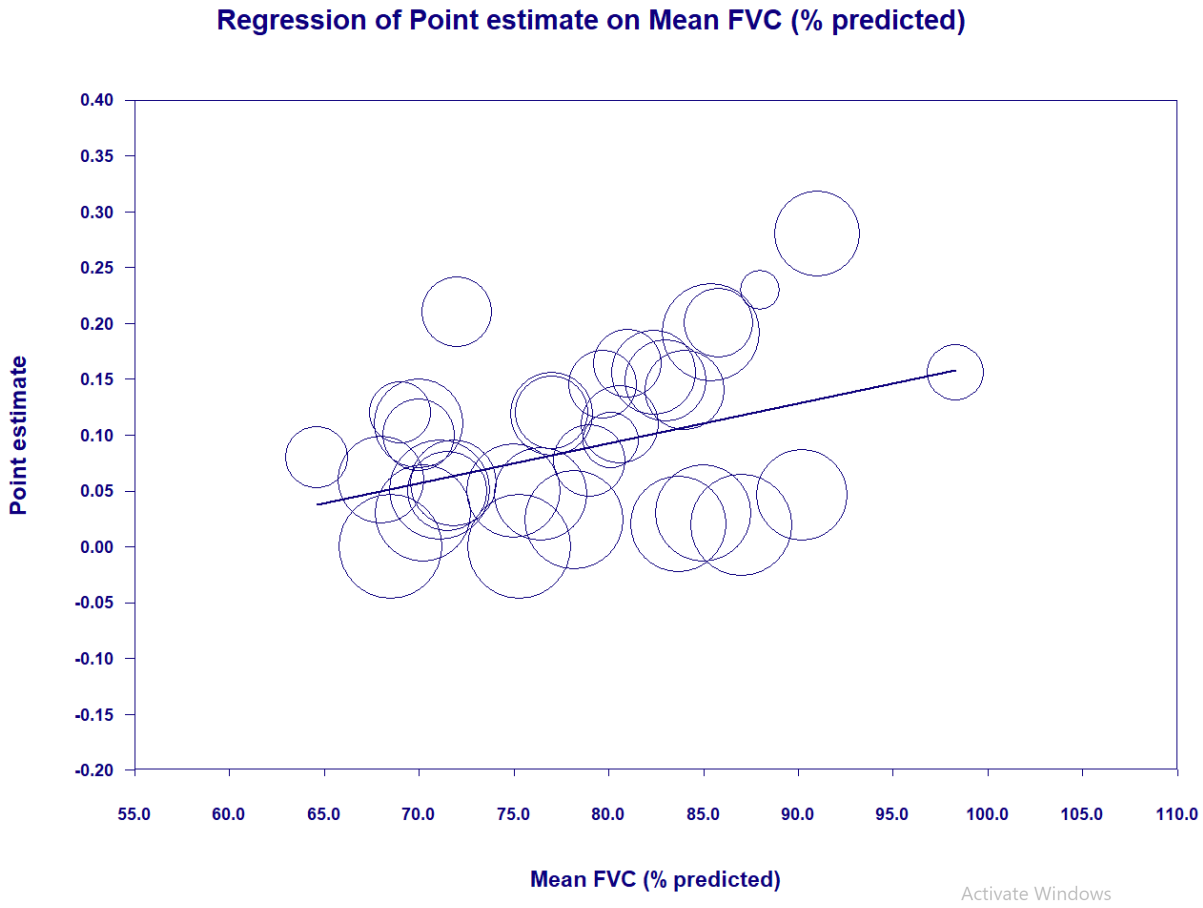
Study or Subgroup	Pneumothorax	SE	Weight	Pneumothorax IV, Random, 95% CI	Year
19.1.1 GA					
Babiak et al. 2009	0.05	0.03446	0.9%	0.05 [-0.02, 0.12]	2009
Hernandez-Gonzalez et al. 2015	0.12	0.05657	0.4%	0.12 [0.01, 0.23]	2015
Cascante et al. 2016	0.145	0.04748	0.5%	0.14 [0.05, 0.24]	2016
Echvarria-Uraga et al. 2016	0.03	0.01706	2.2%	0.03 [-0.00, 0.06]	2016
Almeida et al. 2017	0.18	0.03842	0.8%	0.18 [0.10, 0.26]	2017
Marcoa et al. 2017	0.224	0.04395	0.6%	0.22 [0.14, 0.31]	2017
Sriprasart et a. 2017	0.07	0.02966	1.2%	0.07 [0.01, 0.13]	2017
Abdelghani 2019	0.05	0.03446	0.9%	0.05 [-0.02, 0.12]	2018
Cooley et al. 2018	0.11	0.02481	1.5%	0.11 [0.06, 0.16]	2018
Steinfort et al. 2018	0.0001	0.005	3.7%	0.00 [-0.01, 0.01]	2018
Hagmeyer et al. 2019	0.164	0.04741	0.5%	0.16 [0.07, 0.26]	2019
Jacob et al. 2019	0.156	0.06414	0.3%	0.16 [0.03, 0.28]	2019
Shafiek et al. 2019	0.0001	0.00289	3.9%	0.00 [-0.01, 0.01]	2019
Walscher et al. 2019	0.119	0.03101	1.1%	0.12 [0.06, 0.18]	2019
Barata et al. 2020	0.15	0.05323	0.4%	0.15 [0.05, 0.25]	2020
Inomata et al. 2020	0.046	0.02246	1.7%	0.05 [0.00, 0.09]	2020
Kheir et al. 2020	0.08	0.05538	0.4%	0.08 [-0.03, 0.19]	2020
Pajares et al. 2020	0.024	0.01374	2.6%	0.02 [-0.00, 0.05]	2020
She et al. 2020	0.149	0.03237	1.0%	0.15 [0.09, 0.21]	2020
Shkeiri et al. 2020	0.07	0.02591	1.4%	0.07 [0.02, 0.12]	2020
Troy et al. 2020	0.02	0.01737	2.2%	0.02 [-0.01, 0.05]	2020
Bondue et al. 2021	0.21	0.04526	0.6%	0.21 [0.12, 0.30]	2021
Davidsen et al. 2021	0.149	0.02999	1.1%	0.15 [0.09, 0.21]	2021
Goel et al. 2021	0.025	0.00865	3.3%	0.03 [0.01, 0.04]	2021
Han et al. 2021	0.057	0.02771	1.3%	0.06 [0.00, 0.11]	2021
Kronborg-White(a) 2021	0.23	0.09919	0.1%	0.23 [0.04, 0.42]	2021
Kronborg-White(b) 2021	0.28	0.0284	1.2%	0.28 [0.22, 0.34]	2021
Matta et al. 2021	0.353	0.11591	0.1%	0.35 [0.13, 0.58]	2021
Turan et al. 2021	0.156	0.02993	1.1%	0.16 [0.10, 0.21]	2021
Wu et al. 2021	0.0001	0.00267	3.9%	0.00 [-0.01, 0.01]	2021
Zhang et al. 2021	0.0001	0.00354	3.8%	0.00 [-0.01, 0.01]	2021
Zhou et al. 2021	0.028	0.01123	2.9%	0.03 [0.01, 0.05]	2021
Castellani et al. 2022	0.06	0.02706	1.3%	0.06 [0.01, 0.11]	2022
Hackner et al. 2022	0.2	0.04619	0.6%	0.20 [0.11, 0.29]	2022
Li et al. 2022	0.15	0.0461	0.6%	0.15 [0.06, 0.24]	2022
Riviere et al. 2022	0.39	0.1017	0.1%	0.39 [0.19, 0.59]	2022
Wahidi et al. 2022	0.0001	0.0025	3.9%	0.00 [-0.00, 0.00]	2022
Zhao et al. 2022	0.0001	0.00289	3.9%	0.00 [-0.01, 0.01]	2022
Subtotal (95% CI)			**58.2%**	**0.06 [0.05, 0.07]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 410.31$, df = 37 ($P < 0.00001$); $I^2 = 91\%$					
Test for overall effect: $Z = 10.59$ ($P < 0.00001$)					
19.1.2 Sedation					
Kropski et al. 2013	0.0001	0.002	3.9%	0.00 [-0.00, 0.00]	2013
Casoni et al. 2014	0.28	0.05405	0.4%	0.28 [0.17, 0.39]	2014
Fruchter et al. 2014	0.026	0.01838	2.0%	0.03 [-0.01, 0.06]	2014
Griff et al. 2014	0.0001	0.00139	3.9%	0.00 [-0.00, 0.00]	2014
Pajares et al. 2014	0.077	0.04269	0.7%	0.08 [-0.01, 0.16]	2014
Ramaswamy et al. 2016	0.196	0.05305	0.5%	0.20 [0.09, 0.30]	2016
Tomassetti et al. 2016	0.33	0.06174	0.3%	0.33 [0.21, 0.45]	2016
Bango-Alvarez et al. 2017	0.047	0.02056	1.8%	0.05 [0.01, 0.09]	2017
Ussavarungsi et al. 2017	0.014	0.01366	2.6%	0.01 [-0.01, 0.04]	2017
Dhooria et al. 2018	0.109	0.02755	1.3%	0.11 [0.06, 0.16]	2018
Lentz et al. 2018	0.03	0.01673	2.2%	0.03 [-0.00, 0.06]	2018
Lim et al. 2018	0.0001	0.00213	3.9%	0.00 [-0.00, 0.00]	2018
Harari et al. 2019	0.109	0.03648	0.8%	0.11 [0.04, 0.18]	2019
Kuse et al. 2019	0.0001	0.00141	3.9%	0.00 [-0.00, 0.00]	2019
Ravaglia et al. 2019	0.192	0.0149	2.5%	0.19 [0.16, 0.22]	2019
Romagnoli et al. 2019	0.095	0.06399	0.3%	0.10 [-0.03, 0.22]	2019
Samitas et al. 2019	0.1	0.04243	0.7%	0.10 [0.02, 0.18]	2019
Wijmans et al. 2019	0.214	0.10961	0.1%	0.21 [-0.00, 0.43]	2019
Cirak et al. 2020	0.073	0.02873	1.2%	0.07 [0.02, 0.13]	2020
Gnass et al. 2020	0.044	0.01921	2.0%	0.04 [0.01, 0.08]	2020
Koslow et al. 2020	0.05	0.0199	1.9%	0.05 [0.01, 0.09]	2020
Wang et al. 2020	0.043	0.02425	1.5%	0.04 [-0.00, 0.09]	2020
Deasy et al. 2021	0.2	0.08	0.2%	0.20 [0.04, 0.36]	2021
Hostettler et al. 2021	0.14	0.0347	0.9%	0.14 [0.07, 0.21]	2021
Ikeda et al. 2021	0.026	0.02582	1.4%	0.03 [-0.02, 0.08]	2021
O'Mahoney et al. 2021	0.17	0.04074	0.7%	0.17 [0.09, 0.25]	2021
Subtotal (95% CI)			**41.8%**	**0.05 [0.04, 0.06]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 343.36$, df = 25 ($P < 0.00001$); $I^2 = 93\%$					
Test for overall effect: $Z = 8.64$ ($P < 0.00001$)					
Total (95% CI)			**100.0%**	**0.05 [0.04, 0.06]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 758.24$, df = 63 ($P < 0.00001$); $I^2 = 92\%$					
Test for overall effect: $Z = 13.66$ ($P < 0.00001$)					
Test for subgroup differences: $Chi^2 = 3.80$, df = 1 ($P = 0.05$), $I^2 = 73.7\%$					



Supplementary Figure 15: Pneumothorax by Age

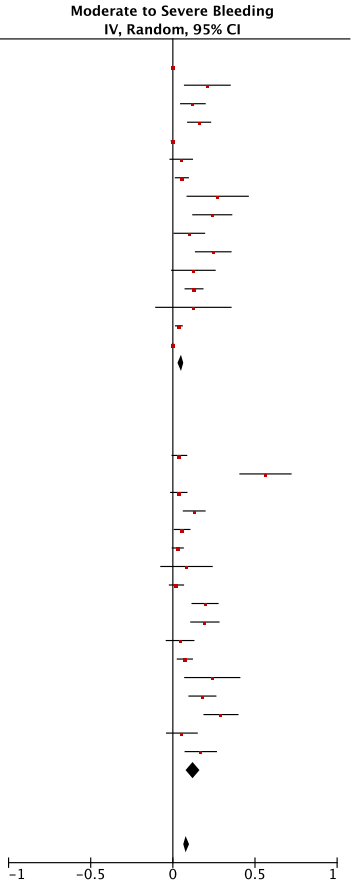


Supplementary Figure 16: Pneumothorax by Mean Forced Vital Capacity

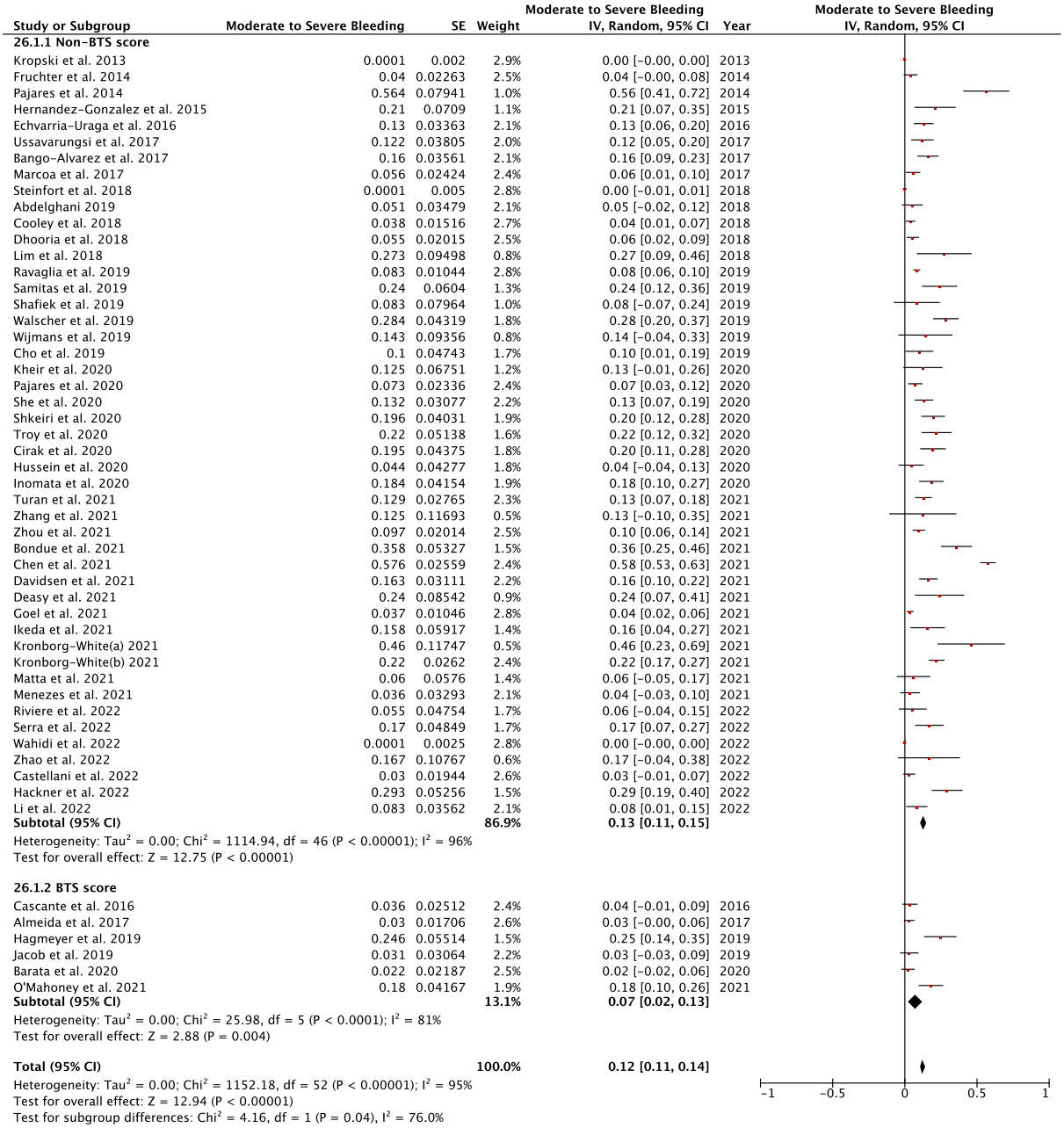


Supplementary Figure 17: Bleeding by Probe Size

Study or Subgroup	Moderate to Severe Bleeding	SE	Weight	Moderate to Severe Bleeding IV, Random, 95% CI	Year
24.1.1 1.9mm					
Kropski et al. 2013	0.0001	0.002	6.7%	0.00 [-0.00, 0.00]	2013
Hernandez-Gonzalez et al. 2015	0.21	0.0709	1.1%	0.21 [0.07, 0.35]	2015
Ussavarungsi et al. 2017	0.122	0.03805	2.7%	0.12 [0.05, 0.20]	2017
Bango-Alvarez et al. 2017	0.16	0.03561	3.0%	0.16 [0.09, 0.23]	2017
Steinfort et al. 2018	0.0001	0.005	6.6%	0.00 [-0.01, 0.01]	2018
Abdelghani 2019	0.051	0.03479	3.0%	0.05 [-0.02, 0.12]	2018
Dhooria et al. 2018	0.055	0.02015	4.8%	0.06 [0.02, 0.09]	2018
Lim et al. 2018	0.273	0.09498	0.7%	0.27 [0.09, 0.46]	2018
Samitas et al. 2019	0.24	0.0604	1.4%	0.24 [0.12, 0.36]	2019
Cho et al. 2019	0.1	0.04743	2.1%	0.10 [0.01, 0.19]	2019
Hagmeyer et al. 2019	0.246	0.05514	1.7%	0.25 [0.14, 0.35]	2019
Kheir et al. 2020	0.125	0.06751	1.2%	0.13 [-0.01, 0.26]	2020
Turan et al. 2021	0.129	0.02765	3.8%	0.13 [0.07, 0.18]	2021
Zhang et al. 2021	0.125	0.11693	0.5%	0.13 [-0.10, 0.35]	2021
Goel et al. 2021	0.037	0.01046	6.1%	0.04 [0.02, 0.06]	2021
Wahidi et al. 2022	0.0001	0.0025	6.7%	0.00 [-0.00, 0.00]	2022
Subtotal (95% CI)			**51.9%**	**0.05 [0.03, 0.07]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 132.80$, df = 15 ($P < 0.00001$); $I^2 = 89\%$					
Test for overall effect: $Z = 5.96$ ($P < 0.00001$)					
24.1.2 2.4mm					
Fruchter et al. 2014	0.04	0.02263	4.4%	0.04 [-0.00, 0.08]	2014
Pajares et al. 2014	0.564	0.07941	0.9%	0.56 [0.41, 0.72]	2014
Cascante et al. 2016	0.036	0.02512	4.1%	0.04 [-0.01, 0.09]	2016
Echvarria-Uraga et al. 2016	0.13	0.03363	3.1%	0.13 [0.06, 0.20]	2016
Marcoa et al. 2017	0.056	0.02424	4.2%	0.06 [0.01, 0.10]	2017
Almeida et al. 2017	0.03	0.01706	5.2%	0.03 [-0.00, 0.06]	2017
Shafiek et al. 2019	0.083	0.07964	0.9%	0.08 [-0.07, 0.24]	2019
Barata et al. 2020	0.022	0.02187	4.5%	0.02 [-0.02, 0.06]	2020
Shkeiri et al. 2020	0.196	0.04031	2.6%	0.20 [0.12, 0.28]	2020
Cirak et al. 2020	0.195	0.04375	2.3%	0.20 [0.11, 0.28]	2020
Hussein et al. 2020	0.044	0.04277	2.4%	0.04 [-0.04, 0.13]	2020
Pajares et al. 2020	0.073	0.02336	4.3%	0.07 [0.03, 0.12]	2020
Deasy et al. 2021	0.24	0.08542	0.8%	0.24 [0.07, 0.41]	2021
O'Mahoney et al. 2021	0.18	0.04167	2.4%	0.18 [0.10, 0.26]	2021
Hackner et al. 2022	0.293	0.05256	1.8%	0.29 [0.19, 0.40]	2022
Riviere et al. 2022	0.055	0.04754	2.1%	0.06 [-0.04, 0.15]	2022
Serra et al. 2022	0.17	0.04849	2.0%	0.17 [0.07, 0.27]	2022
Subtotal (95% CI)			**48.1%**	**0.12 [0.08, 0.16]**	
Heterogeneity: $Tau^2 = 0.01$; $Chi^2 = 107.21$, df = 16 ($P < 0.00001$); $I^2 = 85\%$					
Test for overall effect: $Z = 5.80$ ($P < 0.00001$)					
Total (95% CI)			**100.0%**	**0.08 [0.07, 0.10]**	
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 329.29$, df = 32 ($P < 0.00001$); $I^2 = 90\%$					
Test for overall effect: $Z = 10.17$ ($P < 0.00001$)					
Test for subgroup differences: $Chi^2 = 10.10$, df = 1 ($P = 0.001$), $I^2 = 90.1\%$					



Supplementary Figure 18: Bleeding by Bleeding Score



Supplementary Figure 19: Severe Bleeding

Study or Subgroup	Severe Bleeding	SE	Weight	Severe Bleeding IV, Random, 95% CI	Year
Kropski et al. 2013	0.0001	0.002	0.8%	0.00 [-0.00, 0.00]	2013
Casoni et al. 2014	0.0001	0.0012	2.3%	0.00 [-0.00, 0.00]	2014
Fruchter et al. 2014	0.0001	0.00116	2.5%	0.00 [-0.00, 0.00]	2014
Griff et al. 2014	0.0001	0.00139	1.7%	0.00 [-0.00, 0.00]	2014
Pajares et al. 2014	0.0001	0.0016	1.3%	0.00 [-0.00, 0.00]	2014
Hernandez-Gonzalez et al. 2015	0.0001	0.00174	1.1%	0.00 [-0.00, 0.00]	2015
Cascante et al. 2016	0.018	0.01793	0.0%	0.02 [-0.02, 0.05]	2016
Echvarria-Uraga et al. 2016	0.0001	0.001	3.4%	0.00 [-0.00, 0.00]	2016
Ramaswamy et al. 2016	0.018	0.01777	0.0%	0.02 [-0.02, 0.05]	2016
Tomassetti et al. 2016	0.0001	0.00131	2.0%	0.00 [-0.00, 0.00]	2016
Almeida et al. 2017	0.0001	0.001	3.4%	0.00 [-0.00, 0.00]	2017
Bango-Alvarez et al. 2017	0.0001	0.00097	3.6%	0.00 [-0.00, 0.00]	2017
Sriprasart et a. 2017	0.014	0.01366	0.0%	0.01 [-0.01, 0.04]	2017
Ussavarungsi et al. 2017	0.0001	0.00116	2.5%	0.00 [-0.00, 0.00]	2017
Abdelghani 2019	0.0001	0.00158	1.3%	0.00 [-0.00, 0.00]	2018
Dhooria et al. 2018	0.023	0.01325	0.0%	0.02 [-0.00, 0.05]	2018
Lentz et al. 2018	0.038	0.01875	0.0%	0.04 [0.00, 0.07]	2018
Lim et al. 2018	0.0001	0.00213	0.7%	0.00 [-0.00, 0.00]	2018
Steinfort et al. 2018	0.0001	0.005	0.1%	0.00 [-0.01, 0.01]	2018
Cho et al. 2019	0.05	0.03446	0.0%	0.05 [-0.02, 0.12]	2019
Hagmeyer et al. 2019	0.131	0.0432	0.0%	0.13 [0.05, 0.22]	2019
Harari et al. 2019	0.014	0.01375	0.0%	0.01 [-0.01, 0.04]	2019
Jacob et al. 2019	0.0001	0.00177	1.1%	0.00 [-0.00, 0.00]	2019
Kuse et al. 2019	0.0001	0.00141	1.7%	0.00 [-0.00, 0.00]	2019
Ravaglia et al. 2019	0.007	0.00315	0.3%	0.01 [0.00, 0.01]	2019
Romagnoli et al. 2019	0.0001	0.00218	0.7%	0.00 [-0.00, 0.00]	2019
Samitas et al. 2019	0.0001	0.00141	1.7%	0.00 [-0.00, 0.00]	2019
Shafiek et al. 2019	0.0001	0.00289	0.4%	0.00 [-0.01, 0.01]	2019
Walscher et al. 2019	0.0001	0.00096	3.7%	0.00 [-0.00, 0.00]	2019
Wijmans et al. 2019	0.0001	0.00267	0.5%	0.00 [-0.01, 0.01]	2019
Barata et al. 2020	0.0001	0.00149	1.5%	0.00 [-0.00, 0.00]	2020
Cirak et al. 2020	0.012	0.01202	0.0%	0.01 [-0.01, 0.04]	2020
Gnass et al. 2020	0.0001	0.00094	3.8%	0.00 [-0.00, 0.00]	2020
Hussein et al. 2020	0.0001	0.00209	0.8%	0.00 [-0.00, 0.00]	2020
Inomata et al. 2020	0.0001	0.00107	2.9%	0.00 [-0.00, 0.00]	2020
Kheir et al. 2020	0.0001	0.00204	0.8%	0.00 [-0.00, 0.00]	2020
Koslow et al. 2020	0.07	0.02329	0.0%	0.07 [0.02, 0.12]	2020
Pajares et al. 2020	0.008	0.008	0.1%	0.01 [-0.01, 0.02]	2020
She et al. 2020	0.008	0.0081	0.1%	0.01 [-0.01, 0.02]	2020
Shkeiri et al. 2020	0.01	0.0101	0.0%	0.01 [-0.01, 0.03]	2020
Troy et al. 2020	0.0001	0.00124	2.2%	0.00 [-0.00, 0.00]	2020
Wang et al. 2020	0.057	0.02771	0.0%	0.06 [0.00, 0.11]	2020
Zhou et al. 2021	0.0001	0.00068	7.3%	0.00 [-0.00, 0.00]	2021
Bondue et al. 2021	0.05	0.02422	0.0%	0.05 [0.00, 0.10]	2021
Chen et al. 2021	0.0001	0.00052	12.5%	0.00 [-0.00, 0.00]	2021
Davidsen et al. 2021	0.0001	0.00084	4.8%	0.00 [-0.00, 0.00]	2021
Deasy et al. 2021	0.04	0.03919	0.0%	0.04 [-0.04, 0.12]	2021
Goel et al. 2021	0.009	0.00523	0.1%	0.01 [-0.00, 0.02]	2021
Han et al. 2021	0.0001	0.0012	2.3%	0.00 [-0.00, 0.00]	2021
Hostettler et al. 2021	0.0001	0.001	3.4%	0.00 [-0.00, 0.00]	2021
Ikeda et al. 2021	0.0001	0.00162	1.3%	0.00 [-0.00, 0.00]	2021
Kronborg-White(a) 2021	0.0001	0.00236	0.6%	0.00 [-0.00, 0.00]	2021
Kronborg-White(b) 2021	0.01	0.00629	0.1%	0.01 [-0.00, 0.02]	2021
Matta et al. 2021	0.0001	0.00243	0.6%	0.00 [-0.00, 0.00]	2021
Menezes et al. 2021	0.0001	0.00177	1.1%	0.00 [-0.00, 0.00]	2021
O'Mahoney et al. 2021	0.0001	0.00109	2.8%	0.00 [-0.00, 0.00]	2021
Turan et al. 2021	0.0001	0.00083	4.9%	0.00 [-0.00, 0.00]	2021
Wu et al. 2021	0.0001	0.00267	0.5%	0.00 [-0.01, 0.01]	2021
Zhang et al. 2021	0.0001	0.00354	0.3%	0.00 [-0.01, 0.01]	2021
Zhao et al. 2022	0.0001	0.00289	0.4%	0.00 [-0.01, 0.01]	2022
Castellani et al. 2022	0.0001	0.00114	2.6%	0.00 [-0.00, 0.00]	2022
Hackner et al. 2022	0.067	0.02887	0.0%	0.07 [0.01, 0.12]	2022
Li et al. 2022	0.0001	0.00129	2.0%	0.00 [-0.00, 0.00]	2022
Riviere et al. 2022	0.0001	0.00209	0.8%	0.00 [-0.00, 0.00]	2022
Serra et al. 2022	0.0001	0.00129	2.0%	0.00 [-0.00, 0.00]	2022
Wahidi et al. 2022	0.0001	0.0025	0.5%	0.00 [-0.00, 0.00]	2022
Total (95% CI)			**100.0%**	**0.00 [-0.00, 0.00]**	

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 60.09$, df = 65 (P = 0.65); $I^2 = 0\%$
Test for overall effect: Z = 1.04 (P = 0.30)