Supplementary Materials

Predictors of short-term mortality in patients undergoing emergency coronary artery bypass grafting: a systematic review and meta-analysis

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Table 1. Risk of bias

First author	Confounding	Participation	Interv.	Interv.	Missing	Outcome	Selective	Overall
		selection	classification	deviation	data	measurement	reporting	
Locker <i>et al.</i> , 2000 ^[23]	M	L	L	L	L	L	M	M
Hirose <i>et al.</i> , 2002 ^[24]	M	L	L	L	M	L	L	M
Ochi <i>et al.</i> , 2003 ^[25]	M	M	L	L	L	M	L	M
Kerendi <i>et al.</i> , 2005 ^[26]	M	M	L	L	L	M	L	M
Onorati <i>et al.</i> , 2005 ^[27]	M	M	L	L	L	M	M	M
Thielmann <i>et al.</i> , 2006 ^[28]	L	L	L	L	L	L	L	L
Darwazah <i>et al.</i> , 2009 ^[29]	M	M	L	L	L	L	L	M
Kaya <i>et al.</i> , 2010 ^[30]	M	M	L	L	L	L	L	M
Joskowiak <i>et al.</i> , 2010 ^[31]	M	L	L	L	L	L	L	M

Martinez <i>et al.</i> , 2010 ^[32]	M	M	M	L	M	L	L	M
Fattouch <i>et al.</i> , 2011 ^[33]	M	L	L	L	L	L	M	M
Sezai <i>et al.</i> , 2012 ^[34]	M	L	L	L	M	L	L	M
Khaladj <i>et al.</i> , 2013 ^[35]	M	M	L	M	M	L	L	M
Hata <i>et al.</i> , 2014 ^[36]	M	M	L	L	M	L	L	M
Gaudino <i>et al.</i> , 2015 ^[37]	M	M	L	L	L	L	M	M
Davierwala <i>et al.</i> , 2016 ^[38]	M	L	L	L	M	L	M	M
Grothusen et al, 2017 ^[19]	M	L	L	L	L	L	L	M
Hung <i>et al.</i> , 2021 ^[39]	M	M	L	L	M	L	M	M
Bianchi <i>et al.</i> , 2022 ^[40]	M	M	L	L	M	L	L	M
Tekin et al.,	L	L	L	M	L	M	L	M

2023 ^[41]				

ROBINS I Tool. L: Low risk of bias; M: moderate risk of bias; S: serious risk of bias; C: critical risk of bias.

Table 2. Overall effect sizes of predictors of early mortality in acs patients: leave-one-out analysis

Factor analysed	Study excluded	Overall effect size (OR), 95%CI
Age	None (initial)	1.40 [1.07, 1.82]
	Hirose et al., 2002 ^[24]	1.30 [1.03, 1.65]
	Thielmann et al.,	1.82 [1.07, 3.09]
	2006 ^[28]	
	Joskowiak et al.,	1.30 [1.01, 1.69]
	2010 ^[31]	
	Sezai et al., 2012 ^[34]	1.36 [1.05, 1.75]
	Daviewrwala et al.,	1.30 [1.01, 1.69]
	2016 ^[38]	
	Hung et al., 2021 ^[39]	1.79 [1.16, 2.77]
Cardiogenic	None (initial)	5.35 [3.15, 9.09]
shock	Hirose et al., 2002 ^[24]	5.22 [2.93, 9.31]
	Ochi et al., 2003 ^[25]	5.16 [2.95, 9.04]
	Joskowiak et al.,	5.58 [2.96, 10.55]
	2010 ^[31]	
	Sezai et al., 2012 ^[34]	5.39 [3.11, 9.34]
	Hata et al., 2014 ^[36]	5.26 [2.98, 9.31]
	Hung et al., 2021 ^[39]	4.99 [2.86, 8.70]
	Bianchi et al.,	5.98 [3.39, 10.56]
	2022 ^[40]	
Diabetes	None (initial)	1.66 [0.91, 3.06]
	Ochi et al., 2003 ^[25]	1.53 [0.81, 2.88]
	Thielmann et al.,	1.59 [0.72, 3.53]
	2006 ^[28]	
	Sezai <i>et al.</i> , 2012 ^[34]	1.89 [0.93, 3.82]
	Gaudino et al.,	1.86 [0.95, 3.65]
	2015 ^[37]	
	Hung et al., 2021 ^[39]	1.53 [0.82, 2.86]
Neurological	None (initial)	2.31 [0.92, 5.79]

disease	Hirose et al., 2002 ^[24]	1.70 [0.59, 4.91]
	Ochi et al., 2003 ^[25]	2.68 [1.05, 6.87]
	Sezai et al., 2012 ^[34]	2.05 [0.63, 6.72]
	Gaudino et al.,	3.56 [1.69, 7.52]
	2015 ^[37]	
	Grothusen et al.,	1.79 [0.50, 6.38]
	2017 ^[19]	
CKD	None (initial)	3.19 [1.59, 6.42]
	Hirose et al., 2002 ^[24]	2.24 [0.99, 5.09]
	Ochi et al., 2003 ^[25]	3.32 [1.51, 7.33]
	Thielmann et al.,	3.50 [1.68, 7.28]
	2006 ^[28]	
	Sezai et al., 2012 ^[34]	4.01 [1.75, 9.19]
	Gaudino et al.,	3.07 [1.35, 6.96]
	2015 ^[37]	
COPD	None (initial)	1.91 [0.57, 6.37]
	Hirose et al., 2002 ^[24]	1.31 [0.40, 4.34]
	Ochi et al., 2003 ^[25]	1.33 [0.38, 4.61]
	Thielmann et al.,	2.36 [0.65, 8.53]
	2006 ^[28]	
	Sezai <i>et al.</i> , 2012 ^[34]	2.69 [0.64, 11.30]
	Gaudino et al.,	2.28 [0.46, 11.32]
	2015 ^[37]	
OPCAB	None (initial)	0.72 [0.42, 1.25]
	Locker et al.,	0.57 [0.36, 0.90]
	2000 ^[23]	
	Hirose et al., 2002 ^[24]	0.70 [0.39, 1.27]
	Ochi et al., 2003 ^[25]	0.68 [0.38, 1.21]
	Kerendi et al.,	0.76 [0.44, 1.33]
	2005 ^[26]	
	Onorati et al.,	0.86 [0.49, 1.49]
	2005 ^[27]	
	Darwazah et al.,	0.75 [0.41, 1.38]

2009 ^[29]	
Kaya et al., 2010 ^[30]	0.74 [0.40, 1.36]
Martinez et al.,	0.69 [0.38, 1.22]
2010 ^[32]	
Fattouch et al.,	0.78 [0.44, 1.36]
2011 ^[33]	
Gaudino et al.,	0.76 [0.42, 1.39]
2015 ^[37]	
Tekin et al., 2023 ^[41]	0.72 [0.39, 1.35]

CI: Confidence interval; CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease; IABP: intra-aortic balloon pump; LMS: left main stem; LVEF: left ventricular ejection fraction; OPCAB: off-pump coronary artery bypass grafting; OR: odds ratio; PVD: Peripheral vascular disease.

Table 3. Predictors of early mortality based on time interval between ACS onset and surgery

Predictor	Time interval	Number of	OR, 95%CI
		studies	
Age	Combined	6	1.40 [1.07, 1.82]
	≤ 24 hours	2	1.62 [0.52, 5.04]
	> 24 hours	3	1.66 [0.86, 3.23]
Female gender	Combined	4	1.55 [0.61, 3.91]
	≤ 24 hours	2	2.93 [0.81, 10.56]
	> 24 hours	2	0.77 [0.20, 2.94]
Male gender	Combined	4	0.46 [0.22, 0.94]
	≤ 24 hours	2	0.36 [0.13, 0.97]
	> 24 hours	1	1.28 [0.14, 11.65]
Cardiogenic shock	Combined	7	5.35 [3.15, 9.09]
	≤ 24 hours	2	6.21 [1.74, 22.15]
	> 24 hours	4	5.93 [3.14, 11.19]
Diabetes	Combined	5	1.66 [0.91, 3.06]
	≤ 24 hours	3	1.69 [0.84, 3.41]
	> 24 hours	2	1.86 [0.35, 9.77]
Dyslipidaemia	Combined	4	1.13 [0.40, 3.19]
	≤ 24 hours	2	2.47 [0.95, 6.42]
	> 24 hours	2	0.44 [0.14, 1.41]
Hypertension	Combined	3	0.74 [0.34, 1.58]
	≤ 24 hours	2	0.55 [0.24, 1.28]
	> 24 hours	1	1.74 [0.40, 7.64]
Obesity	Combined	2	1.03 [0.36, 2.95]
	≤ 24 hours	2	1.03 [0.36, 2.95]
	> 24 hours	-	-
Neurological disease	Combined	5	2.31 [0.92, 5.79]
	≤ 24 hours	2	1.71 [0.33, 8.85]
	> 24 hours	3	2.53 [0.71, 8.98]
CKD	Combined	5	3.19 [1.59, 6.42]

	≤ 24 hours	3	1.88 [0.73, 4.90]
	> 24 hours	2	5.87 [2.10, 16.38]
COPD	Combined	5	1.91 [0.57, 6.37]
	≤ 24 hours	3	1.41 [0.22, 9.05]
	> 24 hours	2	2.83 [0.33, 23.90]
PVD	Combined	2	1.88 [0.29, 11.98]
	≤ 24 hours	-	
	> 24 hours	2	1.88 [0.29, 11.98]
IABP	Combined	3	3.55 [1.30, 9.71]
	≤ 24 hours	3	3.55 [1.30, 9.71]
	> 24 hours	-	-
LMS disease	Combined	4	1.48 [0.75, 2.93]
	≤ 24 hours	3	1.38 [0.68, 2.81]
	> 24 hours	1	3.50 [0.28, 43.17]
LVEF < 30%	Combined	3	2.46 [1.00, 6.04]
	≤ 24 hours	1	1.52 [0.42, 5.50]
	> 24 hours	1	10.86 [2.00, 58.98]
OPCAB	Combined	11	0.72 [0.42, 1.25]
	≤ 24 hours	6	0.78 [0.41, 1.46]
	> 24 hours	4	0.97 [0.25, 3.76]
OPCAB	≤ 24 hours	6	0.78 [0.41, 1.46]

CI: Confidence interval; CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease; IABP: intra-aortic balloon pump; LMS: left main stem; LVEF: left ventricular ejection fraction; OPCAB: off-pump coronary artery bypass grafting; OR: odds ratio; PVD: peripheral vascular disease.

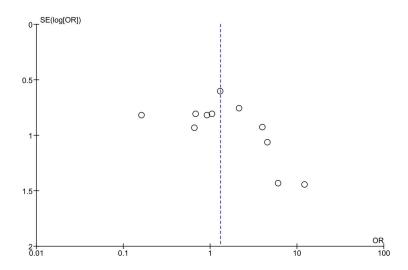


Figure 1. Funnel plot showing potential publication bias.

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Random, 95% CI	Year		Ratio om, 95% Cl	
Hirose, 2002	1.378	0.6648	3.7%	3.97 [1.08, 14.60]	2002		-	
Thielmann, 2006	0.1906	0.1076	32.5%	1.21 [0.98, 1.49]	2006		-	
Joskowiak, 2010	0.6981	0.3265	12.0%	2.01 [1.06, 3.81]	2010		-	
Sezai, 2012	1.6233	1.1062	1.4%	5.07 [0.58, 44.32]	2012	/2 -	10	_
Davierwala, 2016	0.6981	0.3265	12.0%	2.01 [1.06, 3.81]	2016		-	
Hung, 2021	0.077	0.0548	38.3%	1.08 [0.97, 1.20]	2021		•	
Total (95% CI)			100.0%	1.40 [1.07, 1.82]			•	
Heterogeneity: Tau ² = Test for overall effect	- BBT		P = 0.03);	I ^z = 60%		0.01 0.1	1 10	100

Figure 2. Forest plot demonstrating age as predictor of early mortality following CABG in ACS patients.

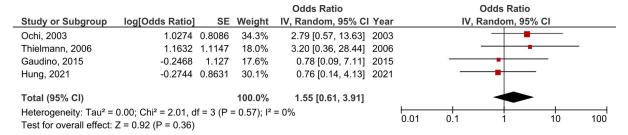


Figure 3. Forest plot demonstrating female gender as predictor of early mortality following CABG in ACS patients.

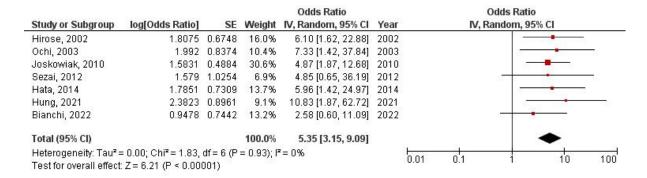


Figure 4. Forest plot demonstrating cardiogenic shock as predictor of early mortality following CABG in ACS patients.

		000000	Odds Ratio			Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% Cl	Year	IV, Random, 95% CI
Hirose, 2002	2.1062	0.6843	27.2%	8.22 [2.15, 31.42]	2002	 •
Ochi, 2003	0.9118	0.9105	15.4%	2.49 [0.42, 14.83]	2003	- • • • • • • • • •
Thielmann, 2006	0.2624	1.1748	9.2%	1.30 [0.13, 13.00]	2006	-
Sezai, 2012	0.6043	0.662	29.0%	1.83 [0.50, 6.70]	2012	
Gaudino, 2015	1.2928	0.8139	19.2%	3.64 [0.74, 17.96]	2015	-
Total (95% CI)			100.0%	3.19 [1.59, 6.42]		•
Heterogeneity: Tau ² =	= 0.00; Chi ² = 3.30,	df = 4 (P	= 0.51); P	² = 0%		bay at 10 40
Test for overall effect	Z = 3.25 (P = 0.00)	1)				0.01 0.1 1 10 10

Figure 5. Forest plot demonstrating chronic kidney disease as predictor of early mortality following CABG in ACS patients.

		Odds Ratio					Odds Ratio		
Study or Subgroup	log[Odds Ratio] S		Weight	IV, Random, 95% CI	Year		IV, Random, 95% CI		
Ochi, 2003	1.1216	1.1116	21.3%	3.07 [0.35, 27.12]	2003		200	-	
Thielmann, 2006	1.0852	0.687	55.7%	2.96 [0.77, 11.38]	2006		(a)		
Sezai, 2012	1.8469	1.0691	23.0%	6.34 [0.78, 51.54]	2012		/3 (•	-0
Total (95% CI)			100.0%	3.55 [1.30, 9.71]			-	•	
Heterogeneity: Tau ² :	= 0.00; Chi² = 0.38,	df = 2 (P	= 0.83); P	² = 0%		0.01	1 1	10	100
Test for overall effect	Z = 2.47 (P = 0.01))				0.01	0.1 1	10	100

Figure 6. Forest plot demonstrating IABP as predictor of early mortality following CABG in ACS patients.

				Odds Ratio			C	dds Ratio		
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI	Year		IV, Ra	andom, 95%	CI	
Ochi, 2003	1.513	1.1088	7.8%	4.54 [0.52, 39.89]	2003					_
Thielmann, 2006	0.571	0.4806	41.7%	1.77 [0.69, 4.54]	2006			-	•	
Sezai, 2012	0.1484	0.6114	25.8%	1.16 [0.35, 3.84]	2012		-	-		
Gaudino, 2015	0.0155	0.721	18.5%	1.02 [0.25, 4.17]	2015		-	+		
Hung, 2021	1.8017	1.2432	6.2%	6.06 [0.53, 69.29]	2021				•	
Total (95% CI)			100.0%	1.66 [0.91, 3.06]				•		
Heterogeneity: Tau² = 0 Test for overall effect: 2			= 0.60); I ²	= 0%		0.01	0.1	1	10	100

Figure 7. Forest plot demonstrating diabetes as predictor of early mortality following CABG in ACS patients.

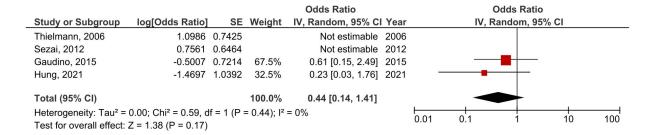


Figure 8. Forest plot demonstrating dyslipidaemia as predictor of early mortality following CABG in ACS patients.

				Odds Ratio				Odds Ratio				
Study or Subgroup	log[Odds Ratio]	SE	SE Weight IV, Random, 95% CI Year					IV, Random, 95% CI				
Thielmann, 2006	-0.3285	0.5822	40.1%	0.72 [0.23, 2.25]	2006		_	-				
Sezai, 2012	-0.8916	0.6269	35.1%	0.41 [0.12, 1.40]	2012		-	-				
Gaudino, 2015	0.555	0.7545	24.9%	1.74 [0.40, 7.64]	2015			•				
Total (95% CI)			100.0%	0.74 [0.34, 1.58]								
Heterogeneity: $Tau^2 = 0.04$; $Chi^2 = 2.18$, $df = 2$ ($P = 0.34$); $I^2 = 8\%$						0.01	01		10	100		
Test for overall effect: Z = 0.79 (P = 0.43)						0.01	0.1	ı	10	100		

Figure 9. Forest plot demonstrating hypertension as predictor of early mortality following CABG in ACS patients.

			Odds Ratio		Odds Ratio		
Study or Subgroup	log[Odds Ratio]	SE Weight	IV, Random, 95% CI Yea	r	IV, Random, 95°	% CI	
Thielmann, 2006	-0.3857 0	.4905 62.0%	0.68 [0.26, 1.78] 200	6	-		
Sezai, 2012	0.7178 0.	.7302 38.0%	2.05 [0.49, 8.58] 2013	2	- •		
Total (95% CI)		100.0%	1.03 [0.36, 2.95]				
Heterogeneity: Tau ² = 0	0.22; Chi ² = 1.57, df =	0.01	0.1 1	10	100		
Test for overall effect: 2	Z = 0.06 (P = 0.95)	0.01	0.1	10	100		

Figure 10. Forest plot demonstrating obesity as predictor of early mortality following CABG in ACS patients.

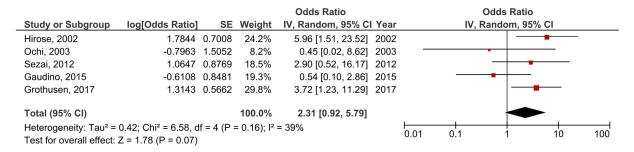


Figure 11. Forest plot demonstrating neurological disease as predictor of early mortality following CABG in ACS patients.

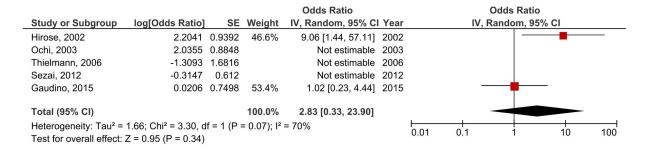


Figure 12. Forest plot demonstrating COPD as predictor of early mortality following CABG in ACS patients.

		Odds Ratio			C	dds Ratio		
Study or Subgroup	log[Odds Ratio]	SE Weight	IV, Random, 95% CI Yea	ar	IV, Ra	andom, 95% (CI	
Grothusen, 2017	1.3476 0.47	716 63.4%	3.85 [1.53, 9.70] 201	17		_	_	
Hung, 2021	-0.6162 1.12	211 36.6%	0.54 [0.06, 4.86] 202	21		-		
Total (95% CI)		100.0%	1.88 [0.29, 11.98]		-		_	
Heterogeneity: Tau ² = Test for overall effect:	1.19; Chi ² = 2.61, df = 1 Z = 0.67 (P = 0.51)	0.01	0.1	1	10	100		

Figure 13. Forest plot demonstrating PVD as predictor of early mortality following CABG in ACS patients.

				Odds Ratio			Odd	ds Ratio		
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% C	Year		IV, Rand	dom, 95%	CI	
Ochi, 2003	1.195 (0.8734	15.9%	3.30 [0.60, 18.30]	2003		-	+ •		
Thielmann, 2006	-0.0408 (0.5004	48.3%	0.96 [0.36, 2.56]	2006		-	-		
Sezai, 2012	0.4574 (0.6523	28.4%	1.58 [0.44, 5.67]	2012		-	-	_	
Gaudino, 2015	1.2528	1.2818	7.4%	3.50 [0.28, 43.17]	2015					_
Total (95% CI)			100.0%	1.48 [0.75, 2.93]						
Heterogeneity: Tau ² = 0.00; Chi ² = 2.05, df = 3 (P = 0.56); I ² = 0%						0.01	0.1	+	10	100
Test for overall effect: $Z = 1.13$ (P = 0.26)						0.01	0.1	1	10	100

Figure 14. Forest plot demonstrating LMS disease as predictor of early mortality following CABG in ACS patients.

				Odds Ratio				Odds Ratio	E	
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% C	Year		IV,	Random, 95	% CI	
Sezai, 2012	0.4187	0.6562	100.0%	1.52 [0.42, 5.50]	2012				_	
Davierwala, 2016	0.6043	0.237		Not estimable	2016					
Hung, 2021	2.3851	0.8633		Not estimable	2021					
Total (95% CI)			100.0%	1.52 [0.42, 5.50]					-	
Heterogeneity: Not applicable Test for overall effect: Z = 0.64 (P = 0.52)						0.01	0.1	1	10	100

Figure 15. Forest plot demonstrating LVEF < 30% as predictor of early mortality following CABG in ACS patients.

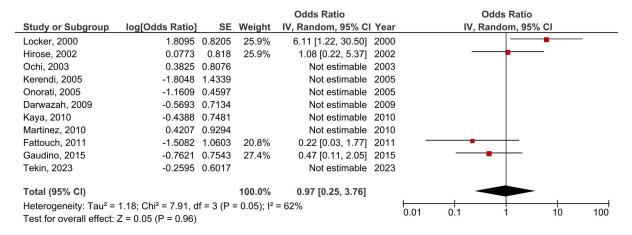


Figure 16. Forest plot demonstrating OPCAB as predictor of early mortality following CABG in ACS patients.