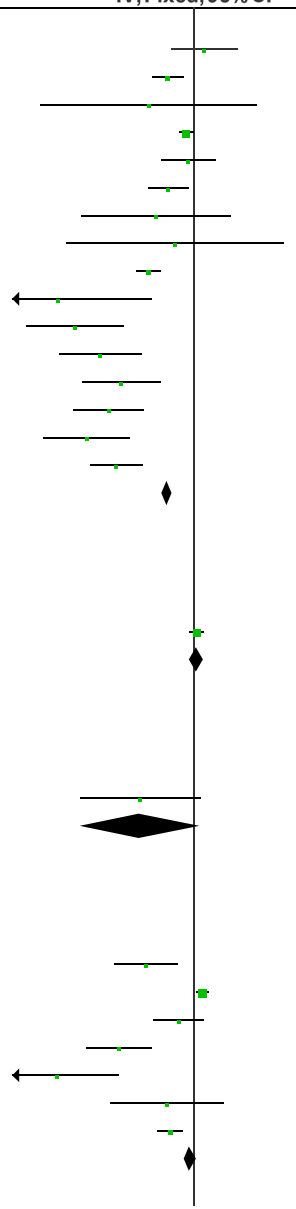
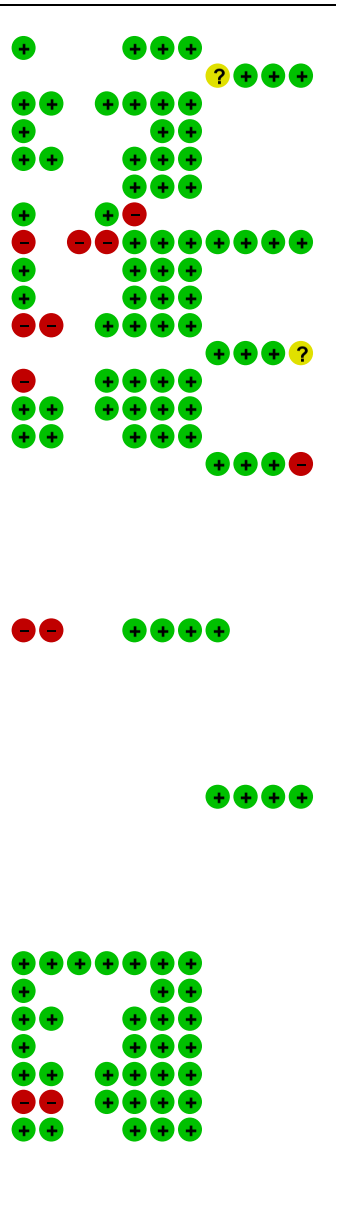
1 NA vs GA

1.1 Blood loss

Study or Subgroup	NA Mean	NA SD	NA Total	GA Mean	GA SD	GA Total	Weight	Mean Difference IV, Fixed, 95% CI
1.1.1 NA vs GA (THA)								
! Kendrisic 2017	810.66	237.5	15	756.66	274.42	15	0.6%	54.00 [-129.66, 237.66]
Benson 2000	604	404	462	751	552	198	2.9%	-147.00 [-232.26, -61.74]
Bonnet 1982	1,600	450	5	1,850	600	7	0.1%	-250.00 [-844.26, 344.26]
Borghi 2002	502	129	70	545	110	70	13.5%	-43.00 [-82.71, -3.29]
Borghi 2005	972	470	70	1,003	431	70	1.0%	-31.00 [-180.39, 118.39]
Davis 1987	527	232	50	671	335	51	1.7%	-144.00 [-256.20, -31.80]
Fredin 1986	1,700	700	30	1,910	910	30	0.1%	-210.00 [-620.83, 200.83]
Hartmann 2003	1,581	1,052	24	1,688	921	18	0.1%	-107.00 [-705.47, 491.47]
Keith 1977	734.1	40.7	10	986.3	94.9	9	4.8%	-252.20 [-319.14, -185.26]
Modig 1980	771	468	7	1,519	554	8	0.1%	-748.00 [-1265.27, -230.73]
Modig 1981	1,100	316	15	1,757	426	15	0.3%	-657.00 [-925.42, -388.58]
Modig 1983	1,100	316	14	1,616	313	16	0.4%	-516.00 [-741.66, -290.34]
Modig 1983a	1,148	446	30	1,548	410	30	0.5%	-400.00 [-616.79, -183.21]
Modig 1986	1,210	490	48	1,680	460	46	0.6%	-470.00 [-662.06, -277.94]
Modig 1987	950	300	14	1,540	340	14	0.4%	-590.00 [-827.52, -352.48]
Thorburn 1980	420	251.50809132	38	848	418.19493062	47	1.0%	-428.00 [-571.84, -284.16]
Subtotal (95% CI)			**902**			**644**	**28.0%**	**-146.12 [-173.73, -118.51]**
Heterogeneity: Chi² = 116.42, df = 15 (P < 0.00001); I² = 87%								
Test for overall effect: Z = 10.37 (P < 0.00001)								
1.1.2 NA vs GA (TKA)								
Zhou 2018	439.18	118.27	63	425.64	109.75	67	13.8%	13.54 [-25.75, 52.83]
Subtotal (95% CI)			**63**			**67**	**13.8%**	**13.54 [-25.75, 52.83]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.68 (P = 0.50)								
1.1.3 NA vs GA (THA/TKA)								
Kaufmann 2002	514	494	45	810	937	38	0.2%	-296.00 [-627.04, 35.04]
Subtotal (95% CI)			**45**			**38**	**0.2%**	**-296.00 [-627.04, 35.04]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.75 (P = 0.08)								
1.1.4 NA+GA vs GA (THA)								
! D Ambrosio 1999	583	300	15	848.2	169	15	0.7%	-265.20 [-439.45, -90.95]
Borghi 2002	593	106	70	545	110	70	16.7%	48.00 [12.21, 83.79]
Borghi 2005	917	399	70	1,003	431	70	1.1%	-86.00 [-223.59, 51.59]
Chin 1982	650	277	21	1,065	316	21	0.7%	-415.00 [-594.73, -235.27]
Dauphin 1997	1,107.8	378.6	20	1,860	616.6	17	0.2%	-752.20 [-1089.01, -415.39]
Kita 2007	335	381	16	485	383	9	0.2%	-150.00 [-462.19, 162.19]
Modig 1987	370	80	14	500	110	14	4.2%	-130.00 [-201.25, -58.75]
Subtotal (95% CI)			**226**			**216**	**23.8%**	**-20.13 [-50.10, 9.83]**
Heterogeneity: Chi² = 68.89, df = 6 (P < 0.00001); I² = 91%								





Test for overall effect: Z = 1.32 (P = 0.19)

1.1.5 NA+GA vs GA (TKA)

Kudoh 2004	178.1	120.5	75	165	74.7	75	20.7%	13.10 [-18.99, 45.19]	
Subtotal (95% CI)			**75**			**75**	**20.7%**	**13.10 [-18.99, 45.19]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.80 (P = 0.42)

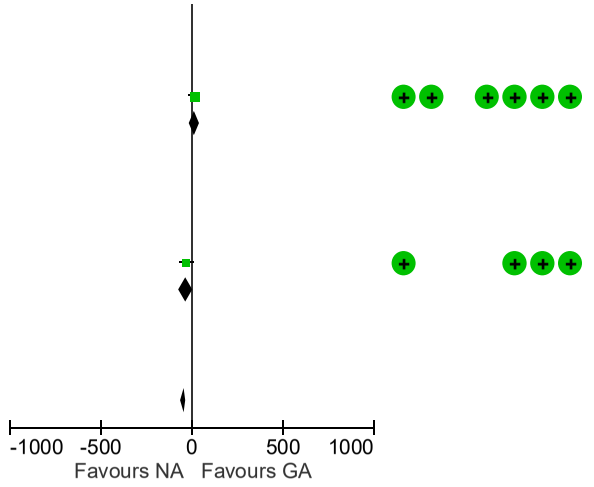
1.1.6 NA+GA vs GA (THA/TKA)

! Saglik 2015	267	68	20	300	60	20	13.5%	-33.00 [-72.74, 6.74]	
Subtotal (95% CI)			**20**			**20**	**13.5%**	**-33.00 [-72.74, 6.74]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 1.63 (P = 0.10)

Total (95% CI)			**1331**			**1060**	**100.0%**	**-46.13 [-60.74, -31.53]**	

Heterogeneity: Chi² = 263.15, df = 26 (P < 0.00001); I² = 90%
Test for overall effect: Z = 6.19 (P < 0.00001)
Test for subgroup differences: Chi² = 77.84, df = 5 (P < 0.00001), I² = 93.6%

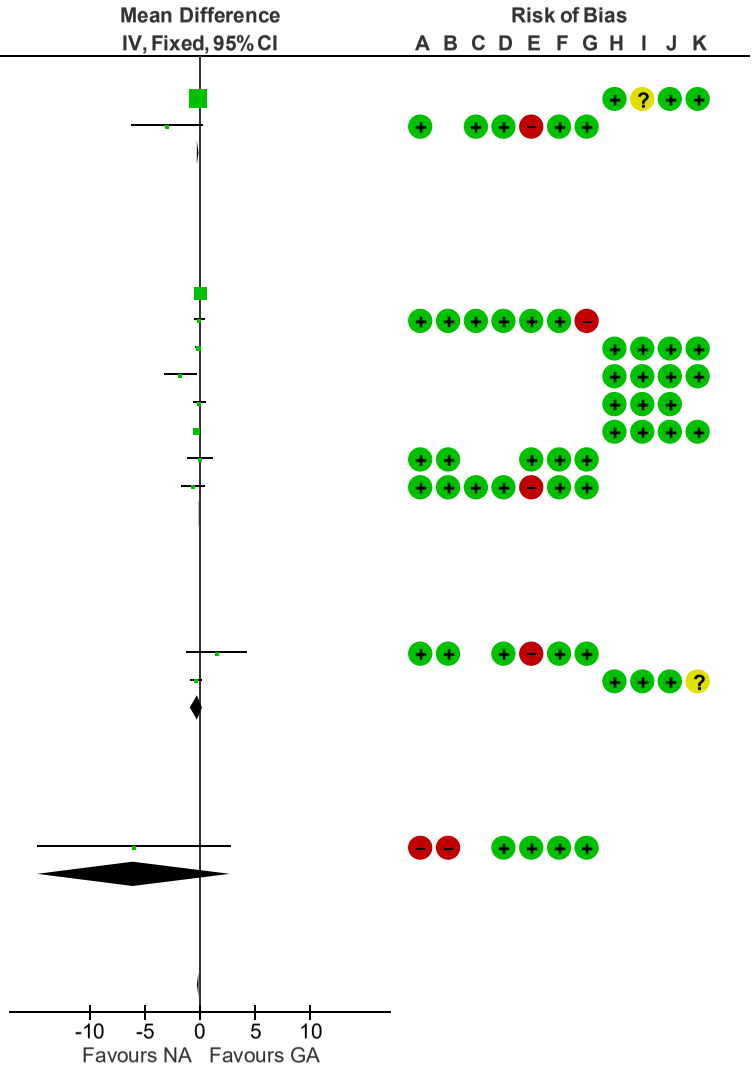


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.3 Length of hospital stay (LOS)

Study or Subgroup	NA Mean	NA SD	NA Total	GA Mean	GA SD	GA Total	Weight	Mean Difference IV, Fixed, 95% CI
1.3.1 NA vs GA (THA)								
! Helwani 2015	3.19	1.61	5102	3.35	1.62	5396	52.9%	-0.16 [-0.22, -0.10]
Wulf 1999	19	5	44	22	10	46	0.0%	-3.00 [-6.25, 0.25]
Subtotal (95% CI)			**5146**			**5442**	**52.9%**	**-0.16 [-0.22, -0.10]**
Heterogeneity: Chi² = 2.94, df = 1 (P = 0.09); I² = 66%								
Test for overall effect: Z = 5.11 (P < 0.00001)								
1.3.2 NA vs GA (TKA)								
Basques 2015	3.1	3.2	8184	3.1	2.3	12752	31.6%	0.00 [-0.08, 0.08]
Kayupov 2017	2.1444	0.6861	41	2.21458	1.58125	47	0.8%	-0.07 [-0.57, 0.43]
Napier 2007	2.8	0.6	41	3	0.5	44	3.6%	-0.20 [-0.44, 0.04]
Park 2017	25.6	11.3	746	27.4	14.1	490	0.1%	-1.80 [-3.29, -0.31]
Pope 2015	2.8	0.8	17	2.9	1.1	27	0.6%	-0.10 [-0.66, 0.46]
Pugely 2013	3.45	2.65	6030	3.77	6.04	8022	9.2%	-0.32 [-0.47, -0.17]
Williams Russo 1995	12.7	5.3	134	12.7	4.3	128	0.1%	0.00 [-1.17, 1.17]
Williams Russo 1996	12.1	4.5	133	12.7	4.3	120	0.2%	-0.60 [-1.68, 0.48]
Subtotal (95% CI)			**15326**			**21630**	**46.3%**	**-0.09 [-0.15, -0.02]**
Heterogeneity: Chi² = 20.90, df = 7 (P = 0.004); I² = 67%								
Test for overall effect: Z = 2.60 (P = 0.009)								
1.3.3 NA vs GA (THA/TKA)								
Jones 1990	19.9	7.8	74	18.4	9	72	0.0%	1.50 [-1.23, 4.23]
McBeath 1995	5.4375	1.691	65	5.7875	1.271	61	0.7%	-0.35 [-0.87, 0.17]
Subtotal (95% CI)			**139**			**133**	**0.8%**	**-0.29 [-0.80, 0.23]**
Heterogeneity: Chi² = 1.70, df = 1 (P = 0.19); I² = 41%								
Test for overall effect: Z = 1.09 (P = 0.27)								
1.3.4 NA+GA vs GA (THA)								
Kita 2007	28	8	16	34	12	9	0.0%	-6.00 [-14.77, 2.77]
Subtotal (95% CI)			**16**			**9**	**0.0%**	**-6.00 [-14.77, 2.77]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.34 (P = 0.18)								
Total (95% CI)			**20627**			**27214**	**100.0%**	**-0.13 [-0.17, -0.08]**
Heterogeneity: Chi² = 30.15, df = 12 (P = 0.003); I² = 60%								
Test for overall effect: Z = 5.59 (P < 0.00001)								
Test for subgroup differences: Chi² = 4.61, df = 3 (P = 0.20), I² = 34.9%								



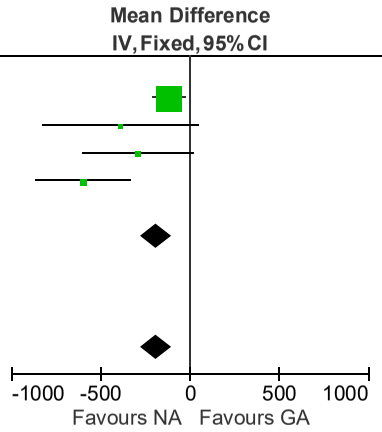
Risk of bias legend

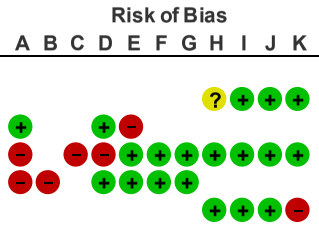
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)

(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.5 Blood transfusion, ml

Study or Subgroup	NA Mean	NA SD	NA Total	GA Mean	GA SD	GA Total	Weight	Mean Difference IV, Fixed, 95% CI
1.5.1 NA vs GA (THA)								
Benson 2000	533	303	212	650	422	93	79.1%	-117.00 [-211.97, -22.03]
Fredin 1986	1,220	750	30	1,610	970	30	3.7%	-390.00 [-828.76, 48.76]
Hartmann 2003	635	478	15	930	316	10	7.4%	-295.00 [-606.24, 16.24]
Modig 1981	1,200	350	15	1,800	400	15	9.9%	-600.00 [-868.97, -331.03]
Thorburn 1980	500	0	38	880	411.33927602	47		Not estimable
Subtotal (95% CI)			**310**			**195**	**100.0%**	**-187.83 [-272.29, -103.38]**
Heterogeneity: Chi² = 12.43, df = 3 (P = 0.006); I² = 76%								
Test for overall effect: Z = 4.36 (P < 0.0001)								
Total (95% CI)			**310**			**195**	**100.0%**	**-187.83 [-272.29, -103.38]**
Heterogeneity: Chi² = 12.43, df = 3 (P = 0.006); I² = 76%								
Test for overall effect: Z = 4.36 (P < 0.0001)								
Test for subgroup differences: Not applicable								

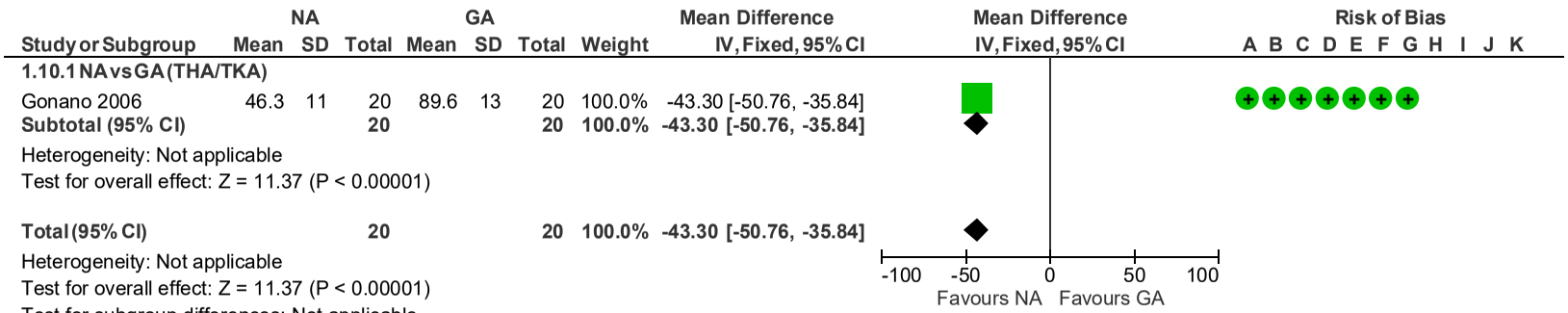




Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

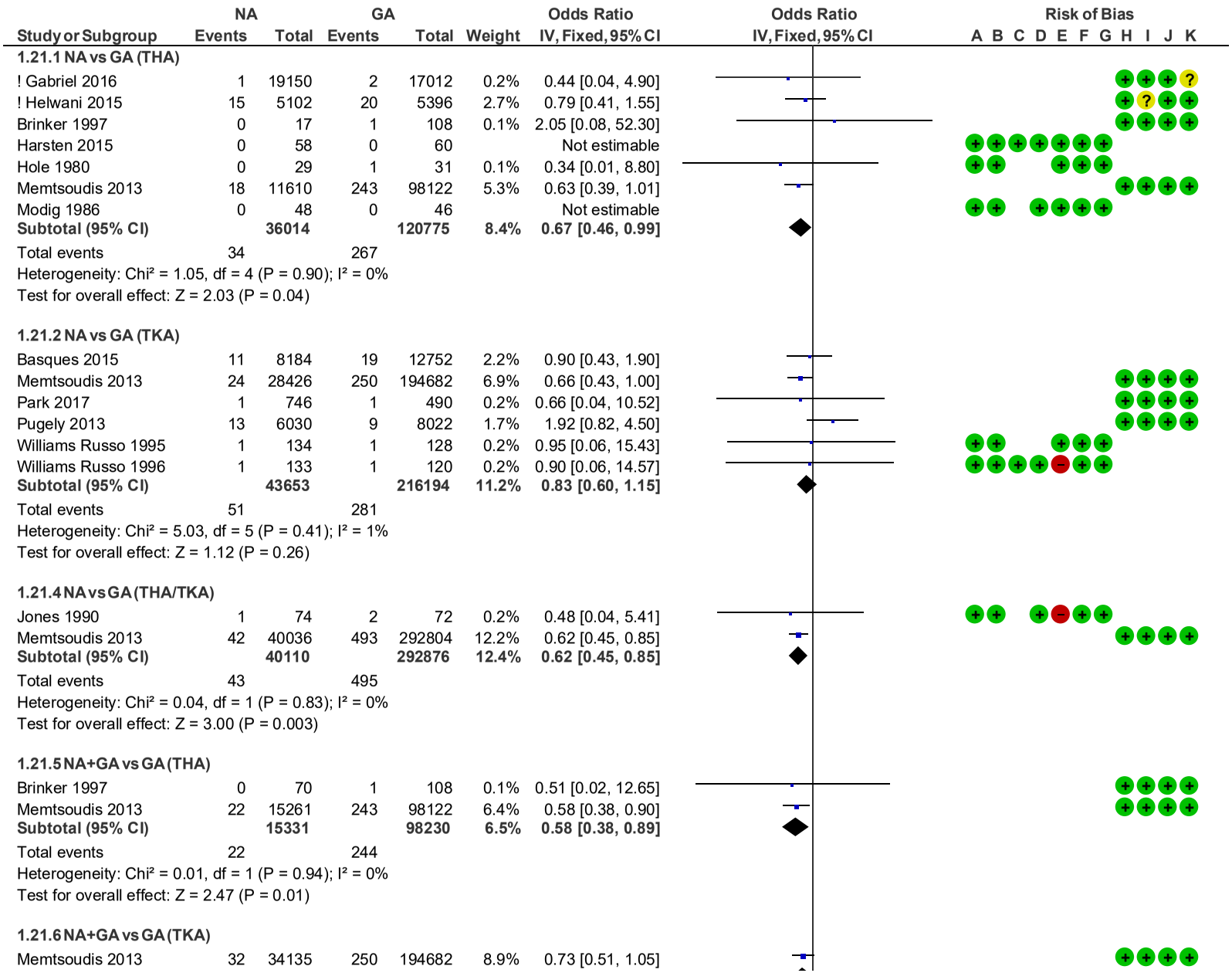
1.10 Total Cost/case (Anesthesia+recovery: drugs and supplies; personal costs not included)

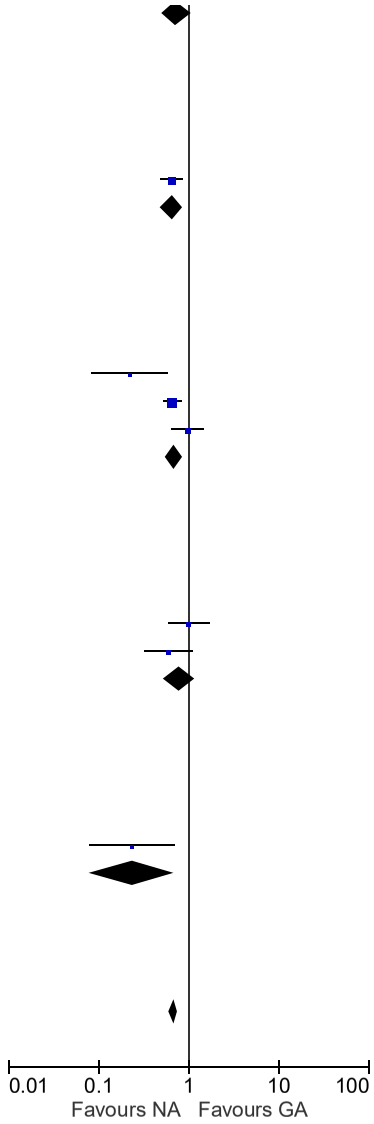


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.21 Mortality





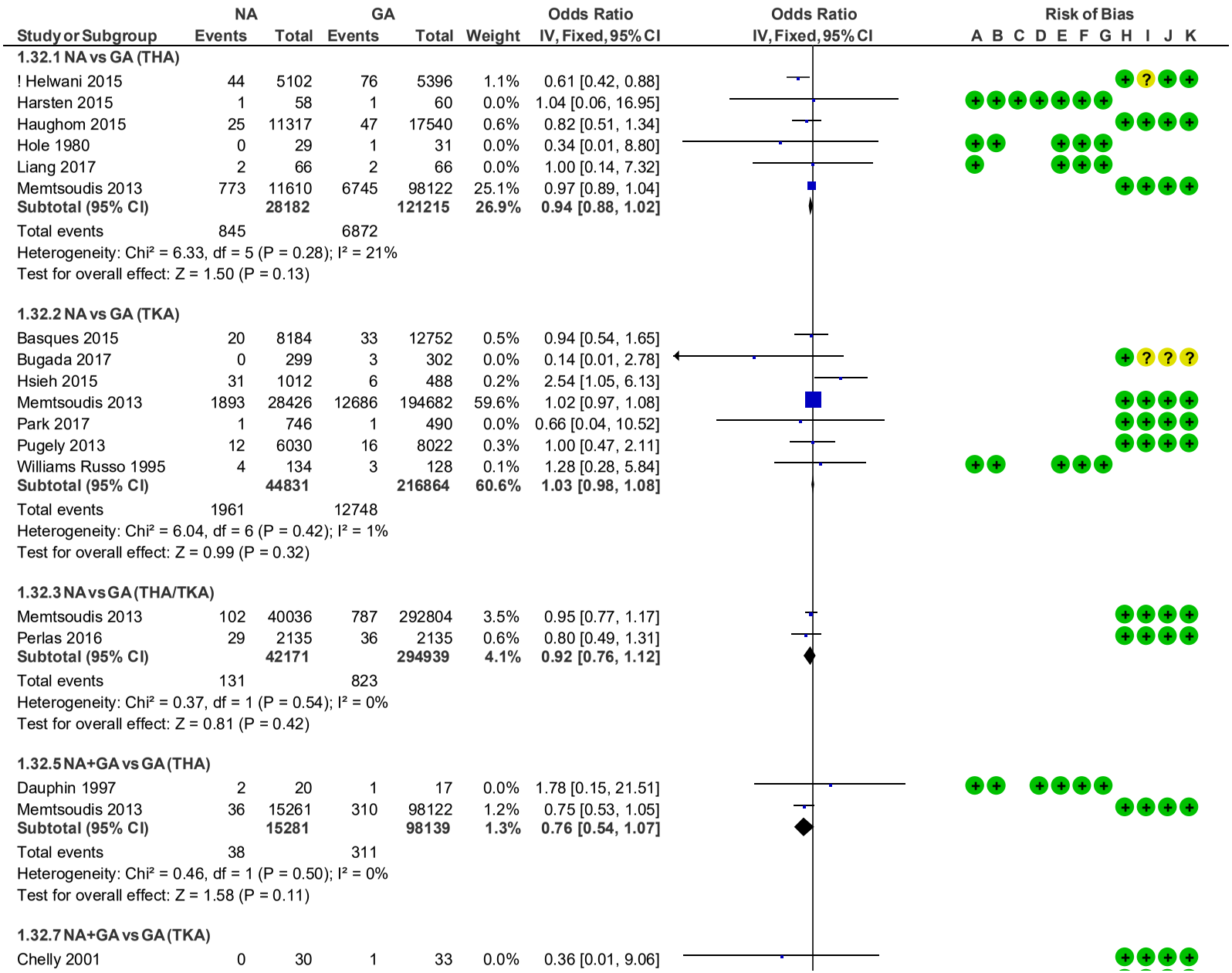
Subtotal (95% CI)		**34135**		**194682**	**8.9%**	**0.73 [0.51, 1.05]**
Total events	32		250			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.68 (P = 0.09)						
1.21.7 NA+GA vs GA (THA/TKA)						
Memtsoudis 2013	54	49396	493	292804	15.3%	0.65 [0.49, 0.86]
Subtotal (95% CI)		**49396**		**292804**	**15.3%**	**0.65 [0.49, 0.86]**
Total events	54		493			
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.02 (P = 0.003)						
1.21.8 NA vs GA | 90 Days (THA)						
Aynardi 2013	27	127	11	20	1.3%	0.22 [0.08, 0.59]
Chen 2015	114	2847	171	2847	20.5%	0.65 [0.51, 0.83]
Khatod 2011	51	10194	38	7401	6.8%	0.97 [0.64, 1.48]
Subtotal (95% CI)		**13168**		**10268**	**28.6%**	**0.68 [0.56, 0.84]**
Total events	192		220			
Heterogeneity: Chi² = 7.98, df = 2 (P = 0.02); I² = 75%						
Test for overall effect: Z = 3.61 (P = 0.0003)						
1.21.9 NA vs GA | 30Days (THA)						
Chen 2015	28	2847	28	2847	4.4%	1.00 [0.59, 1.69]
Haughom 2015	14	11317	37	17540	3.2%	0.59 [0.32, 1.08]
Subtotal (95% CI)		**14164**		**20387**	**7.6%**	**0.80 [0.53, 1.19]**
Total events	42		65			
Heterogeneity: Chi² = 1.67, df = 1 (P = 0.20); I² = 40%						
Test for overall effect: Z = 1.11 (P = 0.27)						
1.21.10 NA vs GA | 30 Days (THA/TKA)						
Perlas 2016	4	2135	17	2135	1.0%	0.23 [0.08, 0.70]
Subtotal (95% CI)		**2135**		**2135**	**1.0%**	**0.23 [0.08, 0.70]**
Total events	4		17			
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.61 (P = 0.009)						
Total (95% CI)		**248106**		**1248351**	**100.0%**	**0.68 [0.61, 0.76]**
Total events	474		2332			
Heterogeneity: Chi² = 22.57, df = 22 (P = 0.43); I² = 3%						
Test for overall effect: Z = 6.83 (P < 0.00001)						
Test for subgroup differences: Chi² = 6.78, df = 8 (P = 0.56), I² = 0%						

Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)

(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.32 Cardiac incl. MI



Memtsoudis 2013	90	34135	477	194682	2.9%	1.08 [0.86, 1.35]
Subtotal (95% CI)		**34165**		**194715**	**2.9%**	**1.07 [0.85, 1.34]**
Total events	90		478			

Heterogeneity: Chi² = 0.45, df = 1 (P = 0.50); I² = 0%
Test for overall effect: Z = 0.59 (P = 0.55)

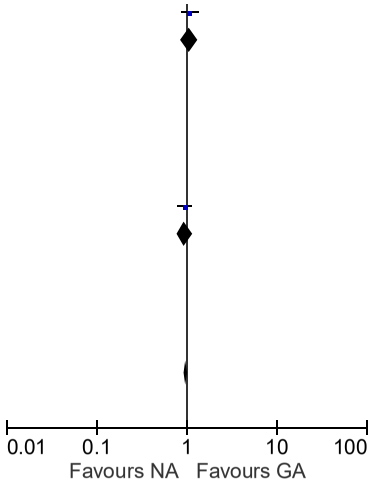
1.32.9NA+GA vs GA(THA/TKA)

Memtsoudis 2013	126	49396	787	292804	4.2%	0.95 [0.79, 1.15]
Subtotal (95% CI)		**49396**		**292804**	**4.2%**	**0.95 [0.79, 1.15]**
Total events	126		787			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.55 (P = 0.59)

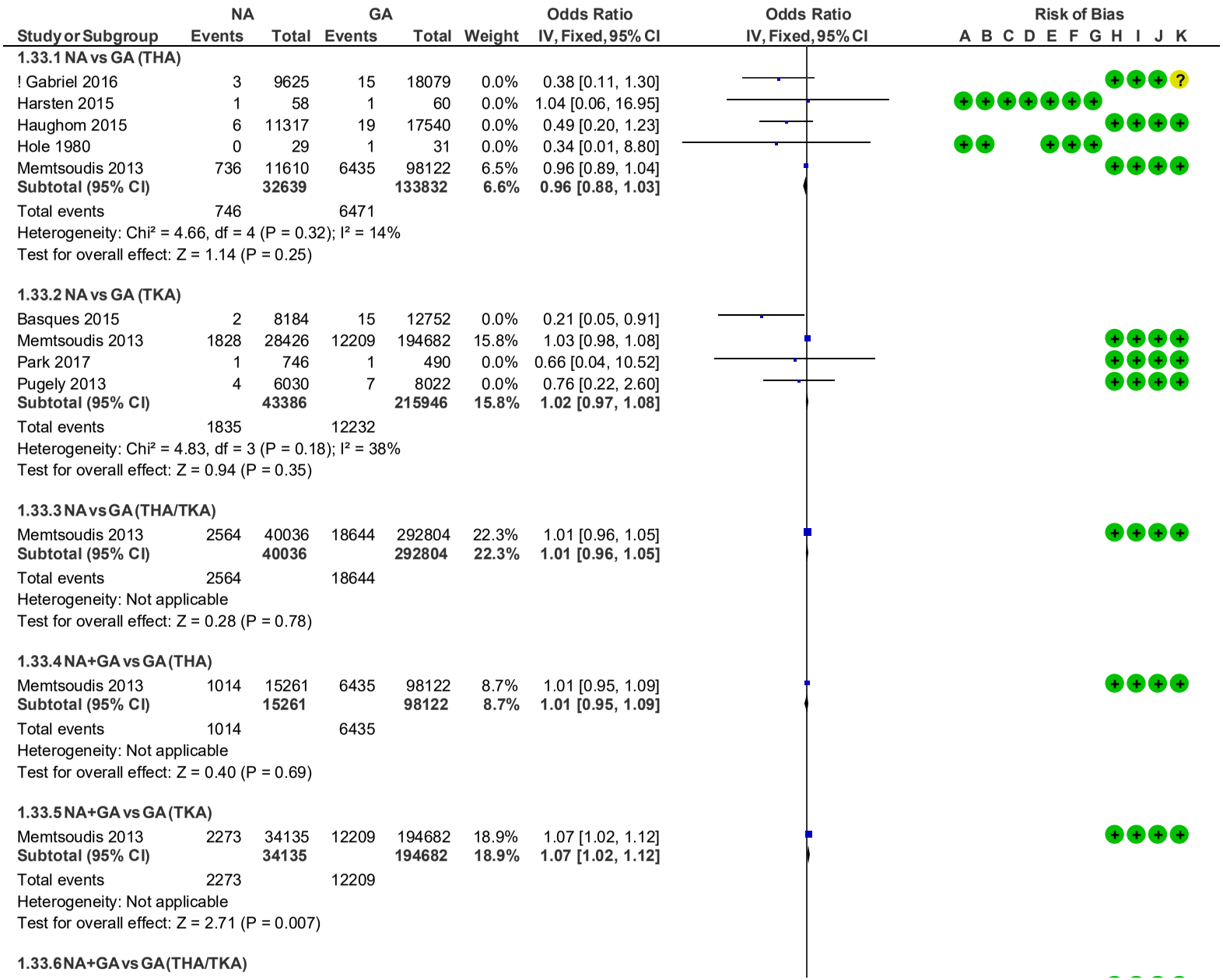
Total (95% CI)		**214026**		**1218676**	**100.0%**	**0.99 [0.96, 1.03]**
Total events	3191		22019			

Heterogeneity: Chi² = 20.54, df = 19 (P = 0.36); I² = 7%
Test for overall effect: Z = 0.36 (P = 0.72)
Test for subgroup differences: Chi² = 6.89, df = 5 (P = 0.23), I² = 27.4%

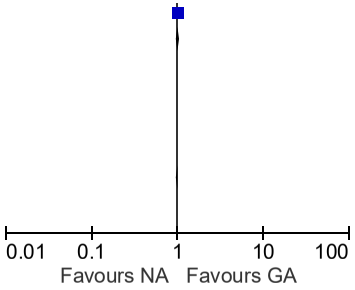


Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.33 Cardiac excl. MI



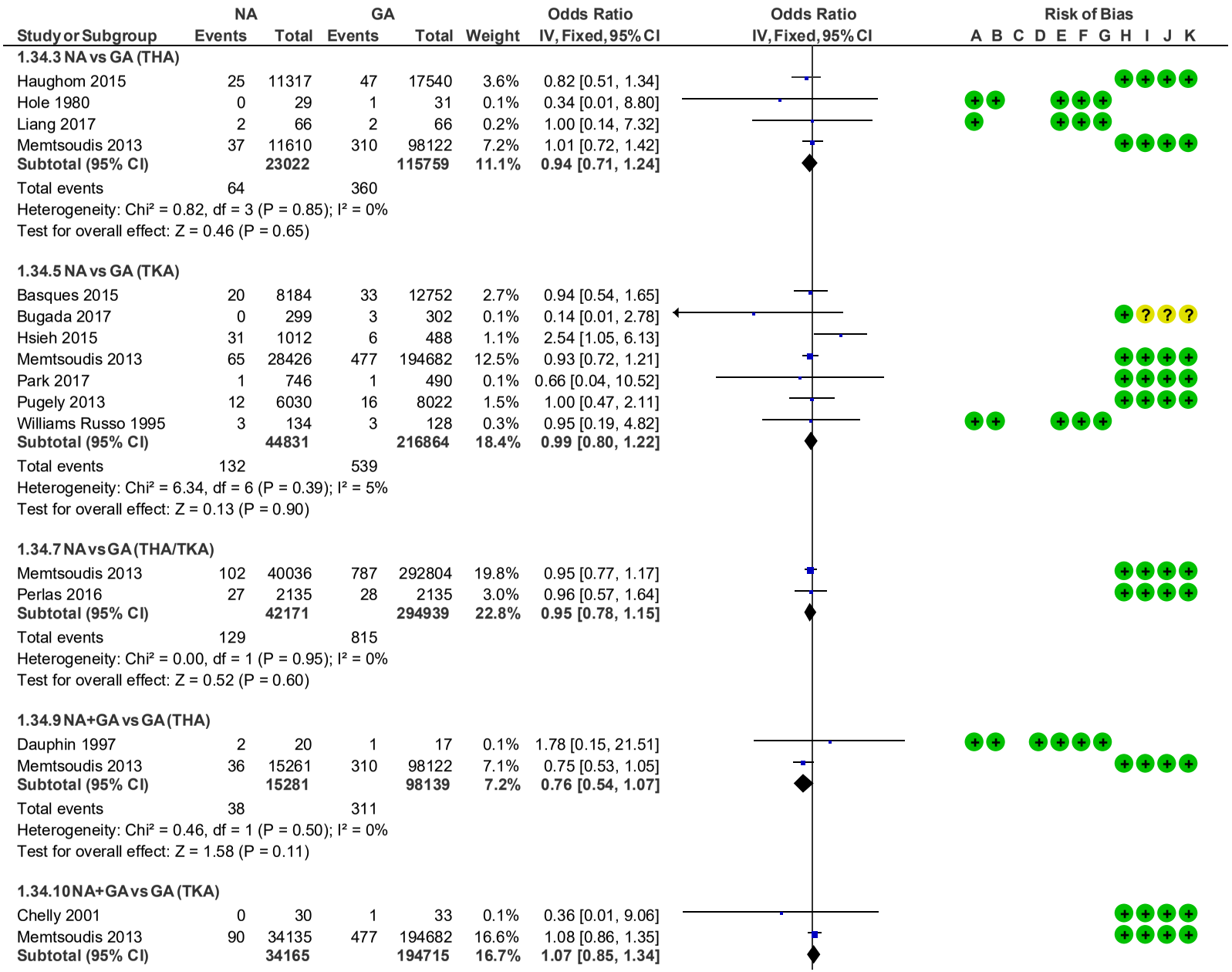
Memtsoudis 2013	3287	49396	18644	282804	27.6%	1.01 [0.97, 1.05]
Subtotal (95% CI)		**49396**		**282804**	**27.6%**	**1.01 [0.97, 1.05]**
Total events	3287		18644			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.51 (P = 0.61)						
Total (95% CI)		**214853**		**1218190**	**100.0%**	**1.02 [1.00, 1.04]**
Total events	11719		74635			
Heterogeneity: Chi² = 16.36, df = 12 (P = 0.18); I² = 27%						
Test for overall effect: Z = 1.78 (P = 0.08)						
Test for subgroup differences: Chi² = 6.87, df = 5 (P = 0.23), I² = 27.2%						



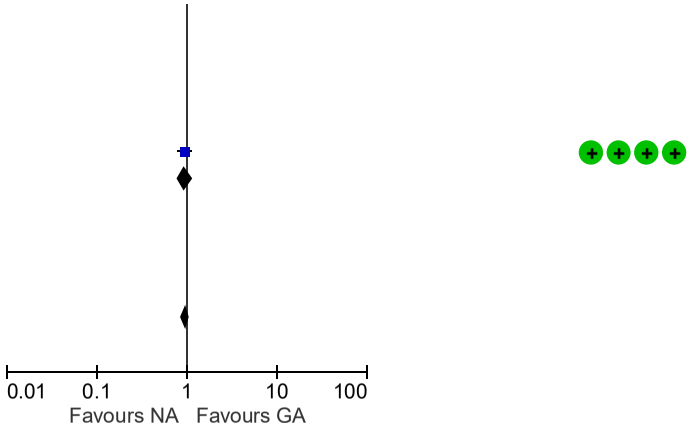
Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.34 Myocardial infarction



Total events	90		478			
Heterogeneity: Chi² = 0.45, df = 1 (P = 0.50); I² = 0%						
Test for overall effect: Z = 0.59 (P = 0.55)						
1.34.11 NA+GA vs GA (THA/TKA)						
Memtsoudis 2013	126	49396	787	292804	23.8%	0.95 [0.79, 1.15]
Subtotal (95% CI)		**49396**		**292804**	**23.8%**	**0.95 [0.79, 1.15]**
Total events	126		787			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.55 (P = 0.59)						
Total (95% CI)		**208866**		**1213220**	**100.0%**	**0.96 [0.87, 1.05]**
Total events	579		3290			
Heterogeneity: Chi² = 10.90, df = 17 (P = 0.86); I² = 0%						
Test for overall effect: Z = 0.91 (P = 0.36)						
Test for subgroup differences: Chi² = 2.84, df = 5 (P = 0.73), I² = 0%						

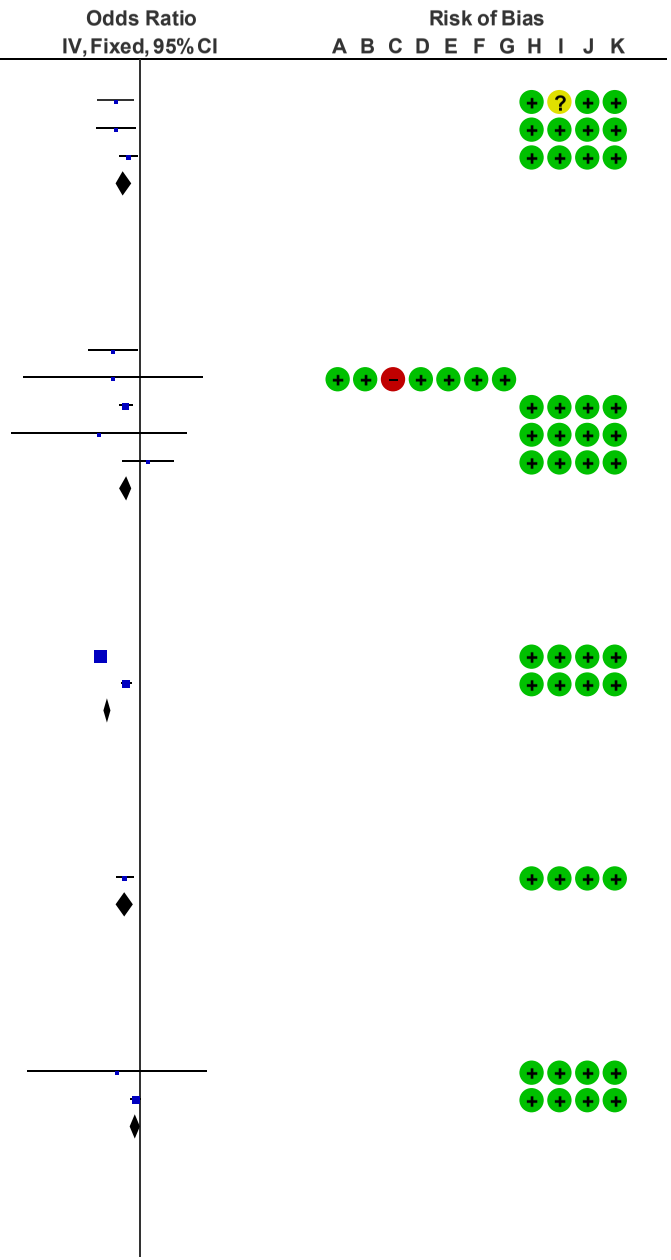


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

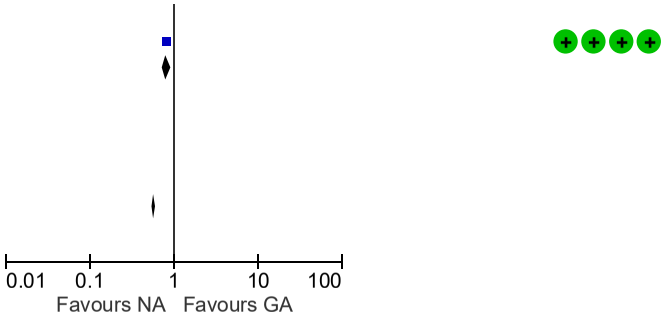
1.35 Pulmonary (excl. Pneumonia)

Study or Subgroup	NA Events	NA Total	GA Events	GA Total	Weight	Odds Ratio IV, Fixed, 95% CI
1.35.1 NA vs GA (THA)						
! Helwani 2015	23	5102	47	5396	1.2%	0.52 [0.31, 0.85]
Haughom 2015	17	11317	51	17540	1.0%	0.52 [0.30, 0.89]
Memtsoudis 2013	61	11610	710	98122	4.2%	0.72 [0.56, 0.94]
Subtotal (95% CI)		**28029**		**121058**	**6.3%**	**0.65 [0.52, 0.80]**
Total events	101		808			
Heterogeneity: Chi² = 2.16, df = 2 (P = 0.34); I² = 8%						
Test for overall effect: Z = 3.99 (P < 0.0001)						
1.35.2 NA vs GA (TKA)						
Basques 2015	11	8184	36	12752	0.6%	0.48 [0.24, 0.93]
Chu 2006	1	30	2	30	0.0%	0.48 [0.04, 5.63]
Memtsoudis 2013	131	28426	1312	194682	8.9%	0.68 [0.57, 0.82]
Park 2017	1	746	2	490	0.0%	0.33 [0.03, 3.62]
Pugely 2013	15	6030	16	8022	0.6%	1.25 [0.62, 2.53]
Subtotal (95% CI)		**43416**		**215976**	**10.2%**	**0.69 [0.58, 0.81]**
Total events	159		1368			
Heterogeneity: Chi² = 4.34, df = 4 (P = 0.36); I² = 8%						
Test for overall effect: Z = 4.38 (P < 0.0001)						
1.35.3 NA vs GA (THA/TKA)						
! Weingarten 2015	766	5503	2070	6467	33.7%	0.34 [0.31, 0.38]
Memtsoudis 2013	192	40036	2022	292804	13.1%	0.69 [0.60, 0.80]
Subtotal (95% CI)		**45539**		**299271**	**46.9%**	**0.42 [0.39, 0.45]**
Total events	958		4092			
Heterogeneity: Chi² = 61.90, df = 1 (P < 0.00001); I² = 98%						
Test for overall effect: Z = 21.78 (P < 0.00001)						
1.35.4 NA+GA vs GA (THA)						
Memtsoudis 2013	73	15261	710	98122	4.9%	0.66 [0.52, 0.84]
Subtotal (95% CI)		**15261**		**98122**	**4.9%**	**0.66 [0.52, 0.84]**
Total events	73		710			
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.38 (P = 0.0007)						
1.35.5 NA+GA vs GA (TKA)						
Chelly 2001	1	30	2	33	0.0%	0.53 [0.05, 6.21]
Memtsoudis 2013	206	34135	1312	194682	13.3%	0.89 [0.77, 1.04]
Subtotal (95% CI)		**34165**		**194715**	**13.3%**	**0.89 [0.77, 1.03]**
Total events	207		1314			
Heterogeneity: Chi² = 0.17, df = 1 (P = 0.68); I² = 0%						
Test for overall effect: Z = 1.51 (P = 0.13)						



1.35.6 NA+GA vs GA (THA/TKA)

Memtsoudis 2013	279	49396	2022	292804	18.3%	0.82 [0.72, 0.93]
Subtotal (95% CI)		**49396**		**292804**	**18.3%**	**0.82 [0.72, 0.93]**
Total events	279		2022			
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.16 (P = 0.002)						
Total (95% CI)		**215806**		**1221946**	**100.0%**	**0.58 [0.55, 0.61]**
Total events	1777		10314			
Heterogeneity: Chi² = 203.09, df = 13 (P < 0.00001); I² = 94%						
Test for overall effect: Z = 19.96 (P < 0.00001)						
Test for subgroup differences: Chi² = 134.52, df = 5 (P < 0.00001), I² = 96.3%						

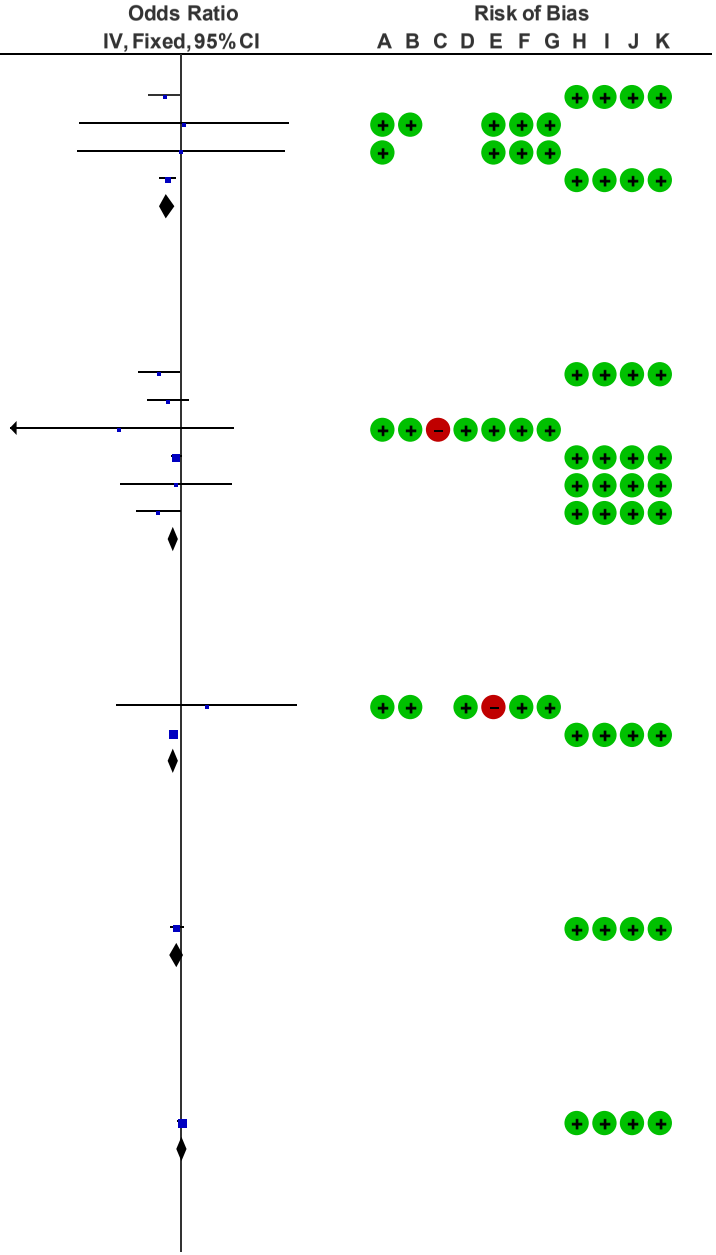


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.53 Pneumonia

Study or Subgroup	NA Events	NA Total	GA Events	GA Total	Weight	Odds Ratio IV, Fixed, 95% CI
1.53.1 NA vs GA (THA)						
Haughom 2015	26	11317	63	17540	1.4%	0.64 [0.40, 1.01]
Hole 1980	1	29	1	31	0.0%	1.07 [0.06, 17.96]
Liang 2017	1	66	1	66	0.0%	1.00 [0.06, 16.33]
Memtsoudis 2013	86	11610	1040	98122	6.0%	0.70 [0.56, 0.87]
Subtotal (95% CI)		**23022**		**115759**	**7.4%**	**0.69 [0.56, 0.84]**
Total events	114		1105			
Heterogeneity: Chi² = 0.28, df = 3 (P = 0.96); I² = 0%						
Test for overall effect: Z = 3.70 (P = 0.0002)						
1.53.2 NA vs GA (TKA)						
! Liu 2013	18	7388	41	9167	0.9%	0.54 [0.31, 0.95]
Basques 2015	18	8184	40	12752	0.9%	0.70 [0.40, 1.22]
Chu 2006	0	30	2	30	0.0%	0.19 [0.01, 4.06]
Memtsoudis 2013	209	28426	1629	194682	13.9%	0.88 [0.76, 1.01]
Park 2017	4	746	3	490	0.1%	0.88 [0.20, 3.93]
Pugely 2013	15	6030	37	8022	0.8%	0.54 [0.30, 0.98]
Subtotal (95% CI)		**50804**		**225143**	**16.7%**	**0.82 [0.72, 0.94]**
Total events	264		1752			
Heterogeneity: Chi² = 6.05, df = 5 (P = 0.30); I² = 17%						
Test for overall effect: Z = 2.92 (P = 0.003)						
1.53.3 NA vs GA (THA/TKA)						
Jones 1990	2	74	1	72	0.0%	1.97 [0.17, 22.24]
Memtsoudis 2013	295	40036	2669	292804	19.9%	0.81 [0.72, 0.91]
Subtotal (95% CI)		**40110**		**292876**	**20.0%**	**0.81 [0.72, 0.91]**
Total events	297		2670			
Heterogeneity: Chi² = 0.52, df = 1 (P = 0.47); I² = 0%						
Test for overall effect: Z = 3.45 (P = 0.0006)						
1.53.4 NA+GA vs GA (THA)						
Memtsoudis 2013	143	15261	1040	98122	9.4%	0.88 [0.74, 1.05]
Subtotal (95% CI)		**15261**		**98122**	**9.4%**	**0.88 [0.74, 1.05]**
Total events	143		1040			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.39 (P = 0.16)						
1.53.5 NA+GA vs GA (TKA)						
Memtsoudis 2013	292	34135	1629	194682	18.5%	1.02 [0.90, 1.16]
Subtotal (95% CI)		**34135**		**194682**	**18.5%**	**1.02 [0.90, 1.16]**
Total events	292		1629			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.35 (P = 0.73)						



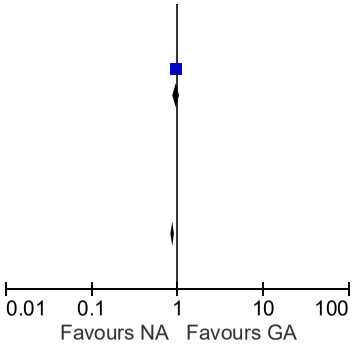
1.53.6 NA+GA vs GA (THA/TKA)

Memtsoudis 2013	435	49396	2669	292804	28.0%	0.97 [0.87, 1.07]
Subtotal (95% CI)		**49396**		**292804**	**28.0%**	**0.97 [0.87, 1.07]**
Total events	435		2669			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.67 (P = 0.50)

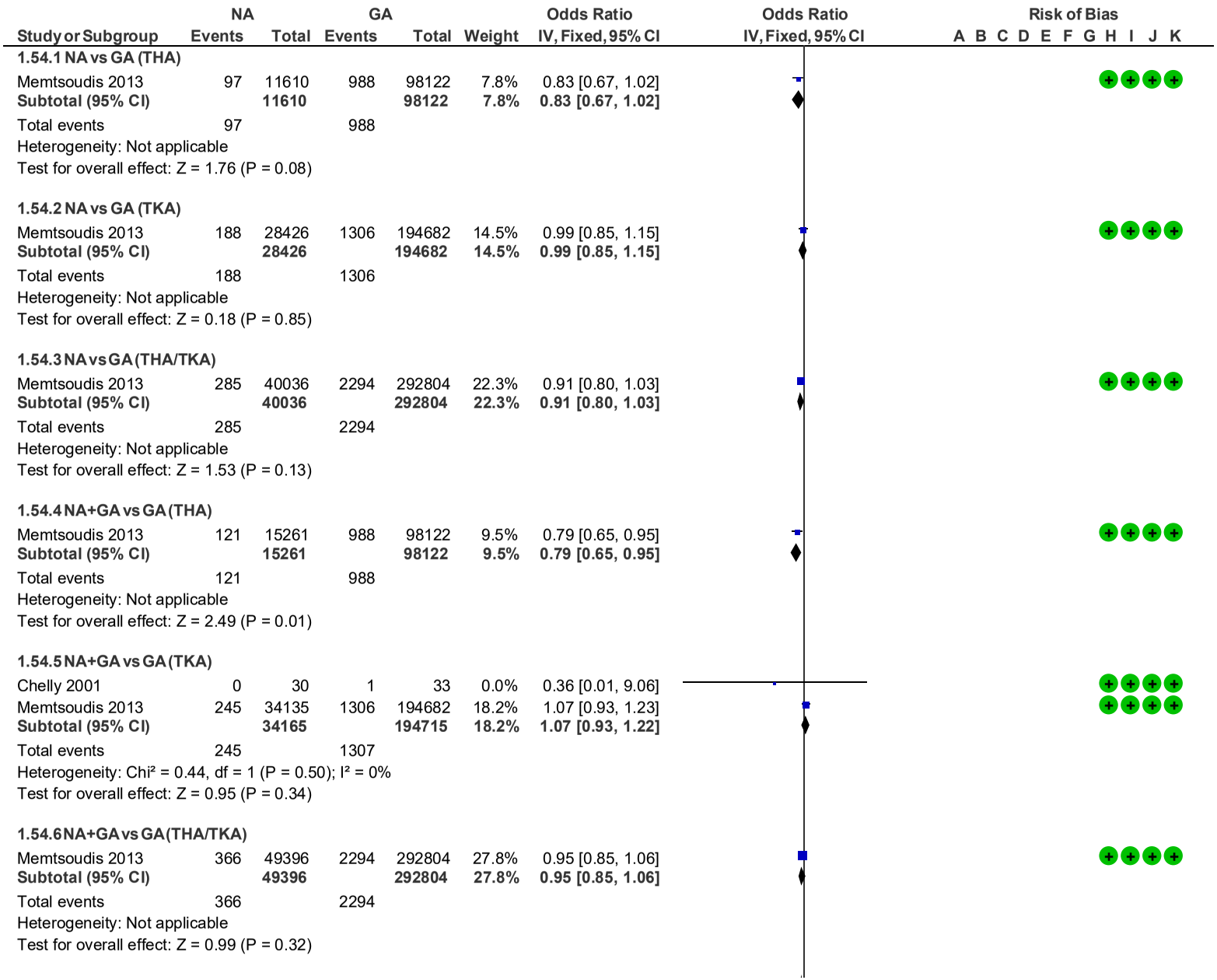
Total (95% CI)		**212728**		**1219386**	**100.0%**	**0.89 [0.84, 0.94]**
Total events	1545		10865			

Heterogeneity: Chi² = 24.37, df = 14 (P = 0.04); I² = 43%
Test for overall effect: Z = 4.37 (P < 0.0001)
Test for subgroup differences: Chi² = 17.53, df = 5 (P = 0.004), I² = 71.5%



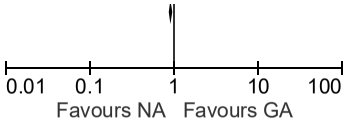
Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.54 Gastrointestinal



Total (95% CI)	**178894**	**1171249**	**100.0%**	**0.94 [0.88, 0.99]**	
Total events	1302	9177			

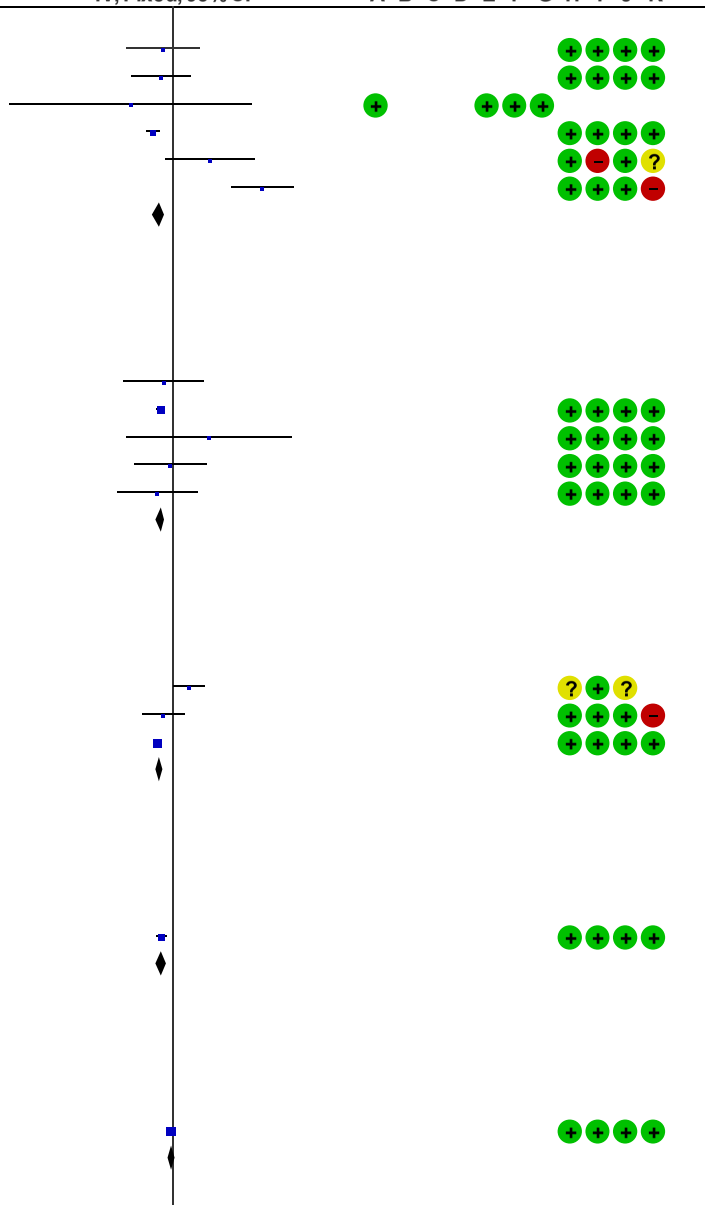
Heterogeneity: Chi² = 9.31, df = 6 (P = 0.16); I² = 36%
Test for overall effect: Z = 2.17 (P = 0.03)
Test for subgroup differences: Chi² = 8.87, df = 5 (P = 0.11), I² = 43.6%



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.56 Acute renal failure

Study or Subgroup	NA Events	NA Total	GA Events	GA Total	Weight	Odds Ratio IV, Fixed, 95% CI
1.56.1 NA vs GA (THA)						
Haughom 2015	6	11317	12	17540	0.2%	0.77 [0.29, 2.07]
Haughom 2015	9	11317	19	17540	0.3%	0.73 [0.33, 1.62]
Liang 2017	0	66	1	66	0.0%	0.33 [0.01, 8.21]
Memtsoudis 2013	136	11610	1925	98122	5.9%	0.59 [0.50, 0.71]
Walton 1982	4	24	16	232	0.1%	2.70 [0.82, 8.85]
Walts 1985	20	32	25	187	0.3%	10.80 [4.71, 24.78]
Subtotal (95% CI)		**34366**		**133687**	**6.7%**	**0.69 [0.59, 0.81]**
Total events	175		1998			
Heterogeneity: Chi² = 50.42, df = 5 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 4.42 (P < 0.00001)						
1.56.2 NA vs GA (TKA)						
Basques 2015	5	8184	10	12752	0.2%	0.78 [0.27, 2.28]
Memtsoudis 2013	320	28426	3010	194682	13.3%	0.73 [0.65, 0.81]
Park 2017	4	746	1	490	0.0%	2.64 [0.29, 23.66]
Pugely 2013	7	6030	10	8022	0.2%	0.93 [0.35, 2.45]
Pugely 2013	5	6030	10	8022	0.2%	0.66 [0.23, 1.95]
Subtotal (95% CI)		**49416**		**223968**	**13.9%**	**0.73 [0.65, 0.82]**
Total events	341		3041			
Heterogeneity: Chi² = 1.62, df = 4 (P = 0.81); I² = 0%						
Test for overall effect: Z = 5.43 (P < 0.00001)						
1.56.3 NA vs GA (THA/TKA)						
Bjerregaard 2015	387	936	37	118	1.1%	1.54 [1.02, 2.33]
Kimmel 2014	21	163	41	255	0.6%	0.77 [0.44, 1.36]
Memtsoudis 2013	456	40036	4935	292804	19.3%	0.67 [0.61, 0.74]
Subtotal (95% CI)		**41135**		**293177**	**20.9%**	**0.70 [0.64, 0.77]**
Total events	864		5013			
Heterogeneity: Chi² = 15.06, df = 2 (P = 0.0005); I² = 87%						
Test for overall effect: Z = 7.43 (P < 0.00001)						
1.56.4 NA+GA vs GA (THA)						
Memtsoudis 2013	225	15261	1925	98122	9.3%	0.75 [0.65, 0.86]
Subtotal (95% CI)		**15261**		**98122**	**9.3%**	**0.75 [0.65, 0.86]**
Total events	225		1925			
Heterogeneity: Not applicable						
Test for overall effect: Z = 4.09 (P < 0.0001)						
1.56.5 NA+GA vs GA (TKA)						
Memtsoudis 2013	506	34135	3010	194682	19.9%	0.96 [0.87, 1.05]
Subtotal (95% CI)		**34135**		**194682**	**19.9%**	**0.96 [0.87, 1.05]**
Total events	506		3010			



Heterogeneity: Not applicable
Test for overall effect: Z = 0.88 (P = 0.38)

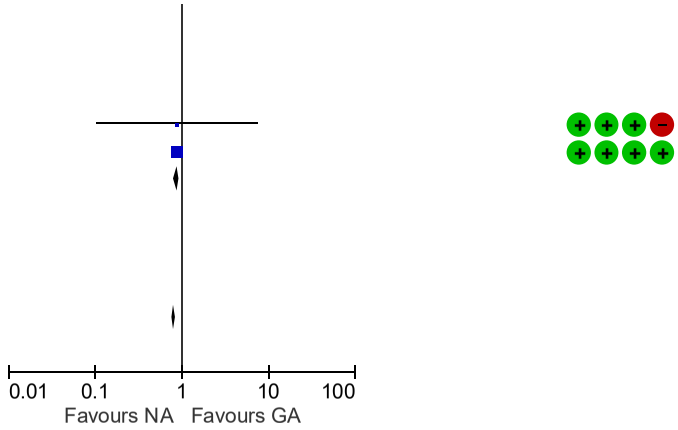
1.56.6 NA+GA vs GA (THA/TKA)

Kimmel 2014	1	7	41	255	0.0%	0.87 [0.10, 7.42]
Memtsoudis 2013	731	49396	4935	292804	29.3%	0.88 [0.81, 0.95]
Subtotal (95% CI)		**49403**		**293059**	**29.3%**	**0.88 [0.81, 0.95]**
Total events	732		4976			

Heterogeneity: Chi² = 0.00, df = 1 (P = 0.99); I² = 0%
Test for overall effect: Z = 3.31 (P = 0.0009)

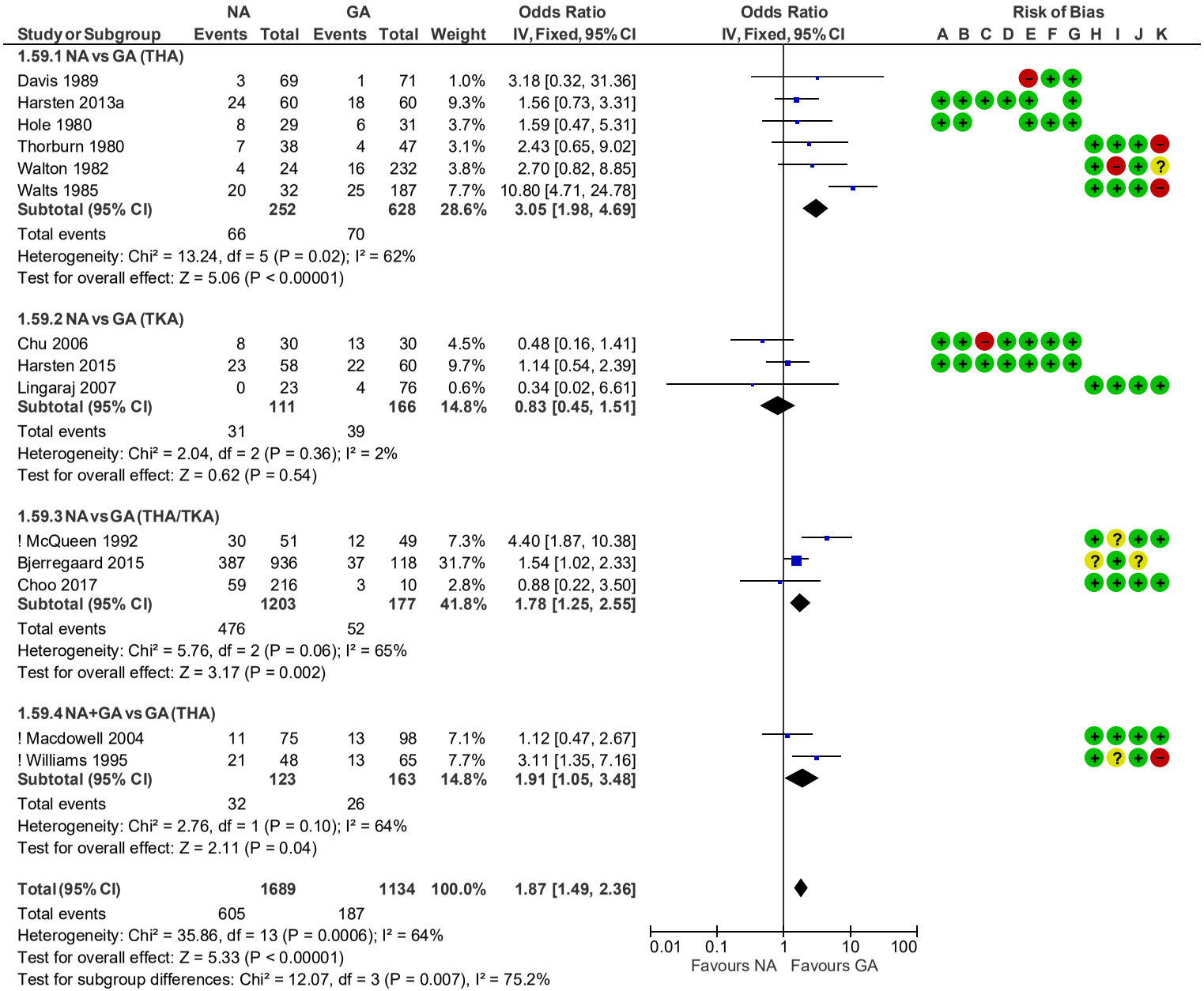
Total (95% CI)		**223716**		**1236695**	**100.0%**	**0.81 [0.77, 0.84]**
Total events	2843		19963			

Heterogeneity: Chi² = 99.84, df = 17 (P < 0.00001); I² = 83%
Test for overall effect: Z = 10.00 (P < 0.00001)
Test for subgroup differences: Chi² = 32.74, df = 5 (P < 0.00001), I² = 84.7%



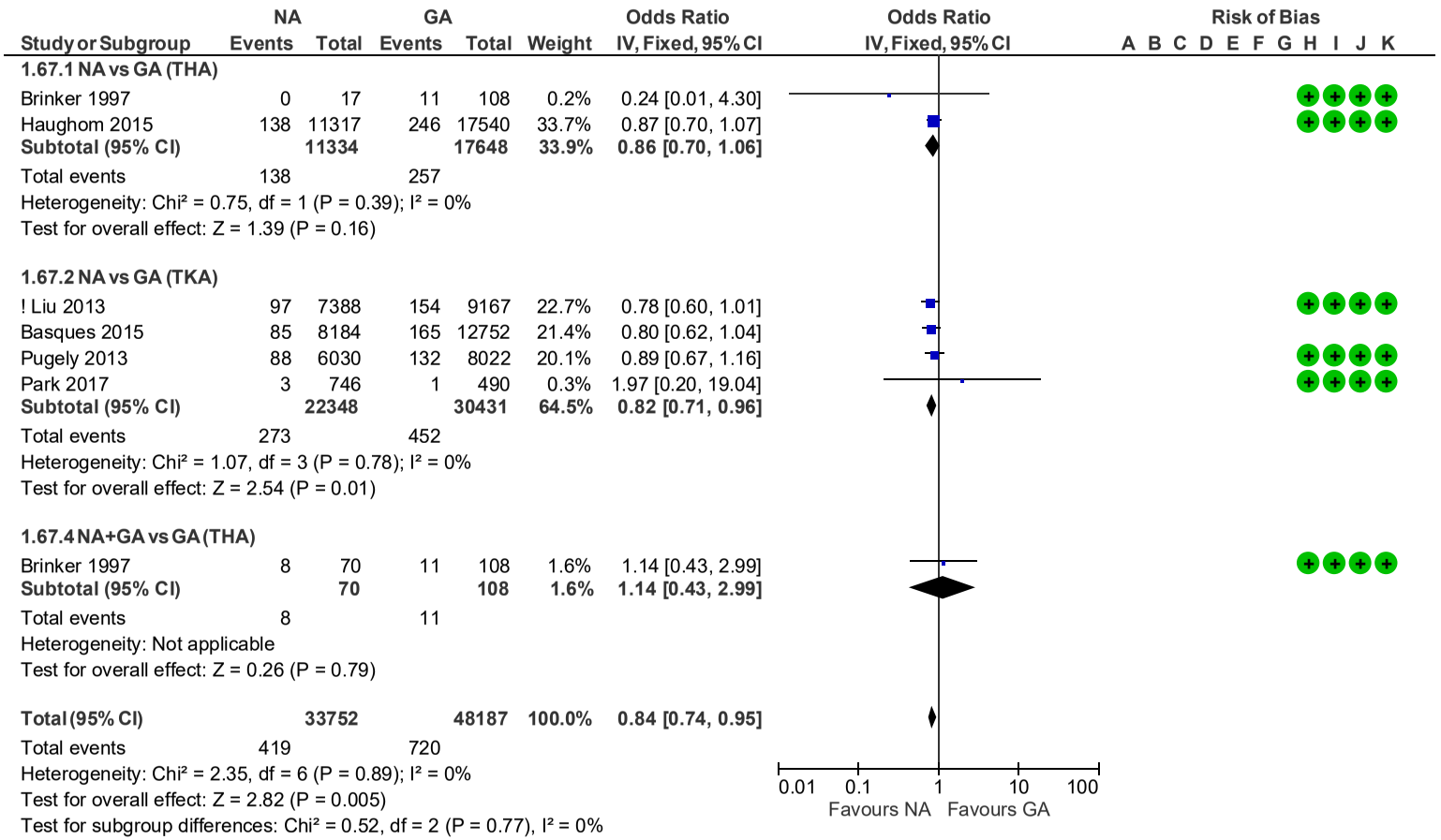
Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.59 Urinary retention



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

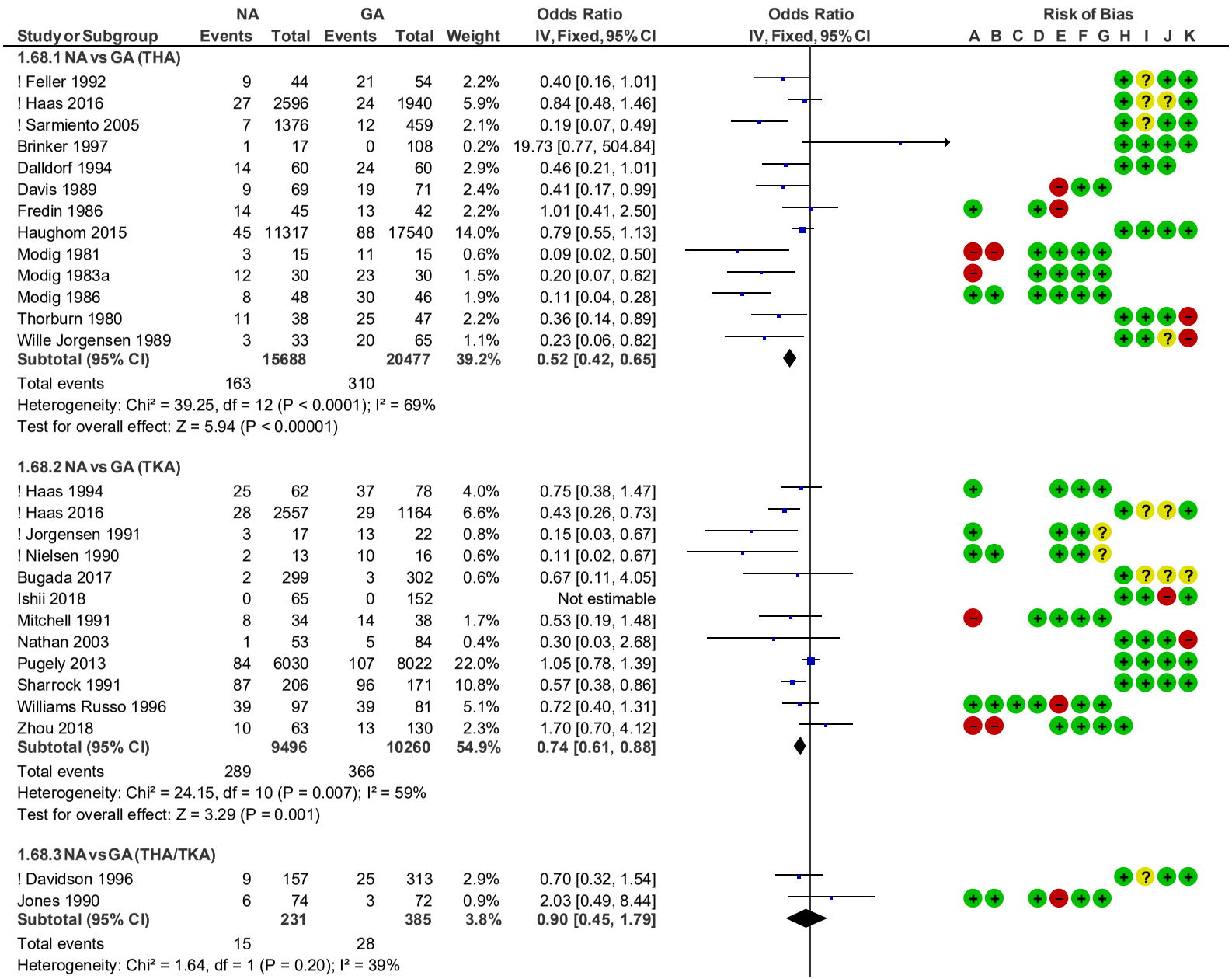
1.67 Urinary tract infection



Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.68 Deep venous thrombosis (DVT)



Test for overall effect: Z = 0.31 (P = 0.76)

1.68.6 NA vs GA | proximal (popliteal and femoral) (THA)

Modig 1983a	4	30	20	30	1.1%	0.08 [0.02, 0.28]
Subtotal (95% CI)		**30**		**30**	**1.1%**	**0.08 [0.02, 0.28]**
Total events	4		20			

Heterogeneity: Not applicable
Test for overall effect: Z = 3.87 (P = 0.0001)

1.68.8 NA+GA vs GA (THA)

Brinker 1997	0	70	0	108		Not estimable
Dauphin 1997	4	20	4	17	0.7%	0.81 [0.17, 3.89]
Subtotal (95% CI)		**90**		**125**	**0.7%**	**0.81 [0.17, 3.89]**
Total events	4		4			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.26 (P = 0.80)

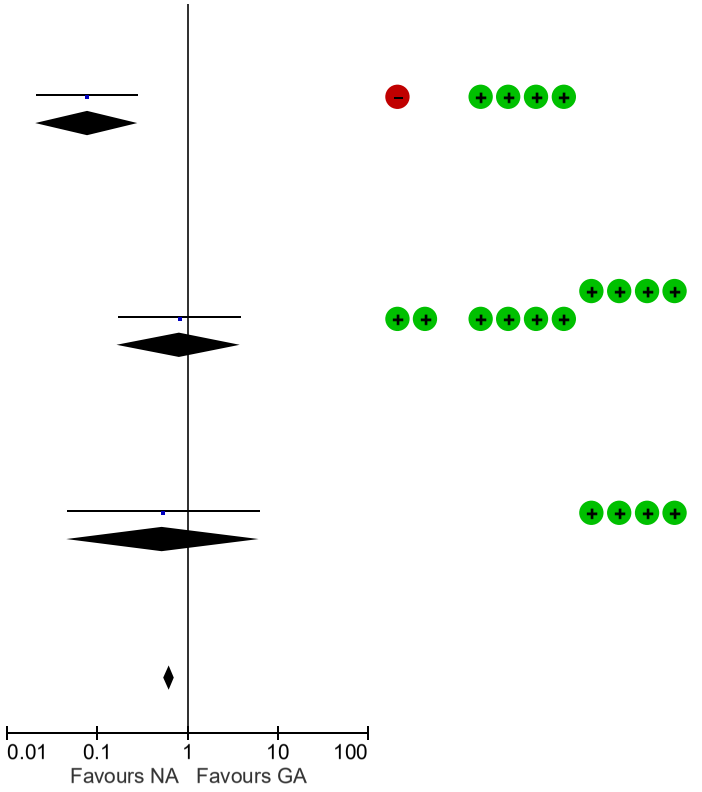
1.68.9 NA+GA vs GA (TKA)

Chelly 2001	1	30	2	33	0.3%	0.53 [0.05, 6.21]
Subtotal (95% CI)		**30**		**33**	**0.3%**	**0.53 [0.05, 6.21]**
Total events	1		2			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.50 (P = 0.62)

Total (95% CI)		**25565**		**31310**	**100.0%**	**0.63 [0.55, 0.72]**
Total events	476		730			

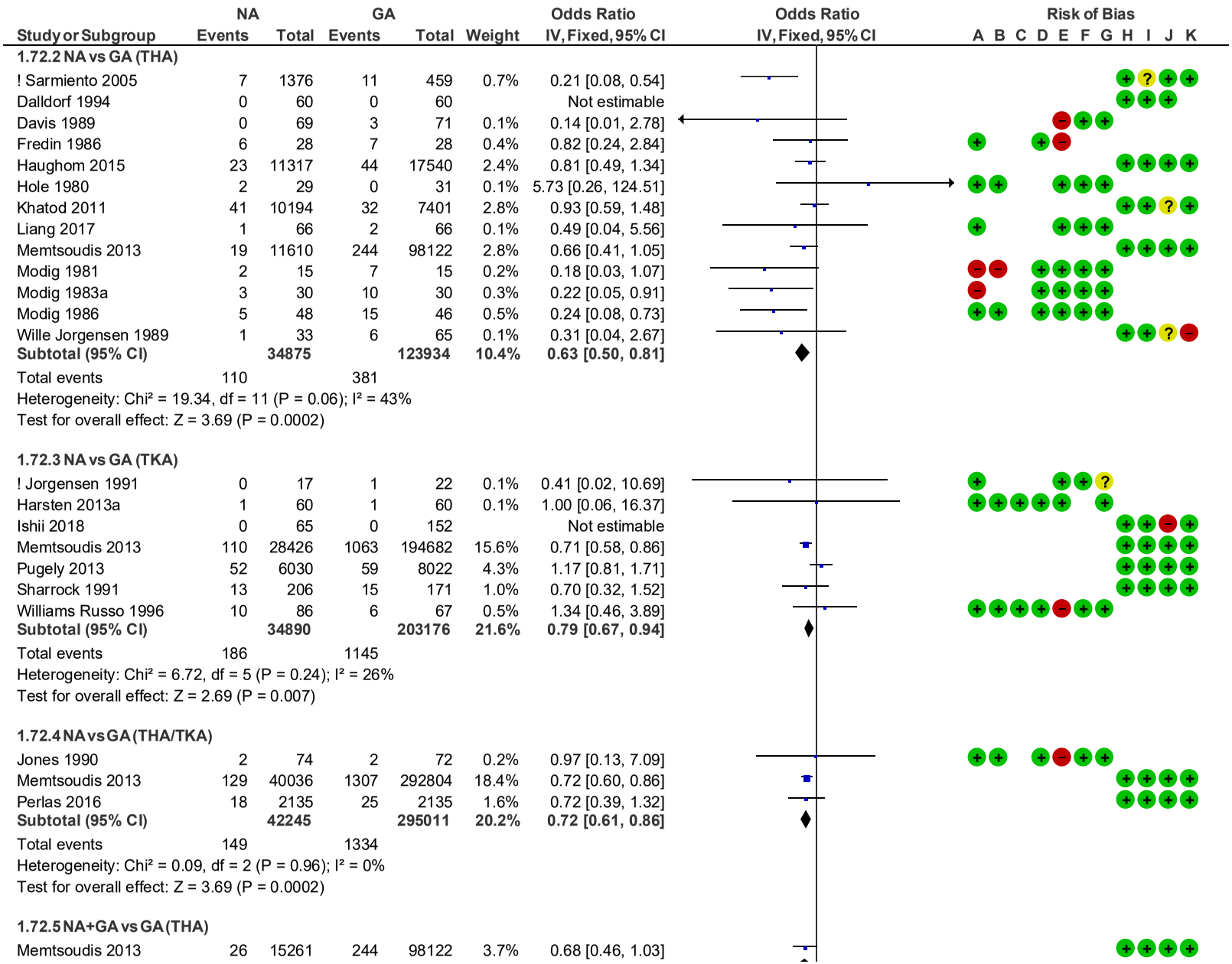
Heterogeneity: Chi² = 82.14, df = 28 (P < 0.00001); I² = 66%
Test for overall effect: Z = 6.67 (P < 0.00001)
Test for subgroup differences: Chi² = 17.10, df = 5 (P = 0.004), I² = 70.8%



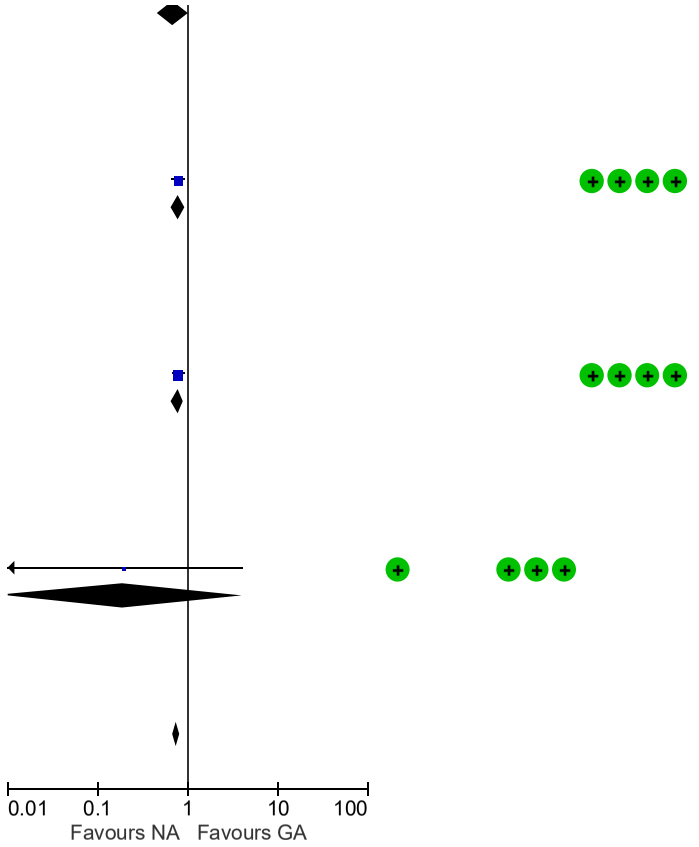
Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.72 Pulmonary embolism (PE)



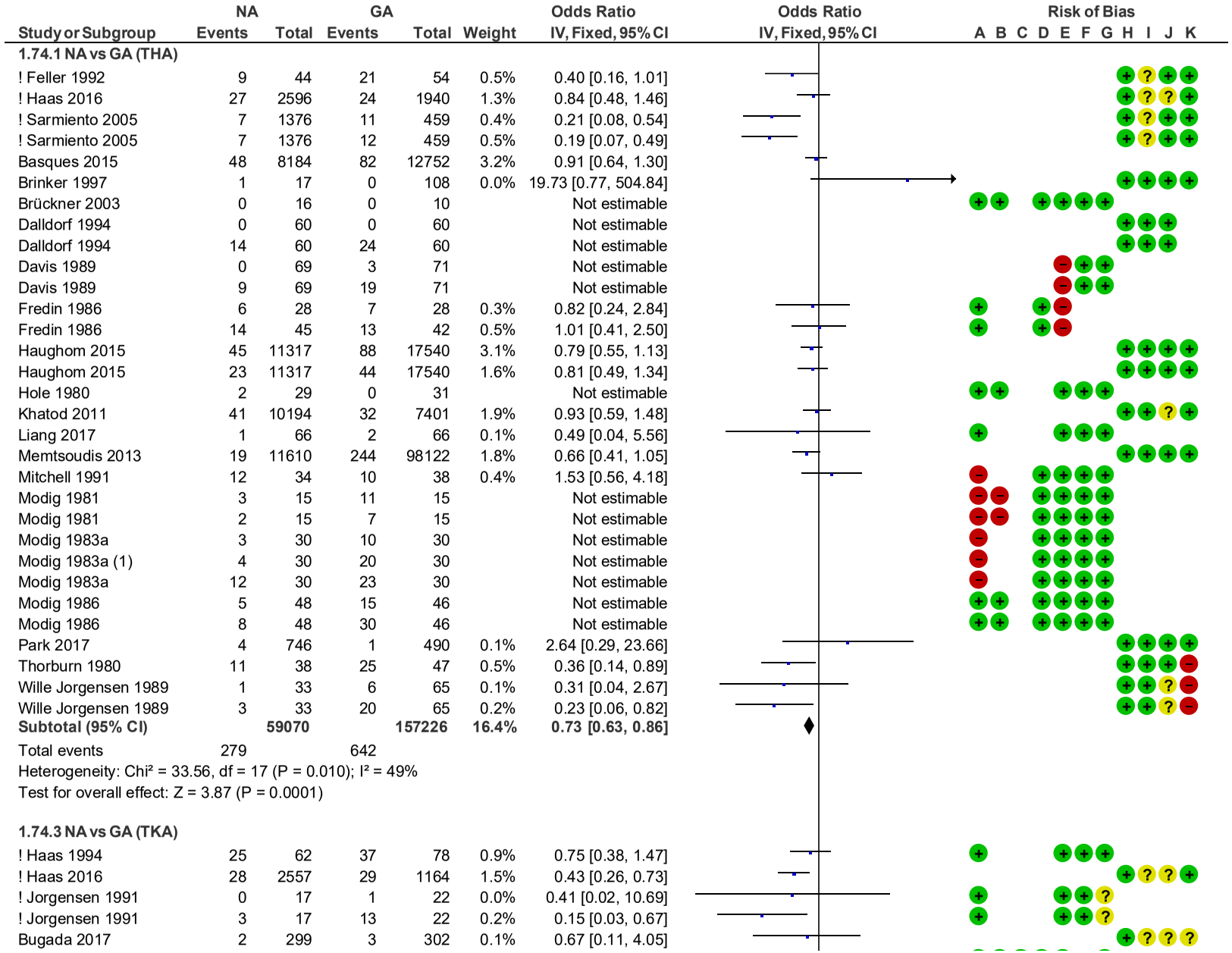
Subtotal (95% CI)		**15261**		**98122**	**3.7%**	**0.68 [0.46, 1.03]**
Total events	26		244			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.84 (P = 0.07)						
1.72.6 NA+GA vs GA (TKA)						
Memtsoudis 2013	146	34135	1063	194682	20.1%	0.78 [0.66, 0.93]
Subtotal (95% CI)		**34135**		**194682**	**20.1%**	**0.78 [0.66, 0.93]**
Total events	146		1063			
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.77 (P = 0.006)						
1.72.7 NA+GA vs GA (THA/TKA)						
Memtsoudis 2013	172	49396	1307	292804	23.9%	0.78 [0.66, 0.91]
Subtotal (95% CI)		**49396**		**292804**	**23.9%**	**0.78 [0.66, 0.91]**
Total events	172		1307			
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.07 (P = 0.002)						
1.72.9 NA (caudal epidural) vs GA						
Liang 2017	0	66	2	66	0.1%	0.19 [0.01, 4.12]
Subtotal (95% CI)		**66**		**66**	**0.1%**	**0.19 [0.01, 4.12]**
Total events	0		2			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.05 (P = 0.29)						
Total (95% CI)		**210868**		**1207795**	**100.0%**	**0.75 [0.69, 0.81]**
Total events	789		5476			
Heterogeneity: Chi² = 30.03, df = 24 (P = 0.18); I² = 20%						
Test for overall effect: Z = 7.22 (P < 0.00001)						
Test for subgroup differences: Chi² = 3.88, df = 6 (P = 0.69), I² = 0%						



Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.74 Thrombembolism (DVT + PE)



Study or Subgroup	NA Events	NA Total	GA Events	GA Total	Weight	Odds Ratio IV, Fixed, 95% CI
1.74.1 NA vs GA (THA)						
! Feller 1992	9	44	21	54	0.5%	0.40 [0.16, 1.01]
! Haas 2016	27	2596	24	1940	1.3%	0.84 [0.48, 1.46]
! Sarmiento 2005	7	1376	11	459	0.4%	0.21 [0.08, 0.54]
! Sarmiento 2005	7	1376	12	459	0.5%	0.19 [0.07, 0.49]
Basques 2015	48	8184	82	12752	3.2%	0.91 [0.64, 1.30]
Brinker 1997	1	17	0	108	0.0%	19.73 [0.77, 504.84]
Brückner 2003	0	16	0	10		Not estimable
Dalldorf 1994	0	60	0	60		Not estimable
Dalldorf 1994	14	60	24	60		Not estimable
Davis 1989	0	69	3	71		Not estimable
Davis 1989	9	69	19	71		Not estimable
Fredin 1986	6	28	7	28	0.3%	0.82 [0.24, 2.84]
Fredin 1986	14	45	13	42	0.5%	1.01 [0.41, 2.50]
Haughom 2015	45	11317	88	17540	3.1%	0.79 [0.55, 1.13]
Haughom 2015	23	11317	44	17540	1.6%	0.81 [0.49, 1.34]
Hole 1980	2	29	0	31		Not estimable
Khatod 2011	41	10194	32	7401	1.9%	0.93 [0.59, 1.48]
Liang 2017	1	66	2	66	0.1%	0.49 [0.04, 5.56]
Memtsoudis 2013	19	11610	244	98122	1.8%	0.66 [0.41, 1.05]
Mitchell 1991	12	34	10	38	0.4%	1.53 [0.56, 4.18]
Modig 1981	3	15	11	15		Not estimable
Modig 1981	2	15	7	15		Not estimable
Modig 1983a	3	30	10	30		Not estimable
Modig 1983a (1)	4	30	20	30		Not estimable
Modig 1983a	12	30	23	30		Not estimable
Modig 1986	5	48	15	46		Not estimable
Modig 1986	8	48	30	46		Not estimable
Park 2017	4	746	1	490	0.1%	2.64 [0.29, 23.66]
Thorburn 1980	11	38	25	47	0.5%	0.36 [0.14, 0.89]
Wille Jorgensen 1989	1	33	6	65	0.1%	0.31 [0.04, 2.67]
Wille Jorgensen 1989	3	33	20	65	0.2%	0.23 [0.06, 0.82]
Subtotal (95% CI)		**59070**		**157226**	**16.4%**	**0.73 [0.63, 0.86]**
Total events	279		642			
Heterogeneity: Chi² = 33.56, df = 17 (P = 0.010); I² = 49%						
Test for overall effect: Z = 3.87 (P = 0.0001)						
1.74.3 NA vs GA (TKA)						
! Haas 1994	25	62	37	78	0.9%	0.75 [0.38, 1.47]
! Haas 2016	28	2557	29	1164	1.5%	0.43 [0.26, 0.73]
! Jorgensen 1991	0	17	1	22	0.0%	0.41 [0.02, 10.69]
! Jorgensen 1991	3	17	13	22	0.2%	0.15 [0.03, 0.67]
Bugada 2017	2	299	3	302	0.1%	0.67 [0.11, 4.05]

Harsten 2013a	1	60	1	60	0.1%	1.00 [0.06, 16.37]
Ishii 2018	0	65	0	152		Not estimable
Ishii 2018	0	65	0	152		Not estimable
Memtsoudis 2013	110	28426	1063	194682	10.4%	0.71 [0.58, 0.86]
Mitchell 1991	8	34	14	38	0.4%	0.53 [0.19, 1.48]
Nathan 2003	1	53	5	84	0.1%	0.30 [0.03, 2.68]
Pugely 2013	84	6030	107	8022	4.9%	1.05 [0.78, 1.39]
Pugely 2013	52	6030	59	8022	2.9%	1.17 [0.81, 1.71]
Sharrock 1991	13	206	15	171	0.7%	0.70 [0.32, 1.52]
Sharrock 1991	87	206	96	171	2.4%	0.57 [0.38, 0.86]
Williams Russo 1996	10	86	6	67	0.4%	1.34 [0.46, 3.89]
Williams Russo 1996	39	97	39	81	1.1%	0.72 [0.40, 1.31]
Zhou 2018	10	63	13	130	0.5%	1.70 [0.70, 4.12]
Subtotal (95% CI)		**44373**		**213420**	**26.5%**	**0.77 [0.68, 0.88]**
Total events	473		1501			

Heterogeneity: Chi² = 26.77, df = 15 (P = 0.03); I² = 44%
Test for overall effect: Z = 4.05 (P < 0.0001)

1.74.4 NA vs GA (THA/TKA)

! Davidson 1996	9	157	25	313	0.7%	0.70 [0.32, 1.54]
Jones 1990	6	74	3	72	0.2%	2.03 [0.49, 8.44]
Jones 1990	2	74	2	72	0.1%	0.97 [0.13, 7.09]
Memtsoudis 2013	129	40036	1307	292804	12.3%	0.72 [0.60, 0.86]
Nakamura 2017	140	512	105	646	5.0%	1.94 [1.46, 2.58]
Perlas 2016	18	2135	25	2135	1.1%	0.72 [0.39, 1.32]
Subtotal (95% CI)		**42988**		**296042**	**19.3%**	**0.94 [0.81, 1.09]**
Total events	304		1467			

Heterogeneity: Chi² = 35.38, df = 5 (P < 0.00001); I² = 86%
Test for overall effect: Z = 0.84 (P = 0.40)

1.74.6 NA+GA vs GA (THA)

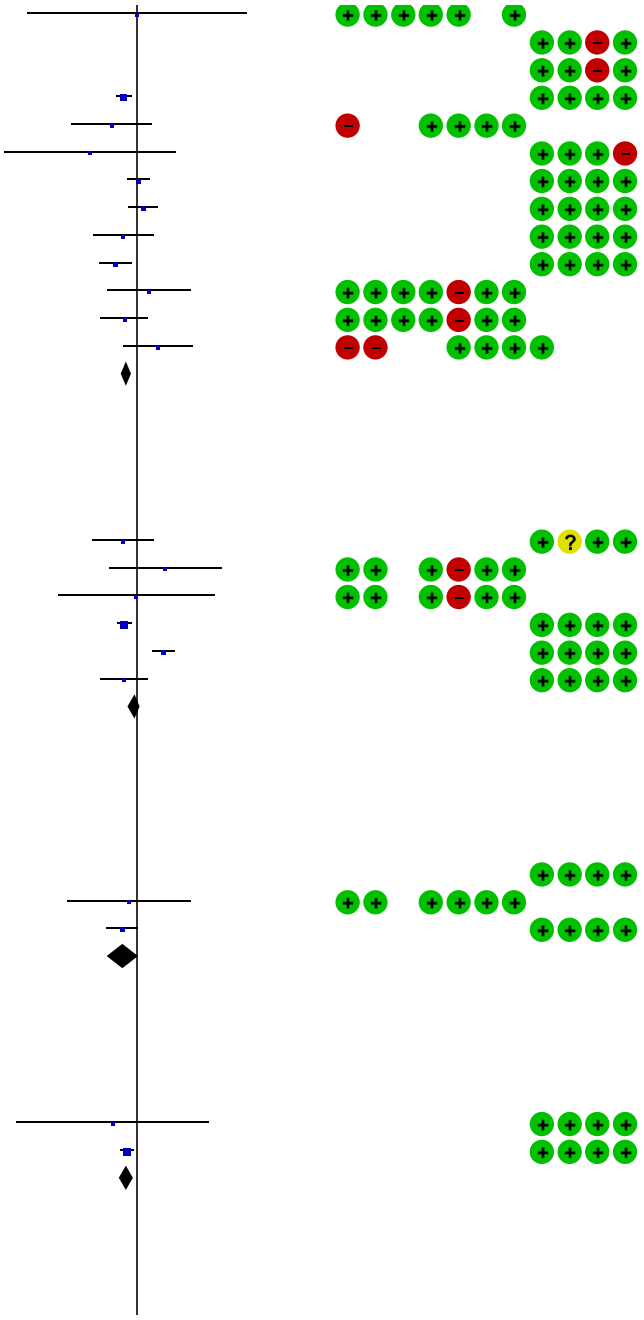
Brinker 1997	0	70	0	108		Not estimable
Dauphin 1997	4	20	4	17	0.2%	0.81 [0.17, 3.89]
Memtsoudis 2013	26	15261	244	98122	2.5%	0.68 [0.46, 1.03]
Subtotal (95% CI)		**15351**		**98247**	**2.6%**	**0.69 [0.47, 1.02]**
Total events	30		248			

Heterogeneity: Chi² = 0.04, df = 1 (P = 0.84); I² = 0%
Test for overall effect: Z = 1.84 (P = 0.07)

1.74.7 NA+GA vs GA (TKA)

Chelly 2001	1	30	2	33	0.1%	0.53 [0.05, 6.21]
Memtsoudis 2013	146	34135	1063	194682	13.4%	0.78 [0.66, 0.93]
Subtotal (95% CI)		**34165**		**194715**	**13.5%**	**0.78 [0.66, 0.93]**
Total events	147		1065			

Heterogeneity: Chi² = 0.09, df = 1 (P = 0.76); I² = 0%
Test for overall effect: Z = 2.80 (P = 0.005)



1.74.8 NA+GA vs GA (TKA/THA)

Memtsoudis 2013	172	49396	1307	292804	15.9%	0.78 [0.66, 0.91]
Nakamura 2017	174	1004	105	646	5.7%	1.08 [0.83, 1.41]
Subtotal (95% CI)		**50400**		**293450**	**21.6%**	**0.85 [0.74, 0.97]**
Total events	346		1412			

Heterogeneity: Chi² = 4.27, df = 1 (P = 0.04); I² = 77%

Test for overall effect: Z = 2.34 (P = 0.02)

1.74.9 NA (caudal epidural) vs GA (THA)

Liang 2017	0	66	2	66	0.0%	0.19 [0.01, 4.12]
Subtotal (95% CI)		**66**		**66**	**0.0%**	**0.19 [0.01, 4.12]**
Total events	0		2			

Heterogeneity: Not applicable

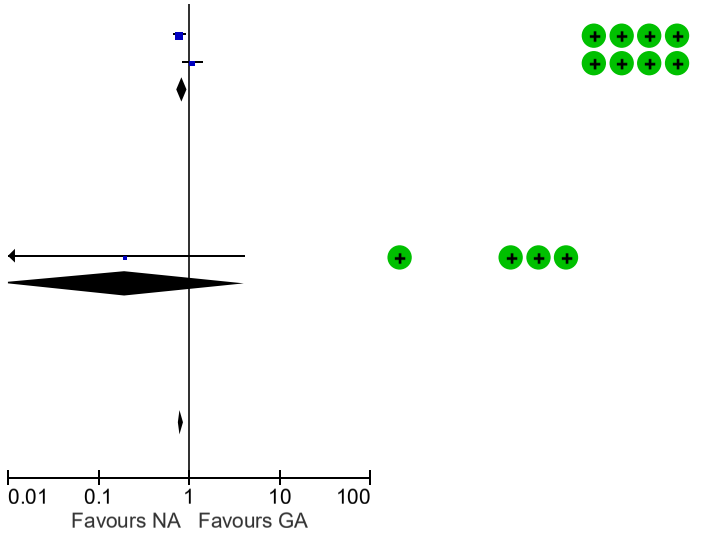
Test for overall effect: Z = 1.05 (P = 0.29)

Total (95% CI)		**246413**		**1253166**	**100.0%**	**0.81 [0.76, 0.86]**
Total events	1579		6337			

Heterogeneity: Chi² = 108.30, df = 46 (P < 0.00001); I² = 58%

Test for overall effect: Z = 6.46 (P < 0.00001)

Test for subgroup differences: Chi² = 8.19, df = 6 (P = 0.22), I² = 26.7%



Footnotes

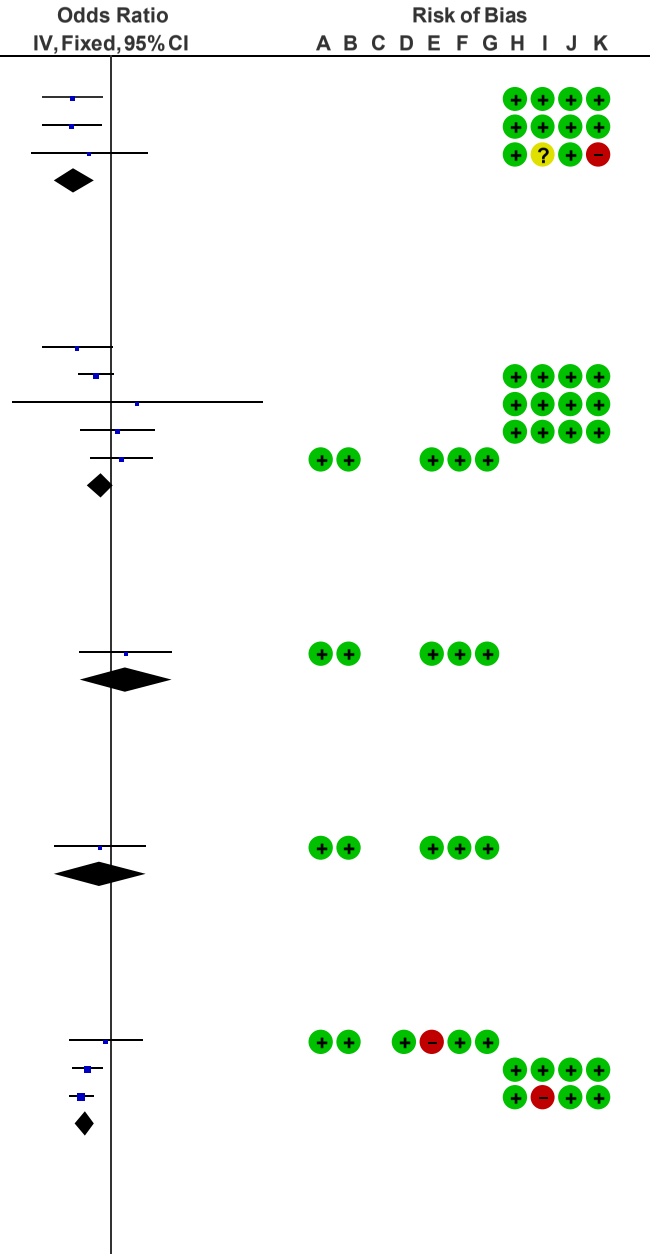
(1) popliteal and femoral

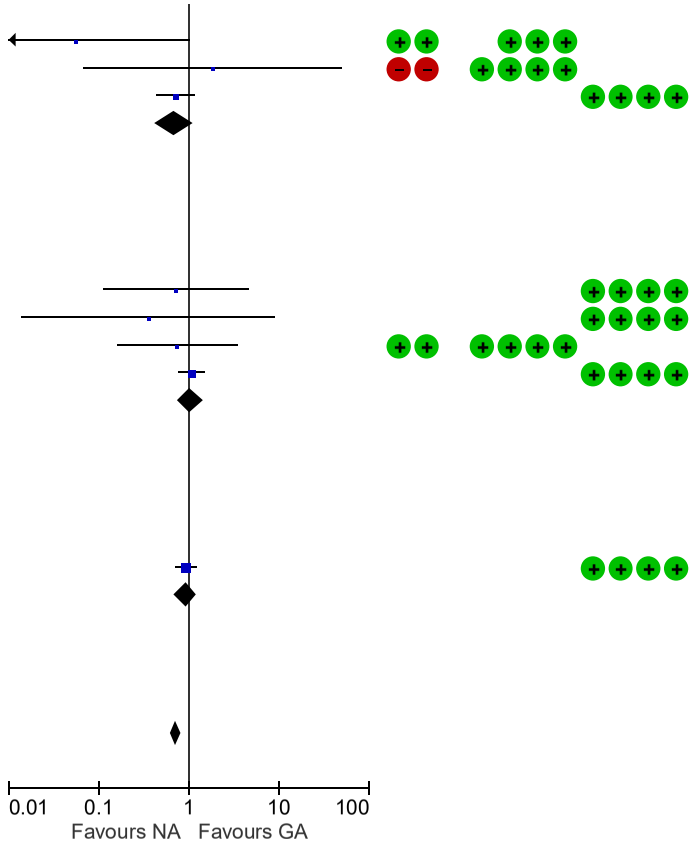
Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate...
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.75 CNS

Study or Subgroup	NA Events	NA Total	GA Events	GA Total	Weight	Odds Ratio IV, Fixed, 95% CI
1.75.1 NA vs GA (THA)						
Haughom 2015	8	11317	33	17540	2.8%	0.38 [0.17, 0.81]
Memtsoudis 2013	7	11610	162	98122	3.0%	0.36 [0.17, 0.78]
Shi 2015	3	50	5	50	0.8%	0.57 [0.13, 2.55]
Subtotal (95% CI)		**22977**		**115712**	**6.6%**	**0.39 [0.23, 0.65]**
Total events	18		200			
Heterogeneity: Chi² = 0.30, df = 2 (P = 0.86); I² = 0%						
Test for overall effect: Z = 3.64 (P = 0.0003)						
1.75.2 NA vs GA (TKA)						
Basques 2015	6	8184	22	12752	2.1%	0.42 [0.17, 1.05]
Memtsoudis 2013	21	28426	212	194682	8.4%	0.68 [0.43, 1.06]
Park 2017	1	746	0	490	0.2%	1.97 [0.08, 48.55]
Pugely 2013	8	6030	9	8022	1.9%	1.18 [0.46, 3.07]
Williams Russo 1995	16	134	12	128	2.7%	1.31 [0.59, 2.89]
Subtotal (95% CI)		**43520**		**216074**	**15.2%**	**0.77 [0.55, 1.08]**
Total events	52		255			
Heterogeneity: Chi² = 4.82, df = 4 (P = 0.31); I² = 17%						
Test for overall effect: Z = 1.50 (P = 0.13)						
**1.75.3 NA+GA vs GA	long-term (TKA)**					
Williams Russo 1995	7	114	5	117	1.2%	1.47 [0.45, 4.76]
Subtotal (95% CI)		**114**		**117**	**1.2%**	**1.47 [0.45, 4.76]**
Total events	7		5			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.64 (P = 0.52)						
**1.75.4 NA+GA vs GA	long-term (THA)**					
Hole 1980	8	29	8	24	1.2%	0.76 [0.24, 2.47]
Subtotal (95% CI)		**29**		**24**	**1.2%**	**0.76 [0.24, 2.47]**
Total events	8		8			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.45 (P = 0.65)						
1.75.5 NA vs GA (THA/TKA)						
Jones 1990	10	65	11	64	1.9%	0.88 [0.34, 2.23]
Memtsoudis 2013	28	40036	374	292804	11.5%	0.55 [0.37, 0.80]
Weinstein 2018	881	40852	41	914	16.5%	0.47 [0.34, 0.65]
Subtotal (95% CI)		**80953**		**293782**	**29.9%**	**0.52 [0.41, 0.66]**
Total events	919		426			
Heterogeneity: Chi² = 1.65, df = 2 (P = 0.44); I² = 0%						
Test for overall effect: Z = 5.41 (P < 0.00001)						



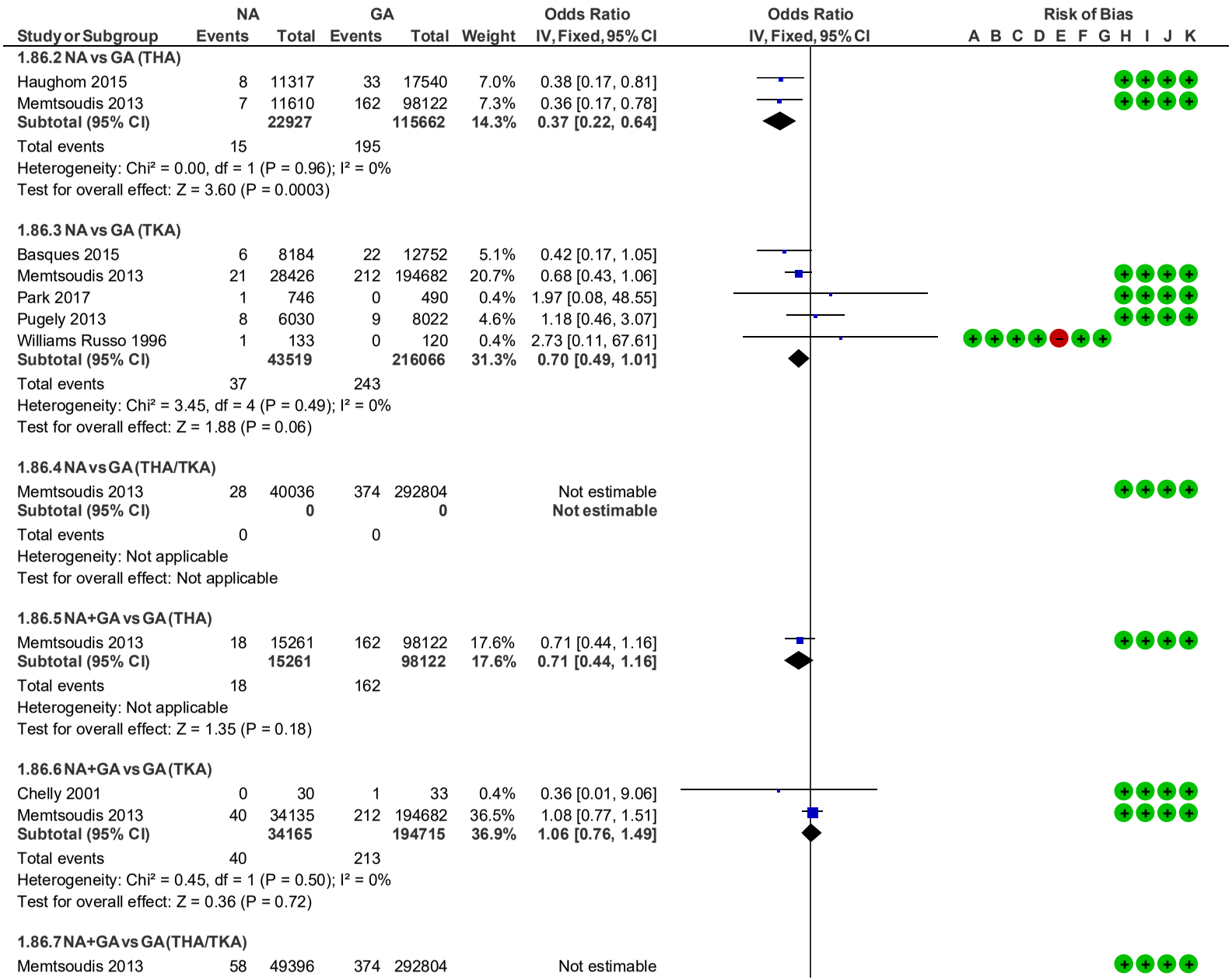


1.75.6 NA+GA vs GA (THA)						
Hole 1980	0	29	7	31	0.2%	0.06 [0.00, 1.02]
Kita 2007	1	16	0	9	0.2%	1.84 [0.07, 49.90]
Memtsoudis 2013	18	15261	162	98122	7.1%	0.71 [0.44, 1.16]
Subtotal (95% CI)		**15306**		**98162**	**7.5%**	**0.68 [0.42, 1.09]**
Total events	19		169			
Heterogeneity: Chi² = 3.24, df = 2 (P = 0.20); I² = 38%						
Test for overall effect: Z = 1.59 (P = 0.11)						
1.75.7 NA+GA vs GA (TKA)						
Chelly 2001	2	30	3	33	0.5%	0.71 [0.11, 4.60]
Chelly 2001	0	30	1	33	0.2%	0.36 [0.01, 9.06]
Kudoh 2004	3	75	4	75	0.7%	0.74 [0.16, 3.42]
Memtsoudis 2013	40	34135	212	194682	14.8%	1.08 [0.77, 1.51]
Subtotal (95% CI)		**34270**		**194823**	**16.2%**	**1.03 [0.75, 1.43]**
Total events	45		220			
Heterogeneity: Chi² = 0.81, df = 3 (P = 0.85); I² = 0%						
Test for overall effect: Z = 0.20 (P = 0.84)						
1.75.8 NA+GA vs GA (THA/TKA)						
Memtsoudis 2013	58	49396	374	292804	22.1%	0.92 [0.70, 1.21]
Subtotal (95% CI)		**49396**		**292804**	**22.1%**	**0.92 [0.70, 1.21]**
Total events	58		374			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.60 (P = 0.55)						
Total (95% CI)		**246565**		**1211498**	**100.0%**	**0.71 [0.63, 0.81]**
Total events	1126		1657			
Heterogeneity: Chi² = 33.20, df = 20 (P = 0.03); I² = 40%						
Test for overall effect: Z = 5.09 (P < 0.00001)						
Test for subgroup differences: Chi² = 22.38, df = 7 (P = 0.002), I² = 68.7%						

Risk of bias legend

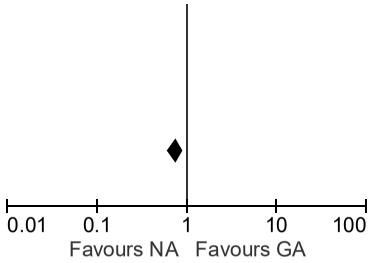
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.86 Stroke


NA
GA
Odds Ratio
Odds Ratio
Risk of Bias
Study or Subgroup Events Total Events Total Weight IV, Fixed, 95% CI
IV, Fixed, 95% CI
A B C D E F G H I J K
1.86.2 NA vs GA (THA)
Haughom 2015 8 11317 33 17540 7.0% 0.38 [0.17, 0.81]
Memtsoudis 2013 7 11610 162 98122 7.3% 0.36 [0.17, 0.78]
Subtotal (95% CI) 22927 115662 14.3% 0.37 [0.22, 0.64]
Total events 15 195
Heterogeneity: Chi² = 0.00, df = 1 (P = 0.96); I² = 0%
Test for overall effect: Z = 3.60 (P = 0.0003)
1.86.3 NA vs GA (TKA)
Basques 2015 6 8184 22 12752 5.1% 0.42 [0.17, 1.05]
Memtsoudis 2013 21 28426 212 194682 20.7% 0.68 [0.43, 1.06]
Park 2017 1 746 0 490 0.4% 1.97 [0.08, 48.55]
Pugely 2013 8 6030 9 8022 4.6% 1.18 [0.46, 3.07]
Williams Russo 1996 1 133 0 120 0.4% 2.73 [0.11, 67.61]
Subtotal (95% CI) 43519 216066 31.3% 0.70 [0.49, 1.01]
Total events 37 243
Heterogeneity: Chi² = 3.45, df = 4 (P = 0.49); I² = 0%
Test for overall effect: Z = 1.88 (P = 0.06)
1.86.4 NA vs GA (THA/TKA)
Memtsoudis 2013 28 40036 374 292804 Not estimable
Subtotal (95% CI) 0 0 Not estimable
Total events 0 0
Heterogeneity: Not applicable
Test for overall effect: Not applicable
1.86.5 NA+GA vs GA (THA)
Memtsoudis 2013 18 15261 162 98122 17.6% 0.71 [0.44, 1.16]
Subtotal (95% CI) 15261 98122 17.6% 0.71 [0.44, 1.16]
Total events 18 162
Heterogeneity: Not applicable
Test for overall effect: Z = 1.35 (P = 0.18)
1.86.6 NA+GA vs GA (TKA)
Chelly 2001 0 30 1 33 0.4% 0.36 [0.01, 9.06]
Memtsoudis 2013 40 34135 212 194682 36.5% 1.08 [0.77, 1.51]
Subtotal (95% CI) 34165 194715 36.9% 1.06 [0.76, 1.49]
Total events 40 213
Heterogeneity: Chi² = 0.45, df = 1 (P = 0.50); I² = 0%
Test for overall effect: Z = 0.36 (P = 0.72)
1.86.7 NA+GA vs GA (THA/TKA)
Memtsoudis 2013 58 49396 374 292804 Not estimable

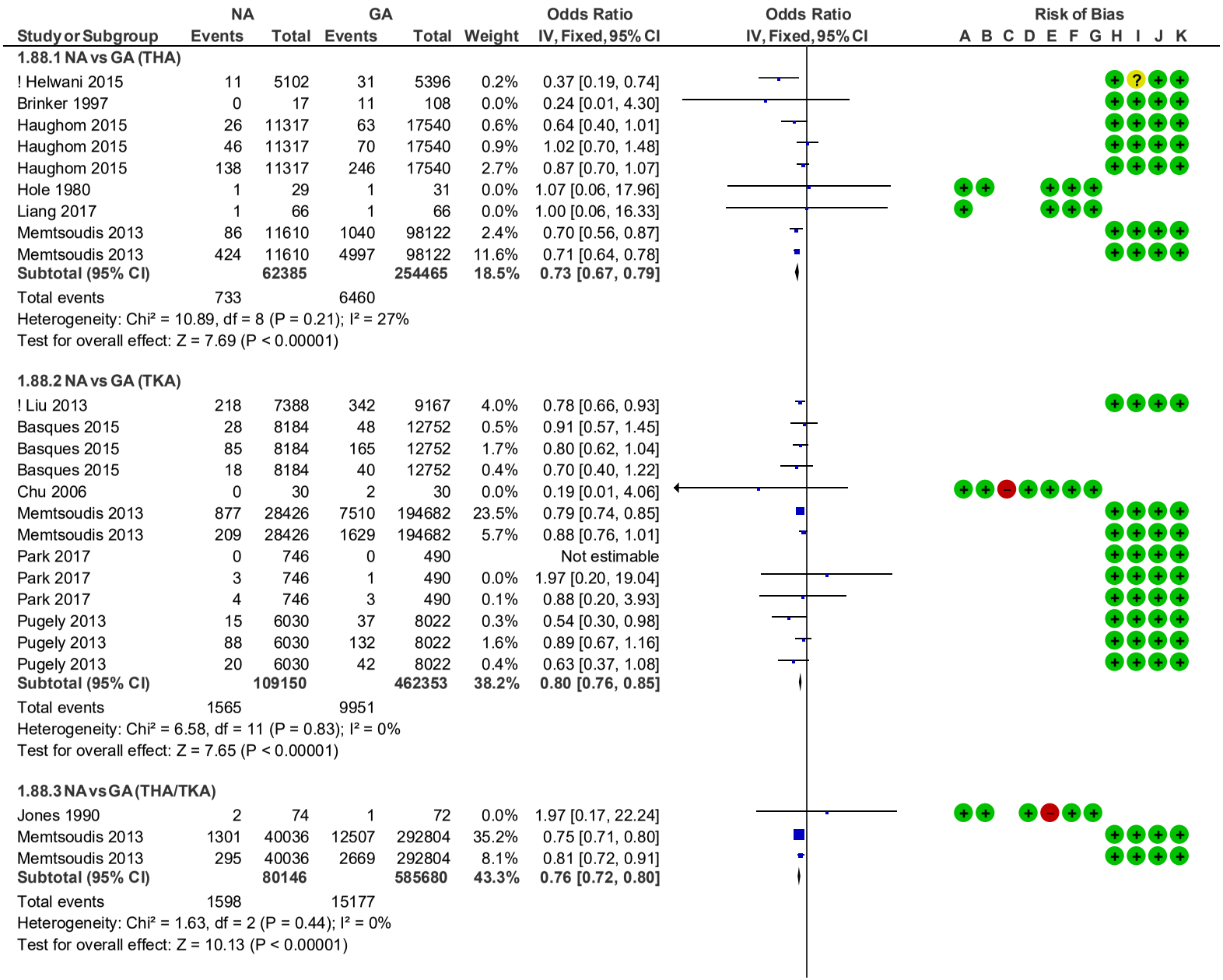
Subtotal (95% CI)	**0**	**0**		**Not estimable**	
Total events	0	0			
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
Total (95% CI)	**115872**	**624565**	**100.0%**	**0.75 [0.61, 0.92]**	
Total events	110	813			

Heterogeneity: Chi² = 14.76, df = 9 (P = 0.10); I² = 39%
Test for overall effect: Z = 2.77 (P = 0.006)
Test for subgroup differences: Chi² = 10.86, df = 3 (P = 0.01), I² = 72.4%



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.88 All infections (including pneumonia and sepsis)



1.88.4 NA+GA vs GA (THA)

Brinker 1997	8	70	11	108	Not estimable
Memtsoudis 2013	143	15261	1040	98122	Not estimable
Memtsoudis 2013	664	15261	4997	98122	Not estimable
Subtotal (95% CI)		**0**		**0**	**Not estimable**
Total events	0		0		

Heterogeneity: Not applicable
Test for overall effect: Not applicable

1.88.6 NA+GA vs GA (TKA)

Memtsoudis 2013	292	34135	1629	194682	Not estimable
Memtsoudis 2013	1279	34135	7510	194682	Not estimable
Subtotal (95% CI)		**0**		**0**	**Not estimable**
Total events	0		0		

Heterogeneity: Not applicable
Test for overall effect: Not applicable

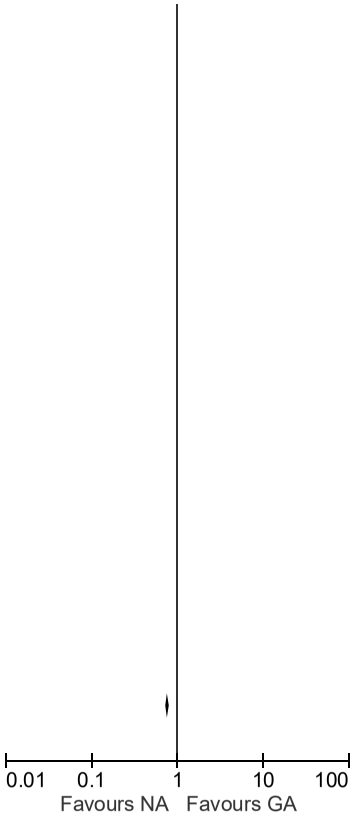
1.88.7 NA+GA vs GA (THA/TKA)

Memtsoudis 2013	1943	49396	12507	292804	Not estimable
Memtsoudis 2013	435	49396	2669	292804	Not estimable
Subtotal (95% CI)		**0**		**0**	**Not estimable**
Total events	0		0		

Heterogeneity: Not applicable
Test for overall effect: Not applicable

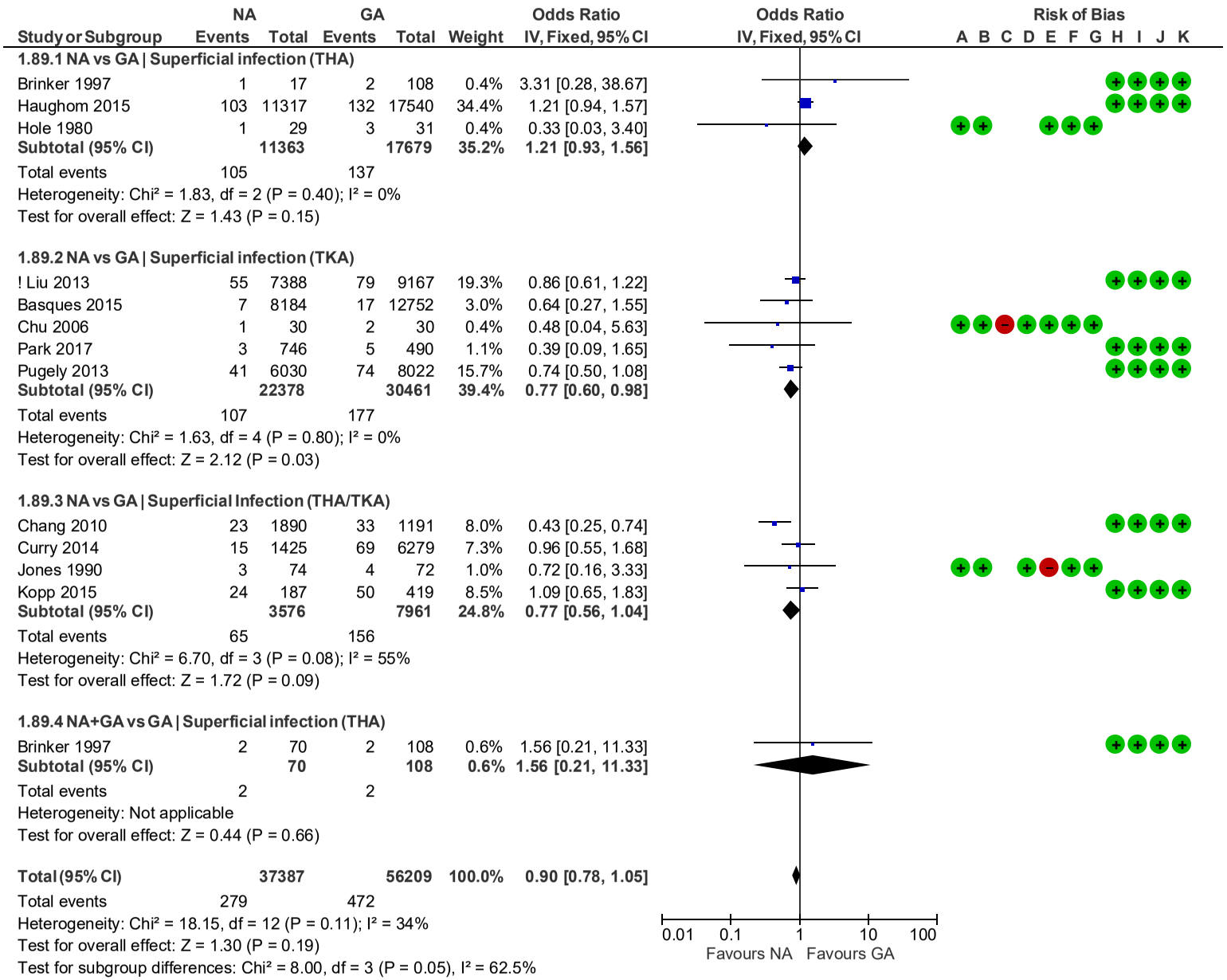
Total (95% CI)		**251681**		**1302498**	**100.0%**	**0.77 [0.75, 0.80]**
Total events	3896		31588			

Heterogeneity: Chi² = 23.25, df = 23 (P = 0.45); I² = 1%
Test for overall effect: Z = 14.70 (P < 0.00001)
Test for subgroup differences: Chi² = 4.15, df = 2 (P = 0.13), I² = 51.8%



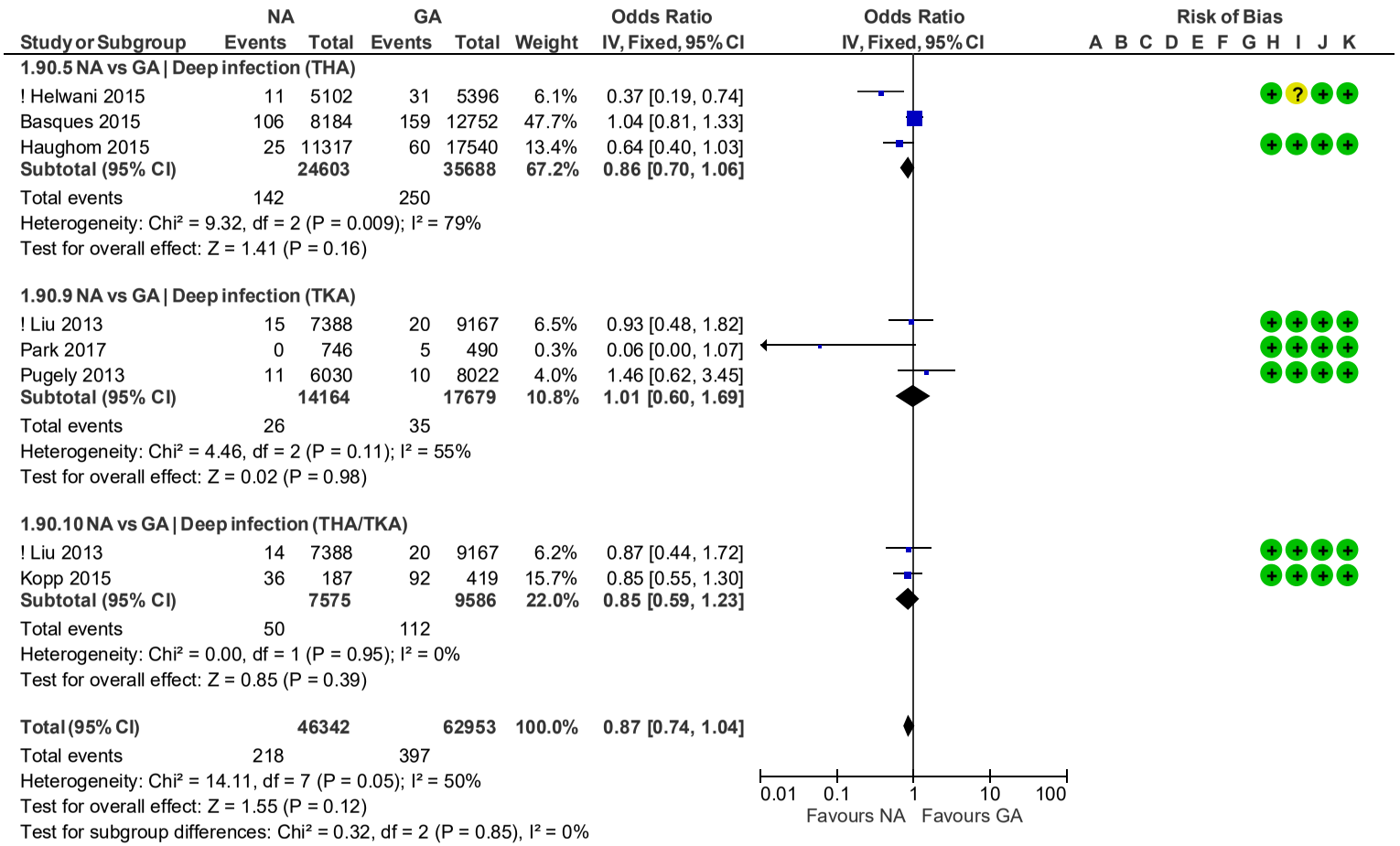
Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.89 Wound complications | Superficial infection



(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

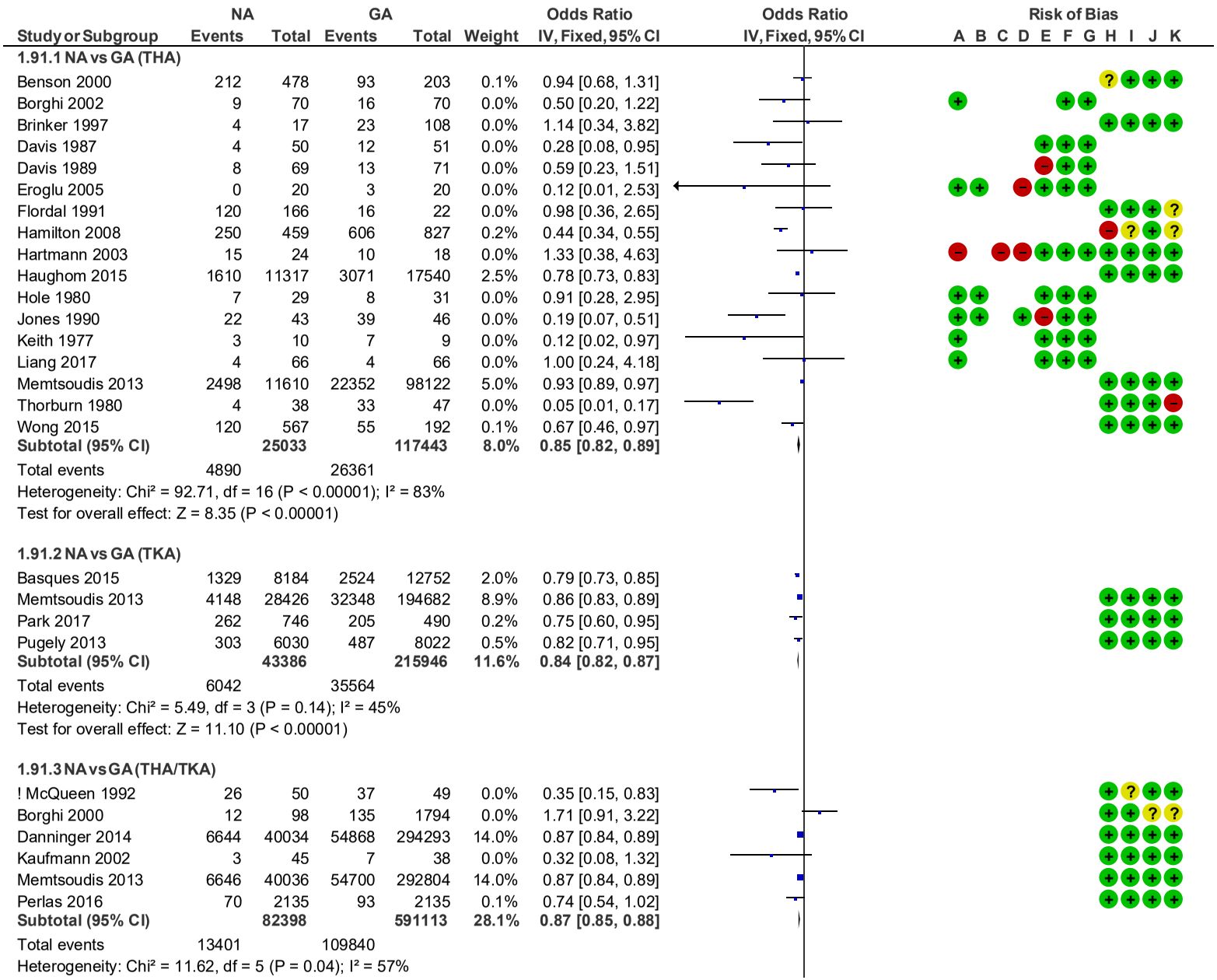
1.90 Wound complications | Deep infection



Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.91 Blood transfusion



Test for overall effect: Z = 14.23 (P < 0.00001)

1.91.4 NA+GA vs GA (THA)

Borghi 2002	13	70	16	70	0.0%	0.77 [0.34, 1.75]
Brinker 1997	16	70	23	108	0.0%	1.10 [0.53, 2.26]
Dauphin 1997	7	20	15	17	0.0%	0.07 [0.01, 0.41]
Memtsoudis 2013	2860	15261	22352	98122	5.8%	0.78 [0.75, 0.82]
Subtotal (95% CI)		**15421**		**98317**	**5.8%**	**0.78 [0.75, 0.82]**
Total events	2896		22406			

Heterogeneity: Chi² = 8.08, df = 3 (P = 0.04); I² = 63%

Test for overall effect: Z = 11.19 (P < 0.00001)

1.91.5 NA+GA vs GA (TKA)

Memtsoudis 2013	5768	34135	32348	194682	11.5%	1.02 [0.99, 1.05]
Subtotal (95% CI)		**34135**		**194682**	**11.5%**	**1.02 [0.99, 1.05]**
Total events	5768		32348			

Heterogeneity: Not applicable

Test for overall effect: Z = 1.29 (P = 0.20)

1.91.6 NA+GA vs GA (THA/TKA)

Borghi 2000	55	604	135	1794	0.1%	1.23 [0.89, 1.71]
Danninger 2014	8635	49421	54868	294293	17.4%	0.92 [0.90, 0.95]
Memtsoudis 2013	8628	49396	54700	292804	17.4%	0.92 [0.90, 0.94]
Subtotal (95% CI)		**99421**		**588891**	**34.9%**	**0.92 [0.91, 0.94]**
Total events	17318		109703			

Heterogeneity: Chi² = 2.99, df = 2 (P = 0.22); I² = 33%

Test for overall effect: Z = 8.86 (P < 0.00001)

1.91.11 NA vs GA | post-op (THA)

Eroglu 2005	8	20	10	20	0.0%	0.67 [0.19, 2.33]
Thorburn 1980	22	38	39	47	0.0%	0.28 [0.10, 0.76]
Subtotal (95% CI)		**58**		**67**	**0.0%**	**0.39 [0.18, 0.86]**
Total events	30		49			

Heterogeneity: Chi² = 1.11, df = 1 (P = 0.29); I² = 10%

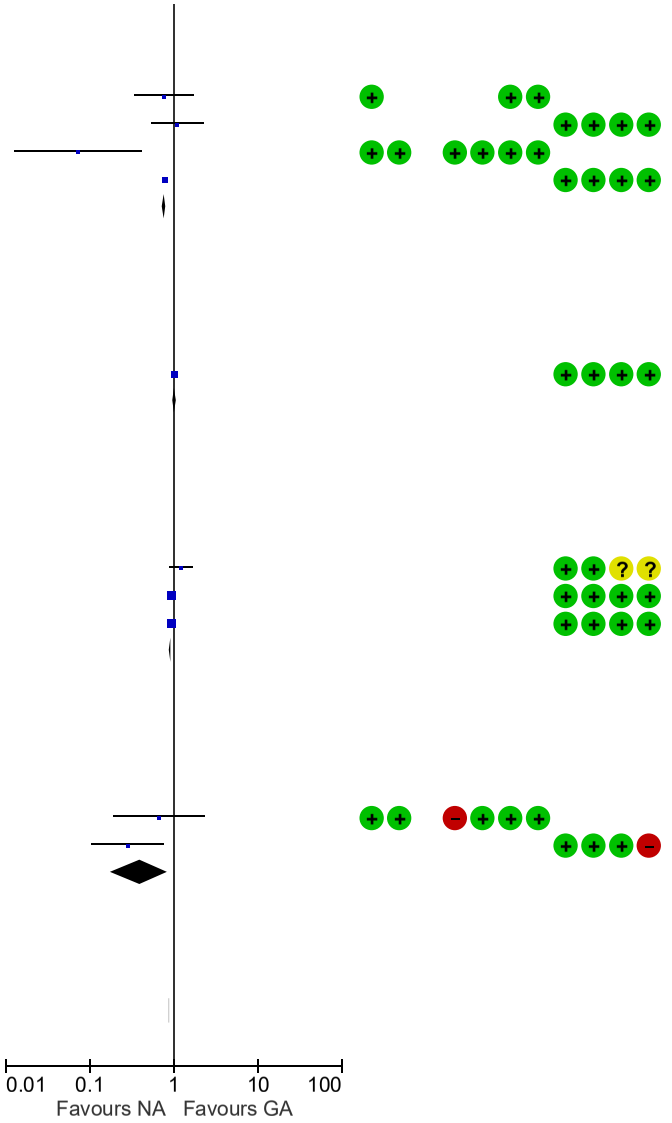
Test for overall effect: Z = 2.34 (P = 0.02)

Total (95% CI)		**299852**		**1806459**	**100.0%**	**0.89 [0.88, 0.90]**
Total events	50345		336271			

Heterogeneity: Chi² = 278.16, df = 36 (P < 0.00001); I² = 87%

Test for overall effect: Z = 21.22 (P < 0.00001)

Test for subgroup differences: Chi² = 156.16, df = 6 (P < 0.00001), I² = 96.2%



Risk of bias legend

(**A**) Random sequence generation (selection bias)

(**B**) Allocation concealment (selection bias)

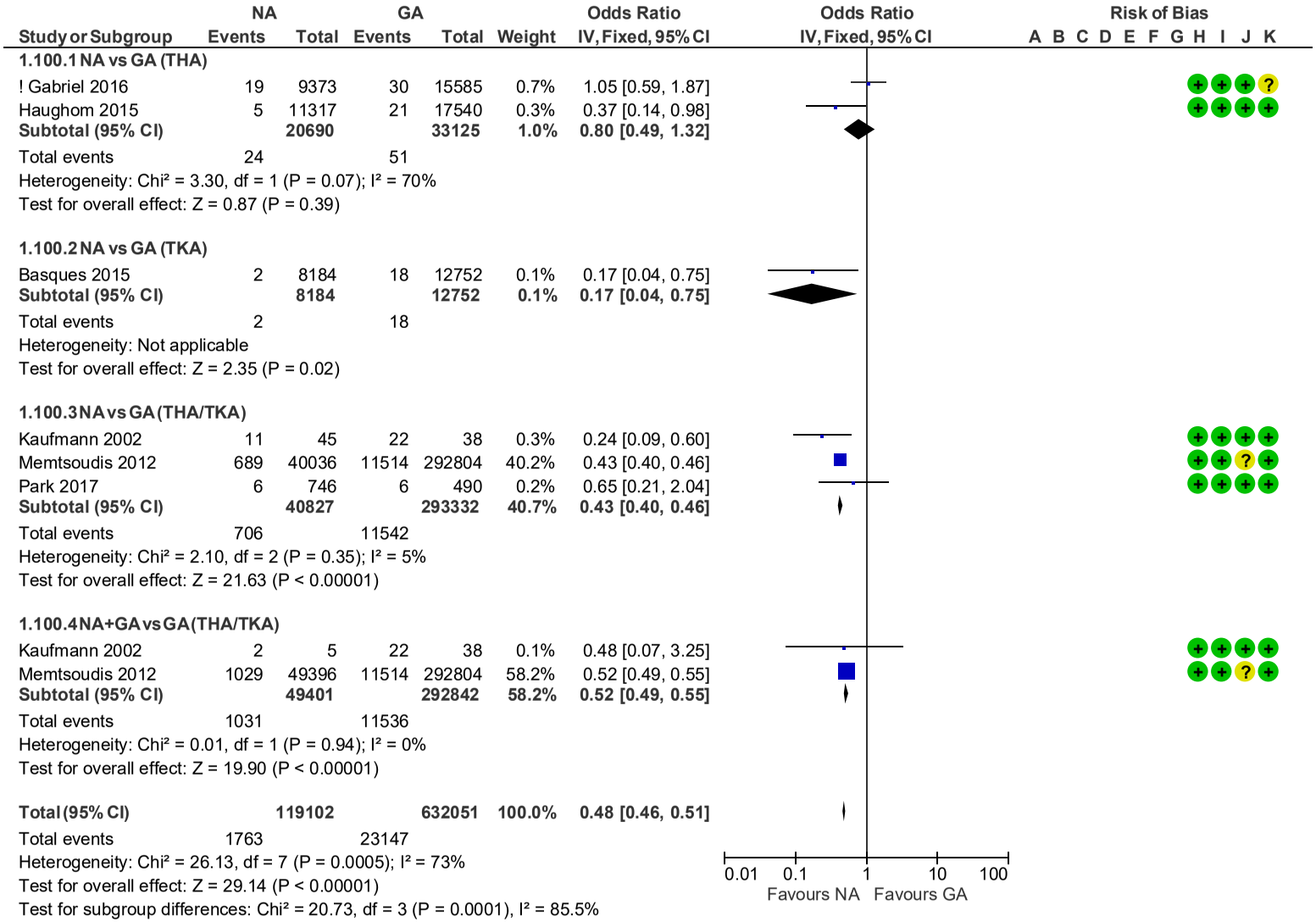
(**C**) Blinding of participants and personnel (performance bias)

(**D**) Blinding of outcome assessment (detection bias)

(**E**) Incomplete outcome data (attrition bias)

(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.100 Critical care admission

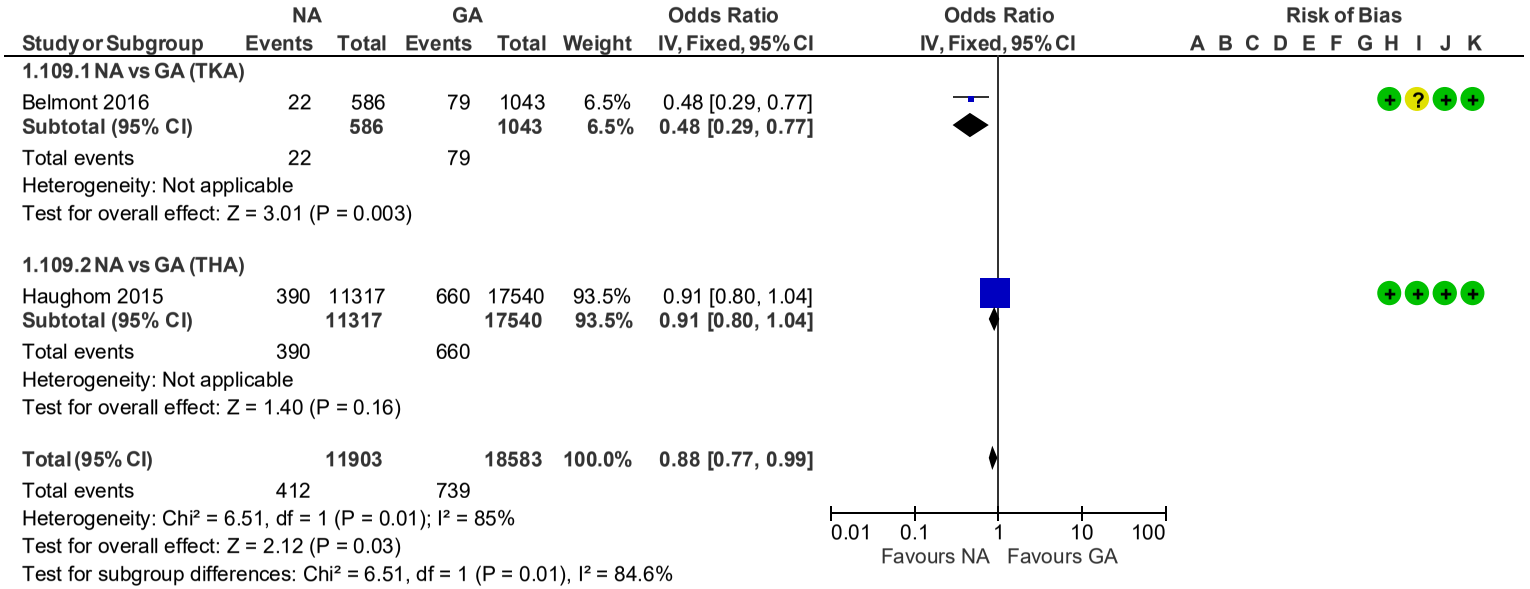


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)

(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

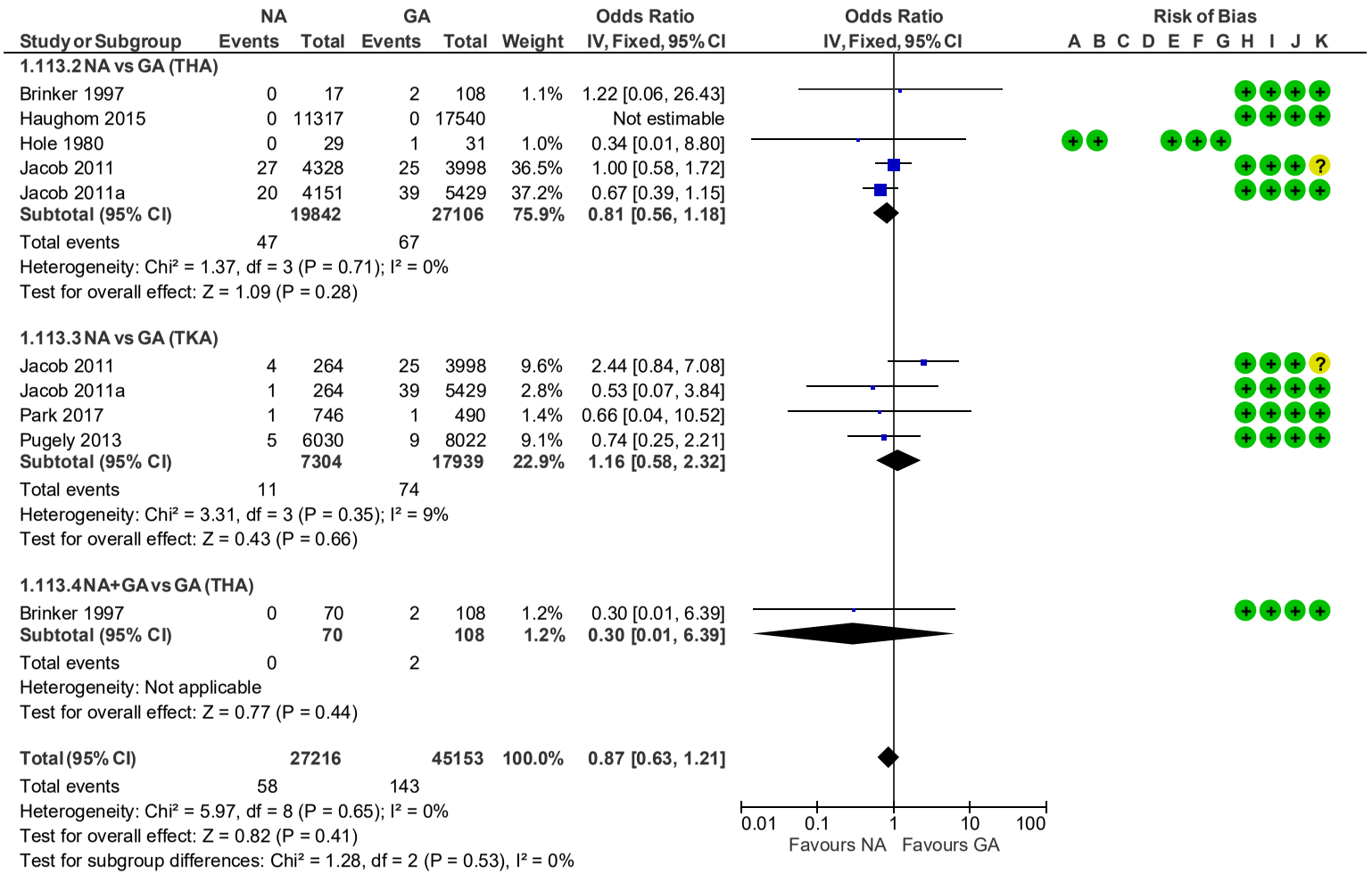
1.109 Readmission



Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.113 Perioperative Nerve Injury

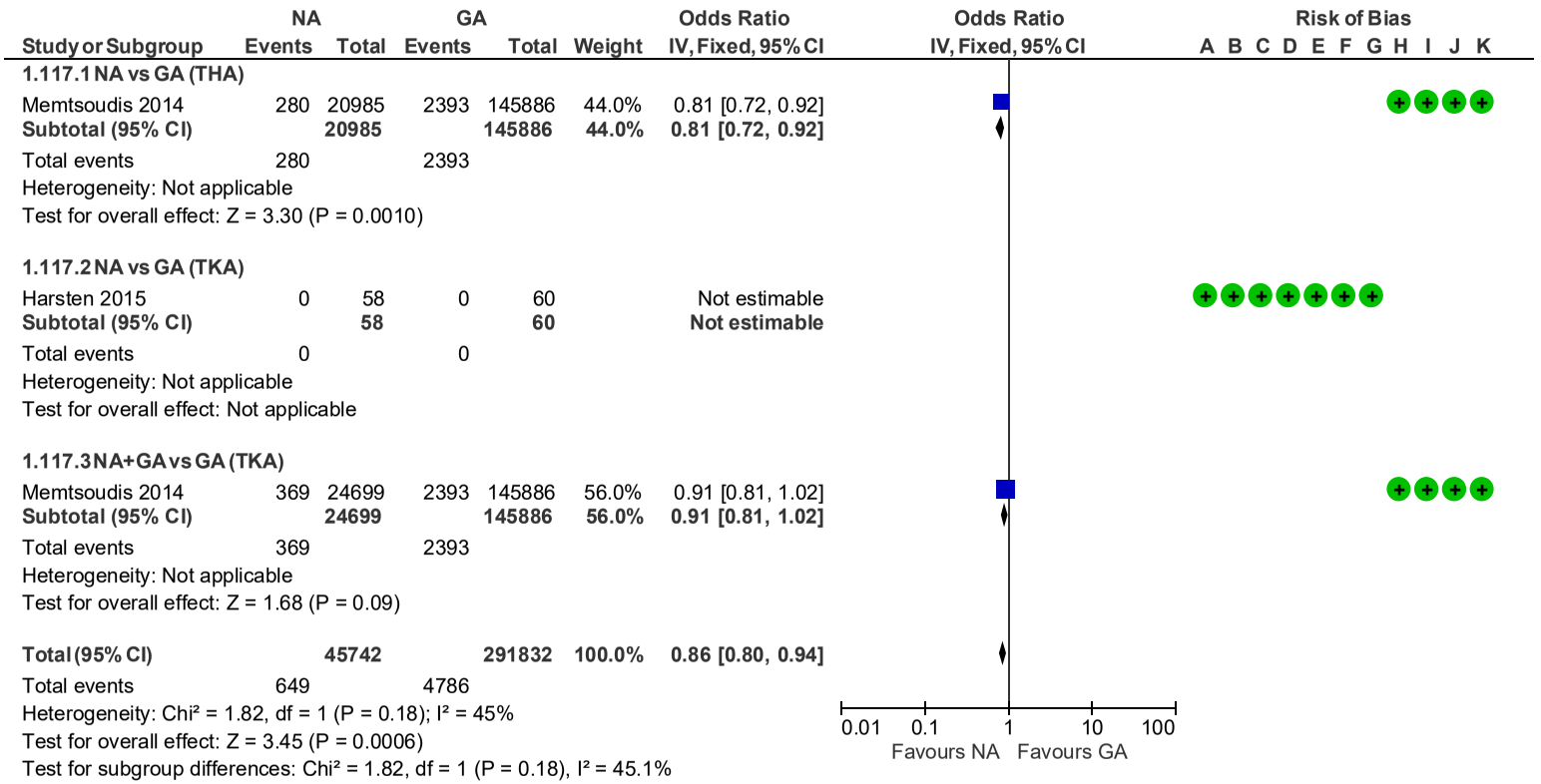


Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria

(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding

1.117 Falls



Risk of bias legend

(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) Other bias
(**H**) Observational Study: Incomplete follow-up
(**I**) Observational Study: Failure to develop and apply appropriate eligibility criteria
(**J**) Observational Study: Flawed measurement of exposure or outcome
(**K**) Observational Study: Failure to adequately control for confounding