

Supplement 1. Literature search query.

Embase (Embase en Medline): 3181 results

('Aorta valve replacement'/de OR 'Aorta Valve Prosthesis'/exp OR (('Aorta Valve'/de OR 'Aorta Valve Disease'/exp OR ((aortic OR aorta) NEAR/3 (valve OR valvul* OR stenos* OR insufficien* OR regurgitat* OR incompeten*)):ab,ti) AND ('Transplantation'/de OR 'Implantation'/exp OR (replac* OR transplant* OR implant* OR artificial):ab,ti)) OR (AVR AND valve):ab,ti) AND ('Mechanical heart valve'/exp OR (mechanical OR mechano* OR ATS OR 'Bjork Shiley' OR 'Bjoerk Shiley' OR CarboMedic* OR 'Saint Jude' OR 'St Jude' OR 'St. Jude' OR 'Starr Edwards' OR pyrocarbon OR LTIC OR carbon):ab,ti) AND ('Survival'/exp OR 'Mortality'/exp OR 'Prognosis'/de OR 'Treatment outcome'/exp OR 'Evaluation and follow up'/de OR 'Follow up'/de OR 'Hazard Assessment'/de OR (surviv* OR mortalit* OR death* OR prognos* OR outcome* OR 'follow up' OR 'long term' OR hazard*):ab,ti) NOT ([animals]/lim NOT [humans]/lim)

Medline (OVID-SP): 2350 results

((("Aortic Valve"/ OR exp "Aortic Valve Stenosis"/ OR "Aortic Valve Insufficiency"/ OR ((aortic OR aorta) ADJ3 (valve OR valvul* OR stenos* OR insufficien* OR regurgitat* OR incompeten*)):ab,ti.) AND ("Transplantation"/ OR transplantation.xs. OR "Heart Valve Prosthesis Implantation"/ OR (replac* OR transplant* OR implant* OR artificial).ab,ti.)) OR (AVR AND valve).ab,ti.) AND ("Carbon"/ OR (mechanical OR mechano* OR ATS OR "Bjork Shiley" OR "Bjoerk Shiley" OR Carbomedic* OR "Saint Jude" OR "St Jude" OR "St. Jude" OR "Starr Edwards" OR pyrocarbon OR LTIC OR carbon).ab,ti.) AND ("Survival"/ OR exp "Mortality"/ OR mortality.xs. OR "Prognosis"/ OR exp "Treatment outcome"/ OR "Follow-Up Studies"/ OR (surviv* OR mortalit* OR death* OR prognos* OR outcome* OR "follow up" OR "long term" OR hazard*).ab,ti.) NOT (animals NOT humans).sh.

Cochrane Central: 80 results

(((((aortic OR aorta) NEAR/3 (valve OR valvul* OR stenos* OR insufficien* OR regurgitat* OR incompeten*)):ab,ti) AND ((replac* OR transplant* OR implant* OR artificial):ab,ti)) OR (AVR AND valve):ab,ti) AND ((mechanical OR mechano* OR ATS OR 'Bjork Shiley' OR 'Bjoerk Shiley' OR CarboMedic* OR 'Saint Jude' OR 'St Jude' OR 'St. Jude' OR 'Starr Edwards' OR pyrocarbon OR LTIC OR carbon):ab,ti) AND ((surviv* OR mortalit* OR death* OR prognos* OR outcome* OR 'follow up' OR 'long term' OR hazard*):ab,ti)

Web of Science: 1538 results

TS=((((aortic OR aorta) NEAR/2 (valve OR valvul* OR stenos* OR insufficien* OR regurgitat* OR incompeten*)) AND (replac* OR transplant* OR implant* OR artificial)) OR (AVR AND valve)) AND ((mechanical OR mechano* OR ATS OR "Bjork Shiley" OR "Bjoerk Shiley" OR CarboMedic* OR "Saint Jude" OR "St Jude" OR "St. Jude" OR "Starr Edwards" OR pyrocarbon OR LTIC OR carbon)) AND ((surviv* OR mortalit* OR death* OR prognos* OR outcome* OR "follow up" OR "long term" OR hazard*)) NOT ((animal* OR rat OR rats OR mouse OR mice OR pigs OR swine OR sheep) NOT (human* OR people OR patient*))

PubMed as supplied by publisher: 36 results

((((aortic[tiab] OR aorta[tiab]) AND (valve[tiab] OR valvul*[tiab] OR stenos*[tiab] OR insufficien*[tiab] OR regurgitat*[tiab] OR incompeten*[tiab])) AND (replac*[tiab] OR transplant*[tiab] OR implant*[tiab] OR artificial[tiab])) OR (AVR[tiab] AND valve[tiab])) AND ((mechanical[tiab] OR mechano*[tiab] OR ATS[tiab] OR Bjork Shiley*[tiab] OR CarboMedic*[tiab] OR Saint Jude*[tiab] OR St Jude*[tiab] OR St. Jude*[tiab] OR Starr Edwards*[tiab] OR pyrocarbon[tiab] OR LTIC[tiab] OR carbon[tiab])) AND ((surviv*[tiab] OR mortalit*[tiab] OR death*[tiab] OR prognos*[tiab] OR outcome*[tiab] OR follow up*[tiab] OR long term*[tiab] OR hazard*[tiab])) NOT ((animal*[tiab] OR rat[tiab] OR rats[tiab] OR mouse[tiab] OR mice[tiab] OR pigs[tiab] OR swine[tiab] OR sheep[tiab]) NOT (human*[tiab] OR people[tiab] OR patient[tiab] OR patients[tiab])) AND publisher[sb]

Supplement 2. Study characteristics.

First author	Year of publication	No. of patients	Inclusion period (y)	Study type	Mean follow-up (y)	Mean age (y)	Gender (% male)	Prosthesis model
Nistal	1996	209	1989-1992	Retrospective	2.5	54.1	74.2	Carbomedics
Gaudino	1997	20	1988-1996	Retrospective	2.5	46.5	85.0	Sorin Bicarbon (n=10)/Carbomedics (n=5)/St. Jude (n=3)
Katircioglu	1997	865	1986-1996	Retrospective	3.3	42.9	-	St. Jude
Renzulli	1997	305	1982-1994	Retrospective	3.1	50.4	-	Carbomedics (n=200)/St. Jude (n=82)/Sorin Bicarbon (n=23)
Natsuaki	1998	37	1985-1997	Retrospective	5.3	52.0	78.4	St. Jude
Jamieson	1999	384	1989-1994	Retrospective	2.5	52.3	74.2	St. Jude/Carbomedics (n=NR)
Chang	2001	256	1988-1997	Retrospective	5.3	43.9	-	St. Jude (n=142)/Carbomedics (n=114)
Imanaka	2001	126	1990-1996	Retrospective	6.3	51.2	59.5	Carbomedics
Ozeren	2001	70	1998-2000	Retrospective	1.3	33.8	-	ATS
Kuwaki	2002	69	1990-2000	Retrospective	6.5	48.9	68.1	Carbomedics
Aagaard	2003	55	1987-2000	Retrospective	7.6 ^a	33.0 ^a	76.4	Carbomedics
Emery	2003	271	1977-1997	Retrospective	7.2	40.0	74.2	St. Jude
Chang	2005	179	1988-1999	Retrospective	7.9	44.4	-	Carbomedics
Concha	2005	62	1997-2003	Prospective	2.5	37.7	75.8	Carbomedics (n=38)/St. Jude (n=24)
Sakamoto	2005	46	1995-2002	Retrospective	6.2	54.0	91.3	St. Jude
Kandemir	2006	174	1992-2004	Retrospective	6.2	47.7	77.6	Carbomedics (n=94)/St. Jude (n=80)
Klieverik	2006	204	1991-2001	Retrospective	6.2	45.0	73.0	St. Jude (n=199)/ATS (n=4)/Björk-Shiley (n=1)
Kilian	2007	147	1990-1998	Retrospective	8.1	54.8	85.0	Sorin Bicarbon
Rodrigues	2009	117	1995-2003	Retrospective	4.0	45.0	69.2	St. Jude
Torella	2010	396	2001-2005	RCT	5.6 ^a	49.7	69.2	Sorin Bicarbon (n=292)/St. Jude (n=92)/Edwards MIRA(n=7)/ Carbomedics (n=5)
Doss	2011	20	-	RCT	1.0	48.0	55.0	Edwards MIRA
Weber	2012	103	2000-2009	Prospective	2.8	50.0	84.5	St. Jude/ATS (n=NR)
Cphoon	2013	60	1994-2000	Retrospective	6.6	46.0	83.3	St. Jude
Andreas	2014	173	1991-2008	Retrospective	7.9	41.0	75.1	Carbomedics/Medtronic Hall/On-X/Edwards/St. Jude (n=NR)
McClure	2014	361	1992-2011	Retrospective	6.0 ^a	53.2	70.4	St. Jude (n=318)/On-X (n=23)/Carbomedics (n=19)/Unknown (n=1)
Nazarov	2014	211	2003-2004	Prospective	5.1	52.2	-	Cardiamed
Nishida	2014	220	1990-2012	Retrospective	12.0	54.9	72.7	Carbomedics
Bouhout	2015	450	1997-2006	Prospective	9.1	53.0	67.6	Carbomedics (n=402)/St. Jude (n=35)/Medtronic Advantage (n=13)
Nishida	2015	157	1981-2014	Retrospective	11.8	50.6	49.7	St. Jude

^aMedian.

-, variable not reported; RCT, randomized controlled trial; NR, not reported.

Supplement 3. Pooled early mortality risk and linearized occurrence rates of late outcome events (including individual study estimates).

	Early mortality (%)	Late mortality (%/yr)	Cardiac death (%/yr)	Valve-related death (%/yr)	SUD (%/yr)	Reintervention (%/yr)	Thromboembolism (%/yr)	Valve thrombosis (%/yr)	Bleeding (%/yr)	SVD (%/yr)	NSVD (%/yr)	Endocarditis (%/yr)
Nistal (1996)	5.26(2.96-9.36)	1.53(0.77-3.05)	1.15(0.52-2.55)	0.96(0.40-2.29)	0.57(0.19-1.78)	0.38(0.10-1.53)	3.07(1.89-4.97)	0.10(0.01-1.53)	1.92(1.04-3.54)	0.10(0.01-1.53)	0.77(0.29-2.03)	0.10(0.01-1.53)
Gaudino (1997)	2.50(0.16-38.60)	5.90(1.97-17.69)	5.90(1.97-17.69)	1.97(0.28-13.70)	0.98(0.06-15.51)	1.97(0.28-13.70)	-	-	-	-	5.90(1.97-17.69)	1.97(0.28-13.70)
Katircioglu (1997)	5.90(4.52-7.69)	0.71(0.44-1.14)	-	-	-	1.00(0.67-1.49)	1.50(1.08-2.07)	0.71(0.44-1.14)	1.58(1.15-2.17)	-	0.12(0.04-0.39)	-
Renzulli (1997)	8.39(5.72-12.31)	0.79(0.38-1.66)	0.57(0.24-1.36)	0.34(0.11-1.05)	0.23(0.06-0.91)	-	0.23(0.06-0.91)	0.06(0.00-0.91)	0.91(0.46-1.81)	0.06(0.00-0.91)	-	-
Natsuaki (1998)	-	1.02(0.26-4.05)	0.51(0.07-3.60)	0.25(0.02-4.06)	-	-	0.25(0.02-4.06)	-	0.51(0.07-3.60)	-	0.25(0.02-4.06)	-
Jamieson (1999)	2.60(1.41-4.80)	1.75(1.09-2.80)	0.72(0.34-1.51)	0.62(0.28-1.37)	0.10(0.01-0.73)	-	1.13(0.63-2.04)	0.05(0.00-0.82)	1.54(0.93-2.55)	-	-	-
Chang (2001)	4.69(2.70-8.14)	2.06(1.43-2.98)	-	-	-	-	-	-	-	0.04(0.00-0.59)	-	-
Imanaka (2001)	6.35(3.25-12.42)	1.26(0.68-2.34)	0.63(0.26-1.52)	0.51(0.19-1.34)	0.25(0.06-1.01)	-	0.25(0.06-1.01)	-	0.25(0.06-1.01)	-	0.13(0.02-0.90)	0.13(0.02-0.90)
Ozeren (2001)	1.43(0.20-10.00)	0.58(0.04-9.25)	-	-	-	1.17(0.17-8.19)	-	0.58(0.04-9.25)	0.58(0.04-9.25)	-	1.17(0.17-8.19)	0.58(0.04-9.25)
Kuwaki (2002)	5.80(2.24-15.01)	1.11(0.47-2.67)	0.89(0.34-2.37)	0.22(0.03-1.58)	0.22(0.03-1.58)	0.67(0.22-2.07)	1.34(0.60-2.96)	0.22(0.03-1.58)	0.45(0.11-1.78)	0.11(0.01-1.78)	1.11(0.47-2.67)	0.22(0.03-1.58)
Aagard (2003)	0.91(0.06-14.35)	0.99(0.37-2.63)	0.74(0.24-2.29)	0.12(0.01-1.98)	0.12(0.01-1.98)	0.50(0.12-1.97)	0.25(0.03-1.75)	0.12(0.01-1.98)	0.12(0.01-1.98)	0.12(0.01-1.98)	0.25(0.03-1.75)	0.25(0.03-1.75)
Emery (2003)	1.11(0.36-3.41)	0.92(0.58-1.46)	-	0.20(0.08-0.54)	-	0.41(0.20-0.82)	0.31(0.14-0.68)	0.10(0.03-0.41)	0.31(0.14-0.68)	0.03(0.00-0.41)	0.31(0.14-0.68)	0.15(0.05-0.47)
Chang (2005)	1.68(0.55-5.15)	1.34(0.86-2.10)	0.99(0.59-1.67)	0.64(0.33-1.22)	0.14(0.04-0.56)	0.07(0.01-0.50)	1.20(0.75-1.93)	0.07(0.01-0.50)	0.92(0.54-1.58)	0.04(0.00-0.57)	0.07(0.01-0.50)	0.42(0.19-0.94)
Concha (2005)	6.45(2.50-16.65)	0.32(0.02-5.06)	0.32(0.02-5.06)	0.32(0.02-5.06)	0.32(0.02-5.06)	0.64(0.09-4.48)	2.54(0.97-6.69)	-	1.27(0.32-5.04)	-	-	1.91(0.62-5.85)
Sakamoto (2005)	2.17(0.31-15.11)	1.05(0.34-3.24)	0.35(0.05-2.48)	0.35(0.05-2.48)	0.18(0.01-2.80)	0.18(0.01-2.80)	0.81(0.22-2.93)	-	0.18(0.01-2.80)	-	-	0.70(0.18-2.79)
Kandemir (2006)	2.30(0.87-6.06)	1.52(0.93-2.47)	1.33(0.79-2.24)	0.19(0.05-0.76)	0.09(0.01-0.67)	-	0.95(0.51-1.76)	0.09(0.01-0.67)	0.66(0.32-1.39)	0.05(0.00-0.76)	0.09(0.01-0.67)	-
Klieverik (2006)	1.96(0.74-5.17)	1.58(1.02-2.44)	1.10(0.66-1.86)	0.87(0.48-1.56)	0.47(0.21-1.05)	0.79(0.43-1.46)	0.47(0.21-1.05)	0.24(0.08-0.73)	0.87(0.48-1.56)	0.04(0.00-0.63)	0.32(0.12-0.84)	0.47(0.21-1.05)
Kilian (2007)	4.08(1.86-8.94)	3.52(2.61-4.73)	-	1.34(0.82-2.18)	-	0.50(0.23-1.12)	1.34(0.82-2.18)	-	1.51(0.95-2.38)	-	-	-
Rodrigues (2009)	6.84(3.50-13.35)	1.91(1.00-3.65)	1.49(0.71-3.10)	1.27(0.57-2.82)	0.42(0.11-1.69)	0.21(0.03-1.50)	0.42(0.11-1.69)	0.11(0.01-1.69)	2.33(1.30-4.19)	0.11(0.01-1.69)	-	0.21(0.03-1.50)
Torella (2010)	-	0.09(0.02-0.36)	0.09(0.02-0.36)	0.09(0.02-0.36)	0.02(0.00-0.36)	-	0.18(0.07-0.48)	-	0.14(0.04-0.42)	-	-	-
Doss (2011)	2.50(0.16-38.60)	5.00(0.74-33.78)	2.50(0.16-38.60)	2.50(0.16-38.60)	2.50(0.16-38.60)	2.50(0.16-38.60)	2.50(0.16-38.60)	2.50(0.16-38.60)	5.00(0.74-33.78)	2.50(0.16-38.60)	2.50(0.16-38.60)	2.50(0.16-38.60)
Weber (2012)	-	0.71(0.18-2.81)	0.35(0.05-2.50)	0.35(0.05-2.50)	0.18(0.01-2.82)	0.71(0.18-2.81)	2.12(0.96-4.68)	-	0.35(0.05-2.50)	-	-	0.71(0.18-2.81)
Cohoon (2013)	-	1.77(0.85-3.68)	-	-	-	-	-	-	-	-	-	-
Andreas (2014)	1.16(0.29-4.59)	2.05(1.42-2.96)	1.54(1.01-2.35)	1.39(0.89-2.17)	1.02(0.61-1.72)	0.73(0.39-1.36)	1.10(0.66-1.82)	0.07(0.01-0.52)	1.32(0.83-2.08)	-	-	0.66(0.34-1.26)
McClure (2014)	1.39(0.58-3.31)	2.28(1.78-2.92)	0.67(0.42-1.07)	0.19(0.08-0.45)	0.02(0.00-0.30)	0.26(0.12-0.55)	0.41(0.23-0.74)	-	0.75(0.48-1.16)	-	-	-
Nazarov (2014)	3.32(1.60-6.87)	1.94(1.27-2.97)	-	-	-	-	2.13(1.42-3.19)	0.05(0.00-0.74)	0.55(0.25-1.23)	0.05(0.00-0.74)	0.18(0.05-0.74)	0.28(0.09-0.86)
Nishida (2014)	0.91(0.23-3.61)	2.80(2.24-3.51)	2.30(1.79-2.95)	1.00(0.68-1.46)	-	0.23(0.10-0.51)	0.80(0.52-1.22)	0.04(0.01-0.27)	0.65(0.40-1.04)	0.02(0.00-0.30)	0.27(0.13-0.56)	0.42(0.23-0.75)
Bouhout (2015)	1.11(0.46-2.66)	1.41(1.10-1.83)	1.00(0.74-1.36)	0.76(0.53-1.07)	0.49(0.32-0.76)	0.63(0.43-0.93)	1.00(0.74-1.36)	0.07(0.02-0.23)	0.93(0.68-1.27)	0.01(0.00-0.19)	0.90(0.65-1.24)	0.24(0.13-0.45)
Nishida (2015)	1.27(0.32-5.05)	2.50(1.88-3.32)	1.10(0.71-1.69)	0.60(0.33-1.08)	-	0.27(0.11-0.65)	0.86(0.53-1.40)	0.03(0.00-0.43)	0.65(0.37-1.14)	0.03(0.00-0.43)	0.16(0.05-0.50)	0.16(0.05-0.50)
Pooled	3.15(2.37-4.21)	1.55(1.25-1.92)	0.95(0.71-1.27)	0.60(0.44-0.81)	0.37(0.26-0.54)	0.51(0.37-0.71)	0.90(0.68-1.21)	0.14(0.08-0.25)	0.85(0.65-1.12)	0.00^a	0.39(0.21-0.76)	0.41(0.29-0.57)
<i>Heterogeneity^b</i>	<i>I²=70% (p<0.001)</i>	<i>I²=83% (p<0.001)</i>	<i>I²=70% (p<0.001)</i>	<i>I²=64% (p<0.001)</i>	<i>I²=47% (p=0.011)</i>	<i>I²=47% (p=0.011)</i>	<i>I²=79% (p<0.001)</i>	<i>I²=62% (p<0.001)</i>	<i>I²=67% (p<0.001)</i>	-	<i>I²=83% (p<0.001)</i>	<i>I²=34% (p=0.0721)</i>

Pooled estimates presented as “percentage (95% confidence interval)”.

-, variable not reported; Yr, year; SUD, sudden, unexplained death; SVD, structural valve deterioration; NSVD, nonstructural valve dysfunction.

In case a particular event was reported not to occur in an individual study, then for the purpose of the analyses it was assumed that 0.5 patient experienced that event.

^aThere were zero events of SVD in the 15 studies that reported this outcome.

^bThe reported p-values are the p-values of Cochran’s Q test for heterogeneity.

Supplement 4. Random effects meta-regression of natural log-transformed outcome measures.

Covariate	β	95%CI-	95%CI+	SE	p-value
<i>Early mortality</i>					
Year of first inclusion	-0.007	-0.058	0.045	0.026	0.796
Mean FUP (per year)	-0.172	-0.261	-0.082	0.046	<0.001
Concomitant Procedures	2.479	0.057	4.902	1.236	0.045
Concomitant CABG	3.855	-1.350	9.060	2.656	0.147
AS	-1.565	-3.416	0.286	0.945	0.098
AR	1.250	-1.057	3.557	1.177	0.288
Rheumatic	1.250	-0.059	2.560	0.668	0.061
Mean age (per year)	-0.006	-0.061	0.049	0.028	0.829
Endocarditis	0.306	-2.544	3.156	1.454	0.834
Emergency	1.542	-6.225	9.310	3.963	0.697
Prospective/RCT study design	-0.157	-0.964	0.651	0.412	0.704
Previous cardiac intervention	0.655	-4.494	5.804	2.627	0.803
<i>Late Mortality</i>					
Year of first inclusion	-0.002	-0.036	0.032	0.017	0.911
Mean FUP (per year)	0.063	0.000	0.126	0.032	0.052
Concomitant Procedures	-0.154	-1.911	1.602	0.896	0.863
Concomitant CABG	0.293	-3.462	4.047	1.916	0.879
AS	0.989	-0.73	2.708	0.877	0.260
AR	-1.502	-3.377	0.373	0.956	0.116
Rheumatic	-0.552	-1.317	0.214	0.391	0.158
Mean age (per year)	0.035	-0.001	0.071	0.018	0.054
Endocarditis	1.650	0.426	2.874	0.624	0.008
Emergency	2.699	-0.290	5.687	1.525	0.077
Prospective/RCT study design	-0.314	-0.821	0.193	0.259	0.225
Previous cardiac intervention	1.368	-0.991	3.727	1.204	0.256
<i>Reintervention</i>					
Year of first inclusion	0.018	-0.030	0.067	0.025	0.464
Mean FUP (per year)	-0.107	-0.189	-0.026	0.042	0.010
Concomitant Procedures	0.739	-1.542	3.020	1.164	0.526
Concomitant CABG	2.908	-1.772	7.588	2.388	0.223
AS	0.132	-1.087	1.352	0.622	0.831
AR	0.129	-1.637	1.895	0.901	0.886
Rheumatic	0.665	-0.038	1.369	0.359	0.064

Mean age (per year)	-0.042	-0.087	0.003	0.023	0.069
Endocarditis	0.635	-1.386	2.657	1.031	0.538
Emergency	2.666	-2.277	7.608	2.522	0.290
Prospective/RCT study design	0.368	-0.359	1.094	0.371	0.321
Previous cardiac intervention	-0.111	-3.504	3.281	1.731	0.949
<i><u>TE/VT</u></i>					
Year of first inclusion	0.023	-0.023	0.069	0.023	0.321
Mean FUP (per year)	-0.062	-0.158	0.034	0.049	0.203
Concomitant Procedures	1.342	-0.669	3.353	1.026	0.191
Concomitant CABG	2.949	-1.601	7.499	2.321	0.204
AS	0.920	-1.046	2.886	1.003	0.359
AR	0.576	-1.513	2.665	1.066	0.589
Rheumatic	0.622	-0.950	2.195	0.802	0.438
Mean age (per year)	-0.004	-0.060	0.052	0.029	0.892
Endocarditis	-0.754	-6.126	4.619	2.741	0.783
Emergency	1.922	-5.606	9.449	3.841	0.617
Prospective/RCT study design	0.368	-0.307	1.044	0.345	0.286
Previous cardiac intervention	0.994	-3.053	5.042	2.065	0.630
<i><u>Bleeding</u></i>					
Year of first inclusion	0.000	-0.042	0.041	0.021	0.991
Mean FUP (per year)	-0.077	-0.151	-0.003	0.038	0.042
Concomitant Procedures	1.150	-0.092	2.391	0.633	0.070
Concomitant CABG	3.157	-0.696	7.011	1.966	0.108
AS	2.235	0.263	4.206	1.006	0.026
AR	-3.083	-5.150	-1.016	1.054	0.003
Rheumatic	0.690	-0.633	2.014	0.675	0.307
Mean age (per year)	-0.008	-0.057	0.040	0.025	0.742
Endocarditis	0.324	-4.003	4.652	2.208	0.883
Emergency	-1.907	-11.833	8.019	5.064	0.707
Prospective/RCT study design	-0.338	-0.952	0.277	0.313	0.281
Previous cardiac intervention	0.343	-3.076	3.761	1.744	0.844
<i><u>NSVD</u></i>					
Year of first inclusion	0.037	-0.049	0.123	0.044	0.401
Mean FUP (per year)	-0.146	-0.309	0.016	0.083	0.078
Concomitant Procedures	1.619	-4.787	8.026	3.269	0.620
Concomitant CABG	-7.148	-14.176	-0.119	3.586	0.046
AS	3.128	1.306	4.949	0.929	<0.001

AR	-3.770	-5.945	-1.595	1.110	<0.001
Rheumatic	-3.296	-5.537	-1.055	1.143	0.004
Mean age (per year)	-0.002	-0.108	0.104	0.054	0.970
Endocarditis	2.718	0.978	4.458	0.888	0.002
Emergency	6.612	1.778	11.445	2.466	0.007
Prospective/RCT study design	0.523	-0.922	1.968	0.737	0.478
Previous cardiac intervention	0.367	-6.177	6.911	3.339	0.913

SE, standard error; 95%CI-, 95% confidence interval lower bound; 95%CI+, 95% confidence interval upper bound; FUP, follow-up; CABG, coronary artery bypass grafting; AS, aortic stenosis; AR, aortic regurgitation; RCT, randomized controlled trial; TE, thromboembolism; VT, valve thrombosis; NSVD, nonstructural valve dysfunction

Supplement 5. Methods.

List of recorded variables

Study characteristics:

- Study design
- Number of patients included
- Inclusion period
- Total follow-up

Baseline patient and operative characteristics:

- Mean age
- Gender
- Etiology
- Aortic valve hemodynamics
- Aortic valve morphology
- Previous cardiac interventions (any previous surgical or percutaneous intervention on the heart, thoracic aorta and/or pulmonary trunk)
- Urgency of the operation
- Type of mechanical valve (bileaflet, caged-ball or tilting disc)
 - Prosthesis model
- Concomitant procedures

Outcome events

- Early outcome events (<30 days after surgery)
 - Early mortality (all-cause mortality within the first 30 postoperative days)
 - Re-exploration for bleeding
 - Pacemaker implantation
 - Deep sternal infection/mediastinitis
 - Endocarditis
 - Stroke
 - Transient ischemic attack
 - Myocardial infarction
 - Valve thrombosis
 - Peripheral bleeding

- Late outcome events (>30 days after surgery)
 - Late mortality
 - Cardiac death
 - Valve related death
 - Sudden, unexplained death (SUD)
 - Reintervention
 - Thromboembolism
 - Valve thrombosis
 - Bleeding
 - Endocarditis
 - Structural valve deterioration (SVD)
 - Nonstructural valve dysfunction (NSVD)

Statistical software used

Statistical analyses were performed in Microsoft Office Excel 2011 (Microsoft Corp., Redmond, WA, USA), IBM SPSS Statistics (version 21.0.0.1. IBM Corp., Armonk, NY, USA) and in the R statistical software (version 3.1.0. R Development Core Team, R Foundation for Statistical Computing, Vienna, Austria) using the metafor package.

Supplement 6. References of studies included in the meta-analysis.^{14,25,29-55}

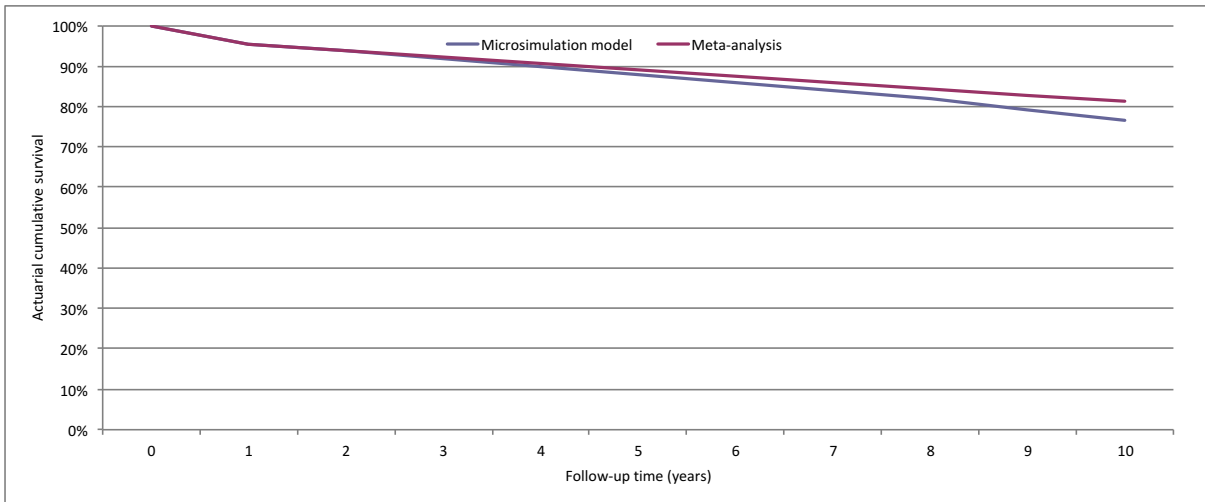
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Supplement 7. Microsimulation model calibration plot.

The actuarial survival curve obtained from the microsimulation model run for 10,000 iterations at the pooled mean age (48 years) and male/female ratio (72.0% male) of the included studies compared to the pooled overall mortality observed in our meta-analysis.



Supplement 8. Funnel plots.

Funnel plots on a natural log x-axis. SE, standard error; SVD, structural valve deterioration; NSVD, nonstructural valve dysfunction.

