Pre-emptive correction of
eriovenous access steno

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Disclosure

CIHR IRSC

What we (think we) know

AVFs/AVGs best but tend to clot: screening needed t
maintain patency (‘openness’)

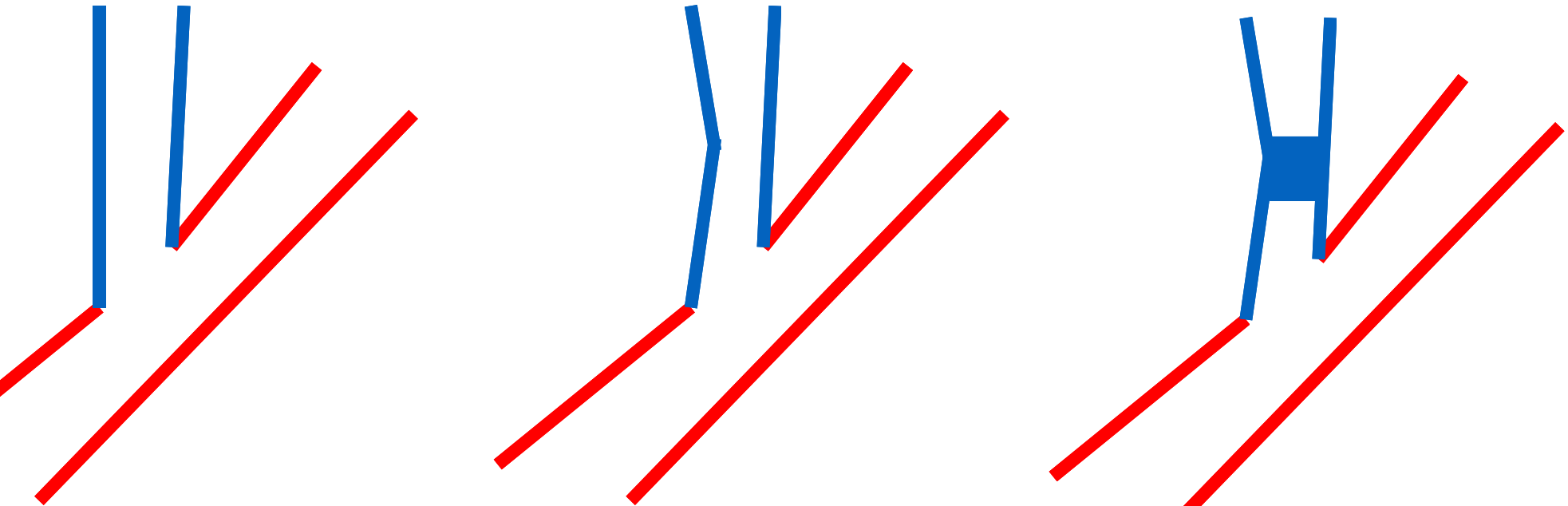
AVGs (or people who use them?) more difficult to
maintain than AVFs

Active surveillance detects <Qa due to initial stenosis
while the access is still functional

Pre-emptive correction of stenosis >50% regardless
access performance is recommended to maintain
patency

Mechanism of thrombosis

ss is fully open
d functional → Initial stenosis (functional) → Dysfunction → Thrombosis → Acce



ve
ance

Clinical monitoring

Pre-emptive correction

Deferred correction

Outcomes

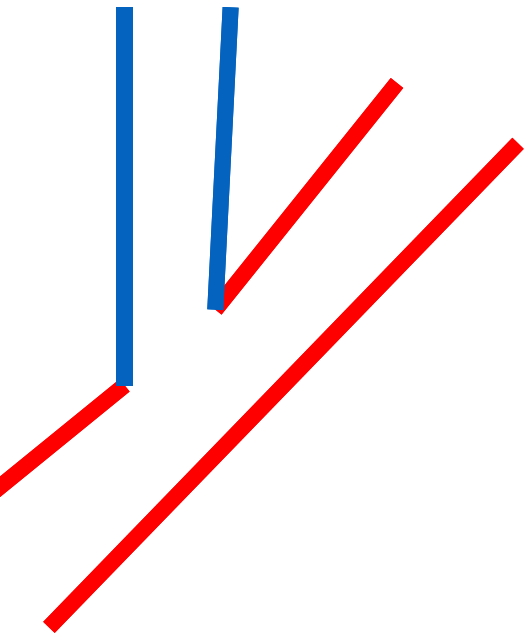
ss is fully open
d functional

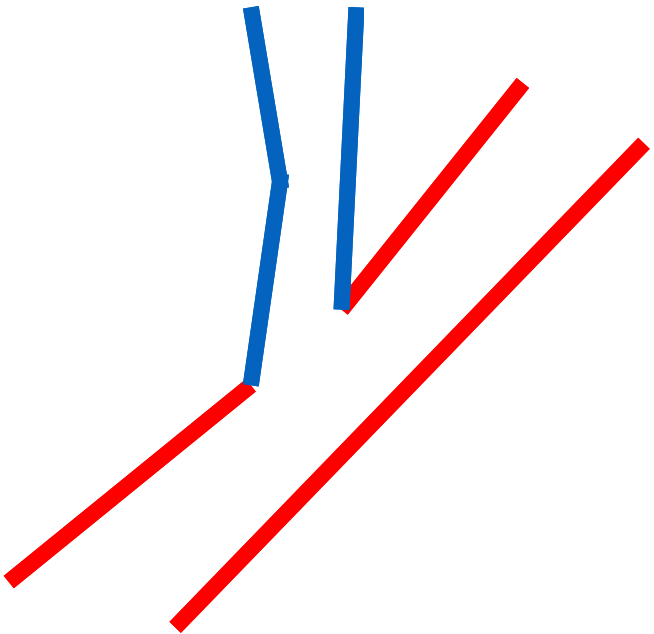
Initial stenosis (functional)

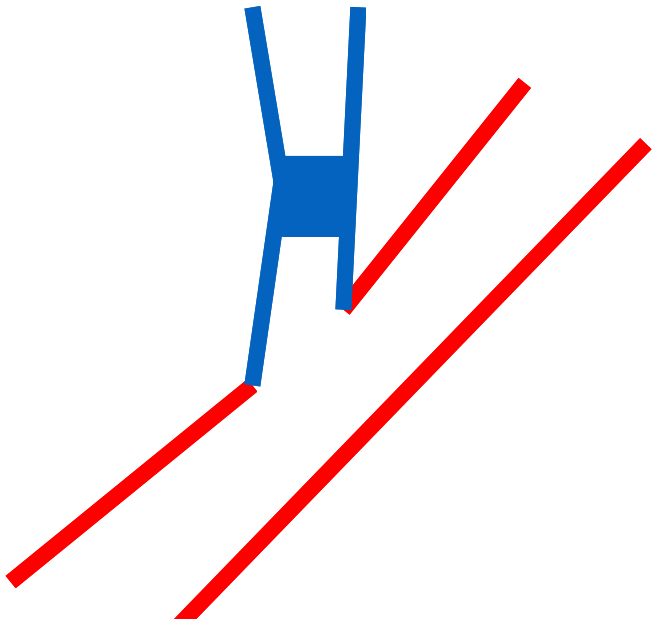
Dysfunction

Thrombosis

Acce







Screening

amination of thrill/bruit; inspection;
n elevation; augmentation test

mostasis time

parameters, Qb, A/TM pressure, KT

Surveillance

Direct measures of Qa

Indirect measures (dynamic/static VP)

Doppler (anatomic and functional data

Prophylaxis

functional access **without known**

cal monitoring and deferred
stenosis (when the access becomes

ve Qa surveillance and pre-emptive
stenosis in a functional access

Secondary

Population with a **functional** access w
stenosis

Comparator: Deferred stenosis correc
access becomes dysfunctional)

Intervention: Pre-emptive stenosis cor

PICO-D

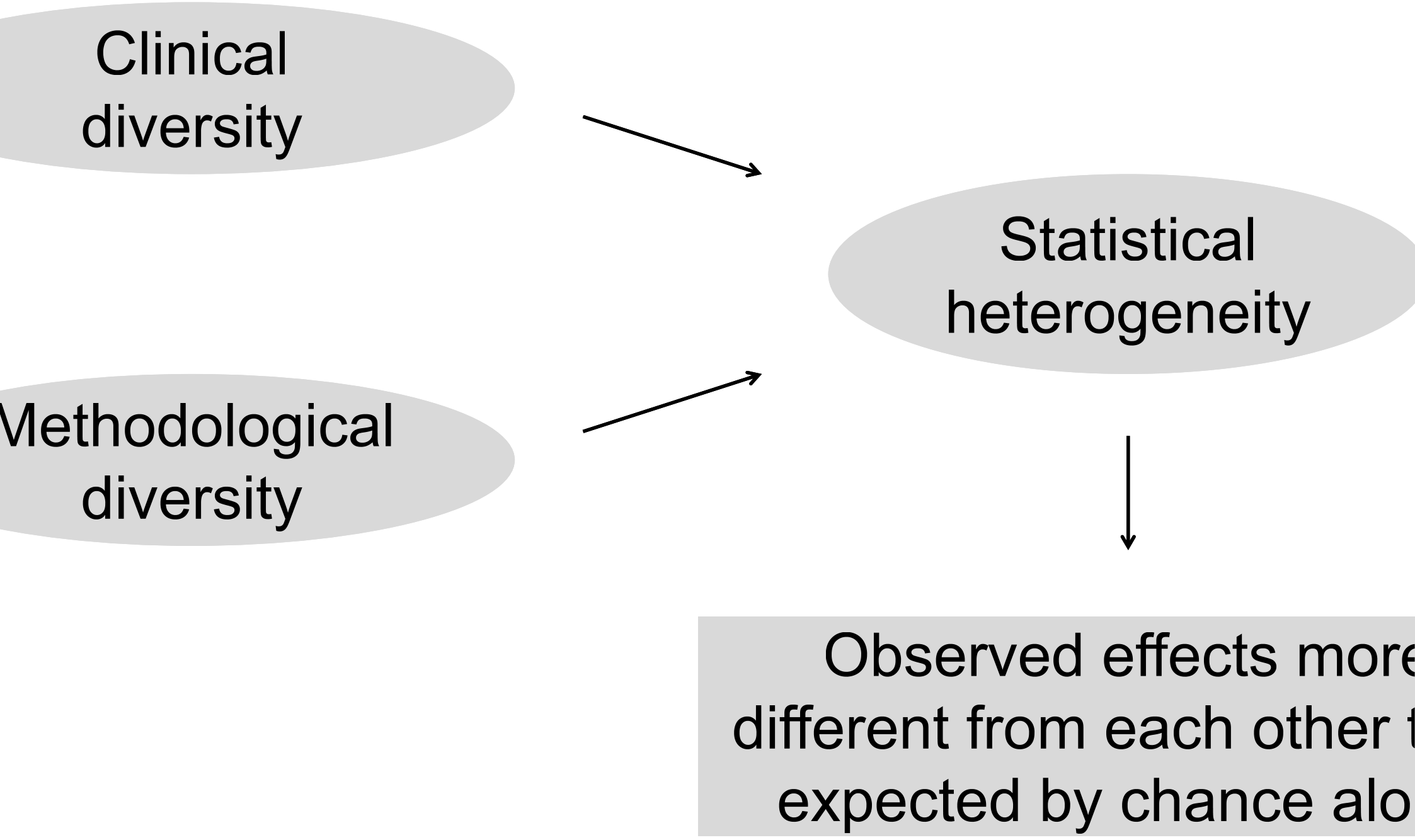
an access able to deliver the prescribed dialysis dos
n)

e correction (surveillance)

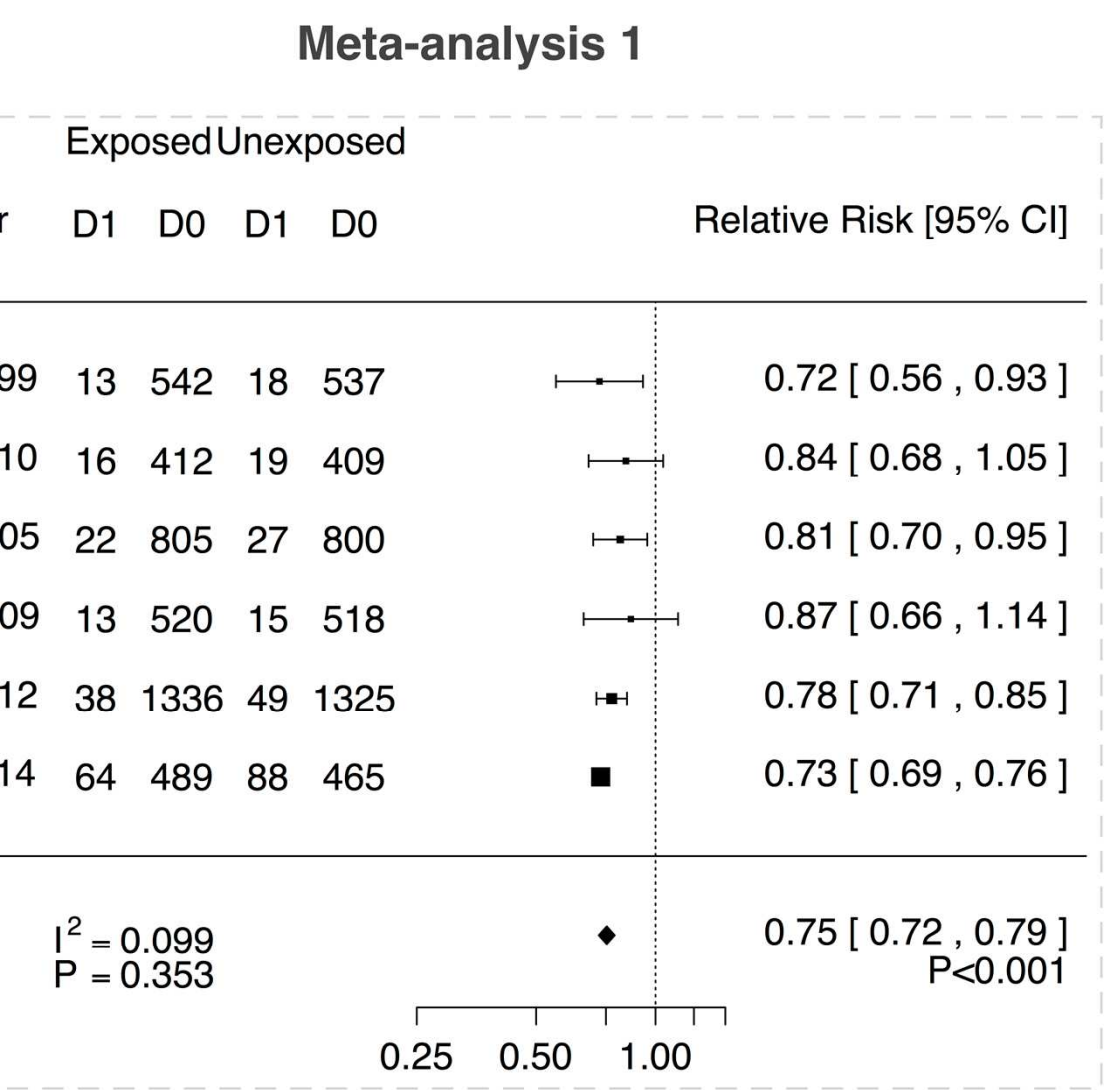
rrection (monitoring)

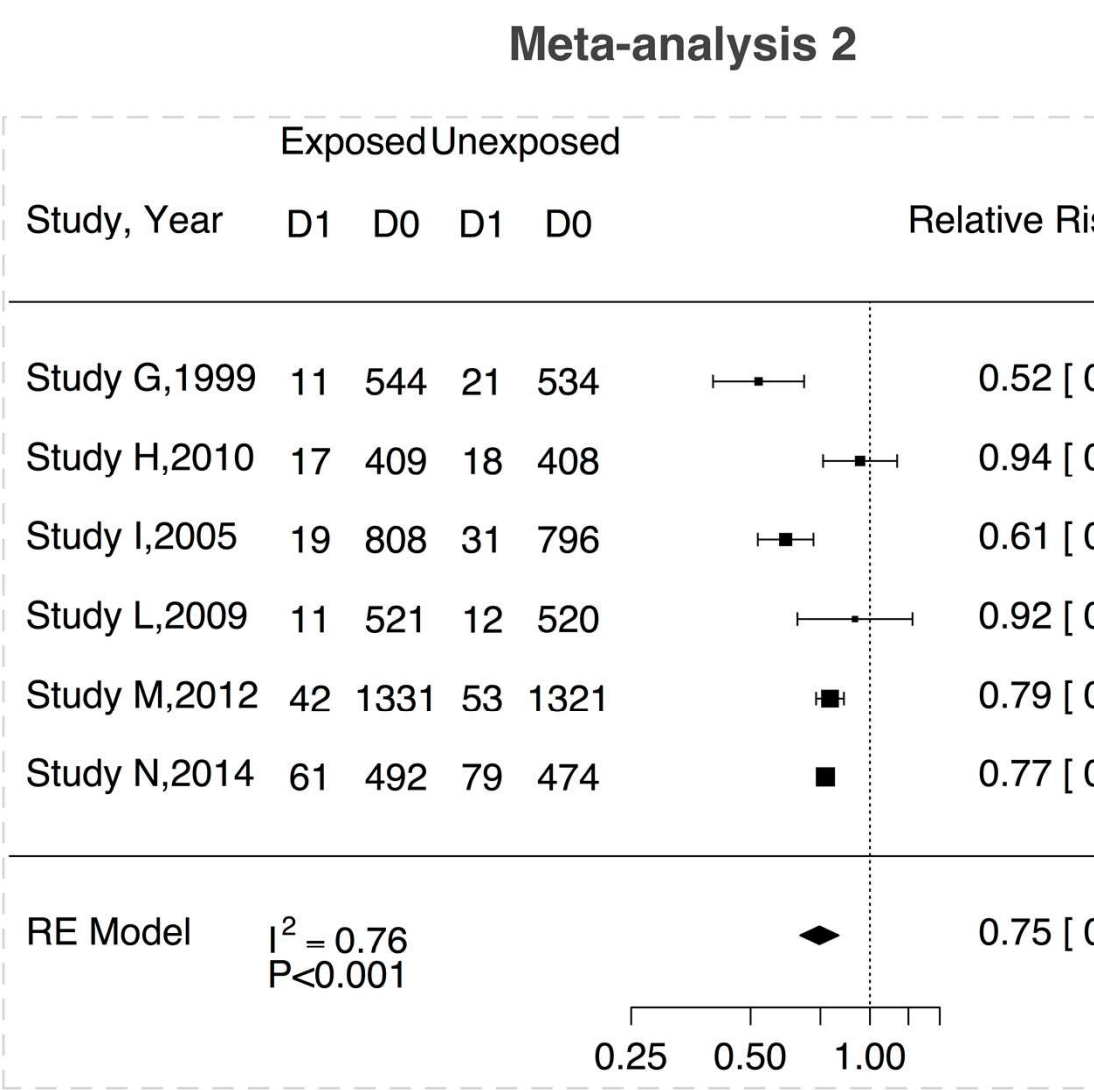
of the access (loss/thrombosis) and of the patient (dea
procedures)

Heterogeneity



Example


Meta-analysis 1
Exposed Unexposed
D1 D0 D1 D0
Relative Risk [95% CI]
99 13 542 18 537 0.72 [0.56 , 0.93]
10 16 412 19 409 0.84 [0.68 , 1.05]
05 22 805 27 800 0.81 [0.70 , 0.95]
09 13 520 15 518 0.87 [0.66 , 1.14]
12 38 1336 49 1325 0.78 [0.71 , 0.85]
14 64 489 88 465 0.73 [0.69 , 0.76]
I² = 0.099
P = 0.353
0.75 [0.72 , 0.79]
P<0.001
0.25 0.50 1.00

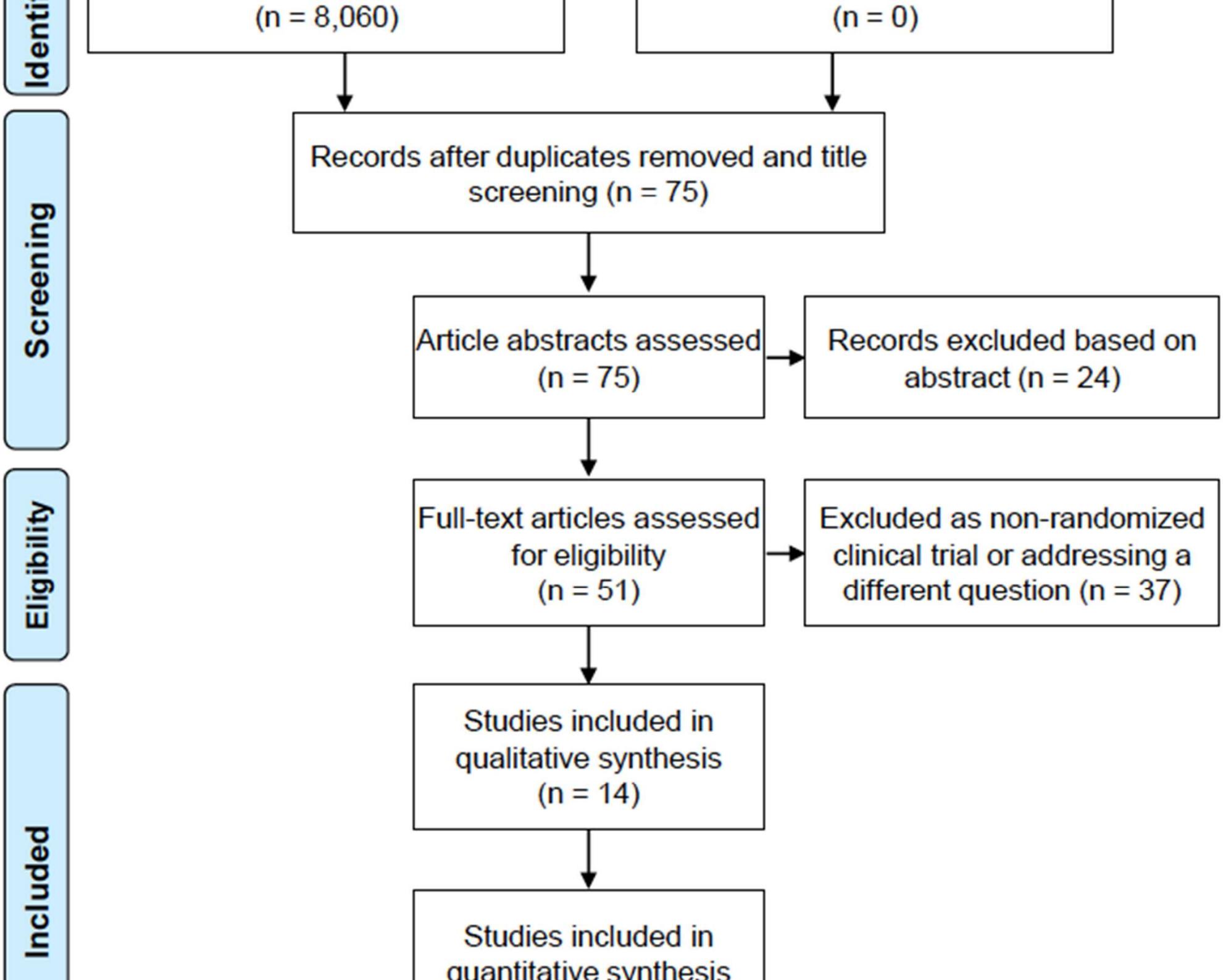

Meta-analysis 2
Exposed Unexposed
Study, Year D1 D0 D1 D0
Relative Ris
Study G,1999 11 544 21 534 0.52 [
Study H,2010 17 409 18 408 0.94 [
Study I,2005 19 808 31 796 0.61 [
Study L,2009 11 521 12 520 0.92 [
Study M,2012 42 1331 53 1321 0.79 [
Study N,2014 61 492 79 474 0.77 [
RE Model
I² = 0.76
P<0.001
0.75 [
0.25 0.50 1.00

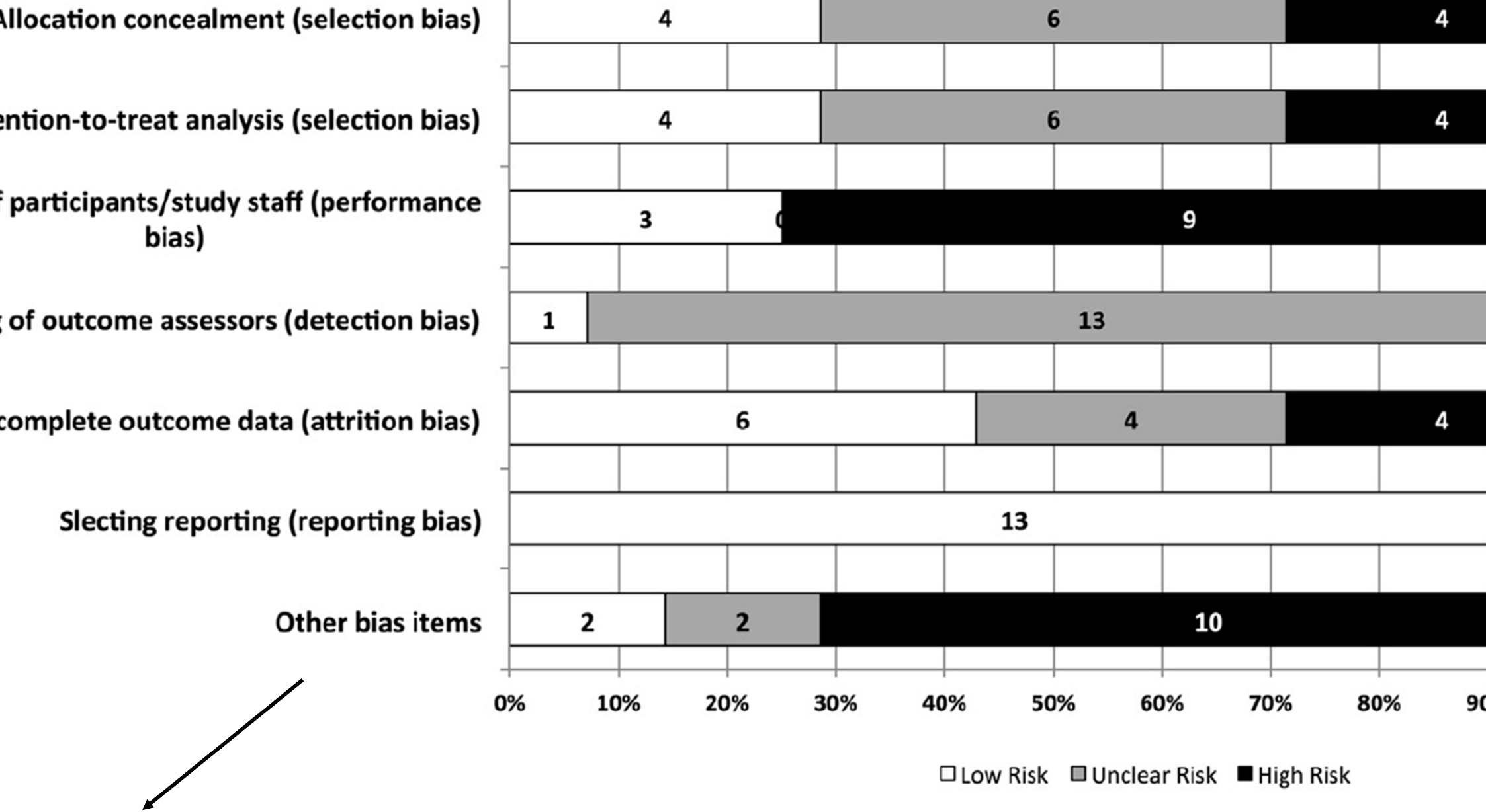
Sub-group analyses

ess (AVF vs. AVG)

ntervention (primary vs. secondary prophylaxis)

veillance in primary prophylaxis (Qa data only vs. US)

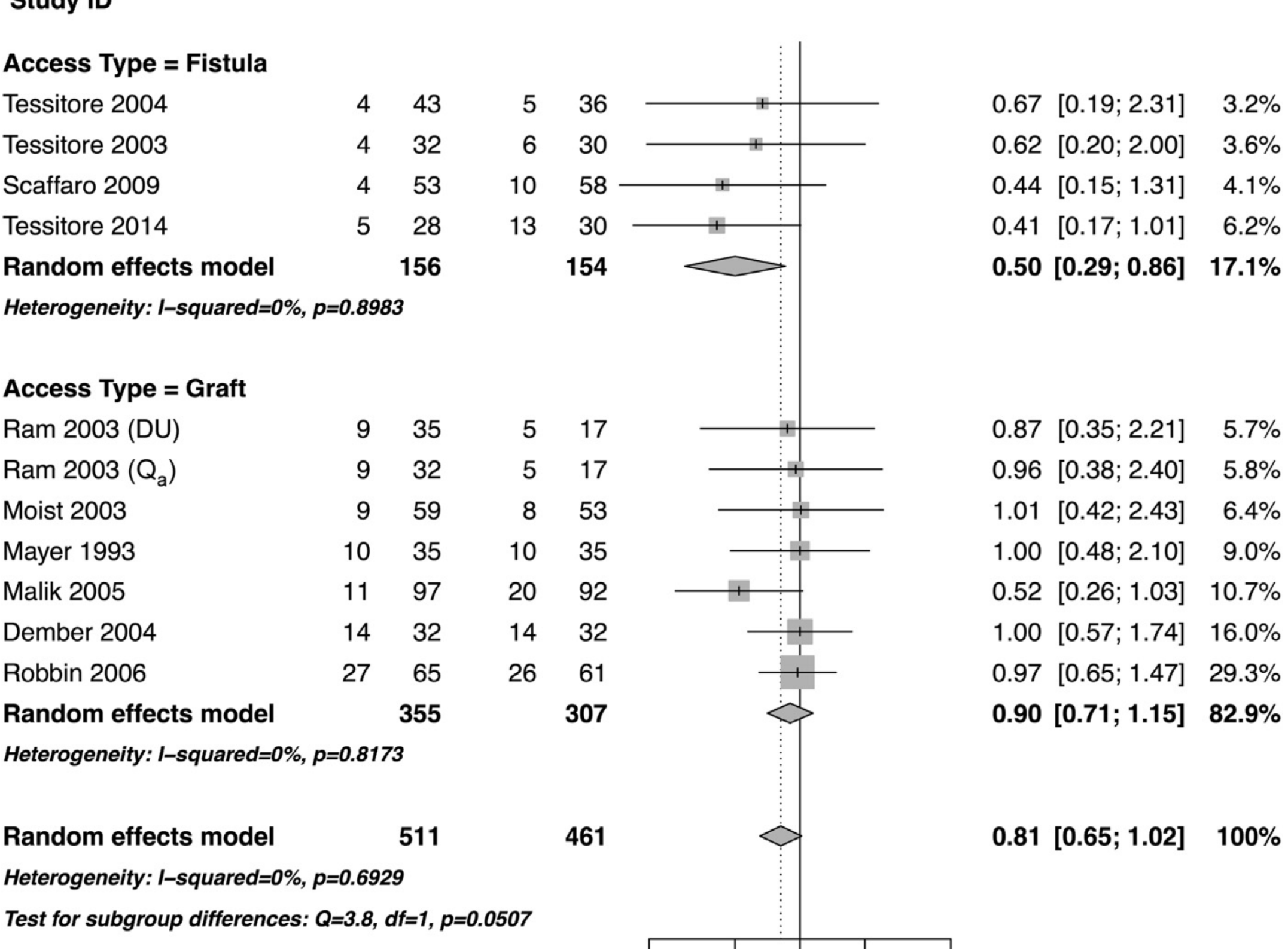

Identi
(n = 8,060)
(n = 0)
Screening
Records after duplicates removed and title screening (n = 75)
Article abstracts assessed (n = 75)
Records excluded based on abstract (n = 24)
Eligibility
Full-text articles assessed for eligibility (n = 51)
Excluded as non-randomized clinical trial or addressing a different question (n = 37)
Included
Studies included in qualitative synthesis (n = 14)
Studies included in



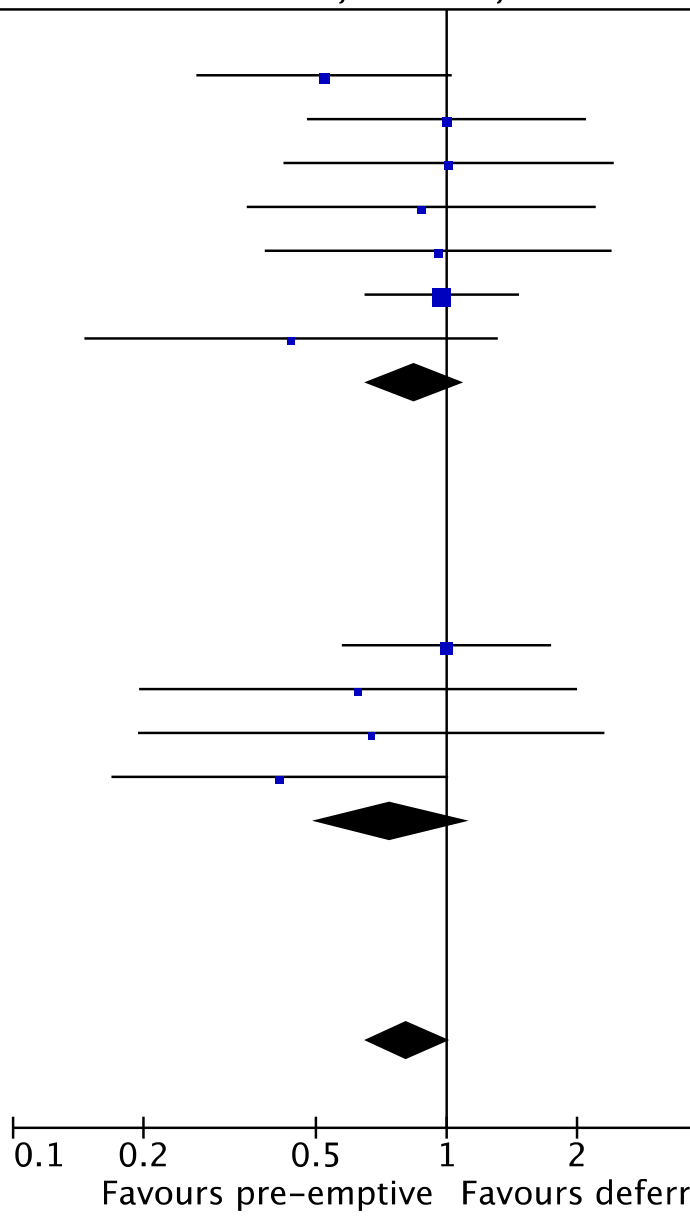
Failure to report hypothesis or assumptions of sample size estimation;
Unequal co-interventions;
Early termination of a study with failure to report pre-specified stopping rules;
Industry sponsor as author or involved in data handling and analysis; and

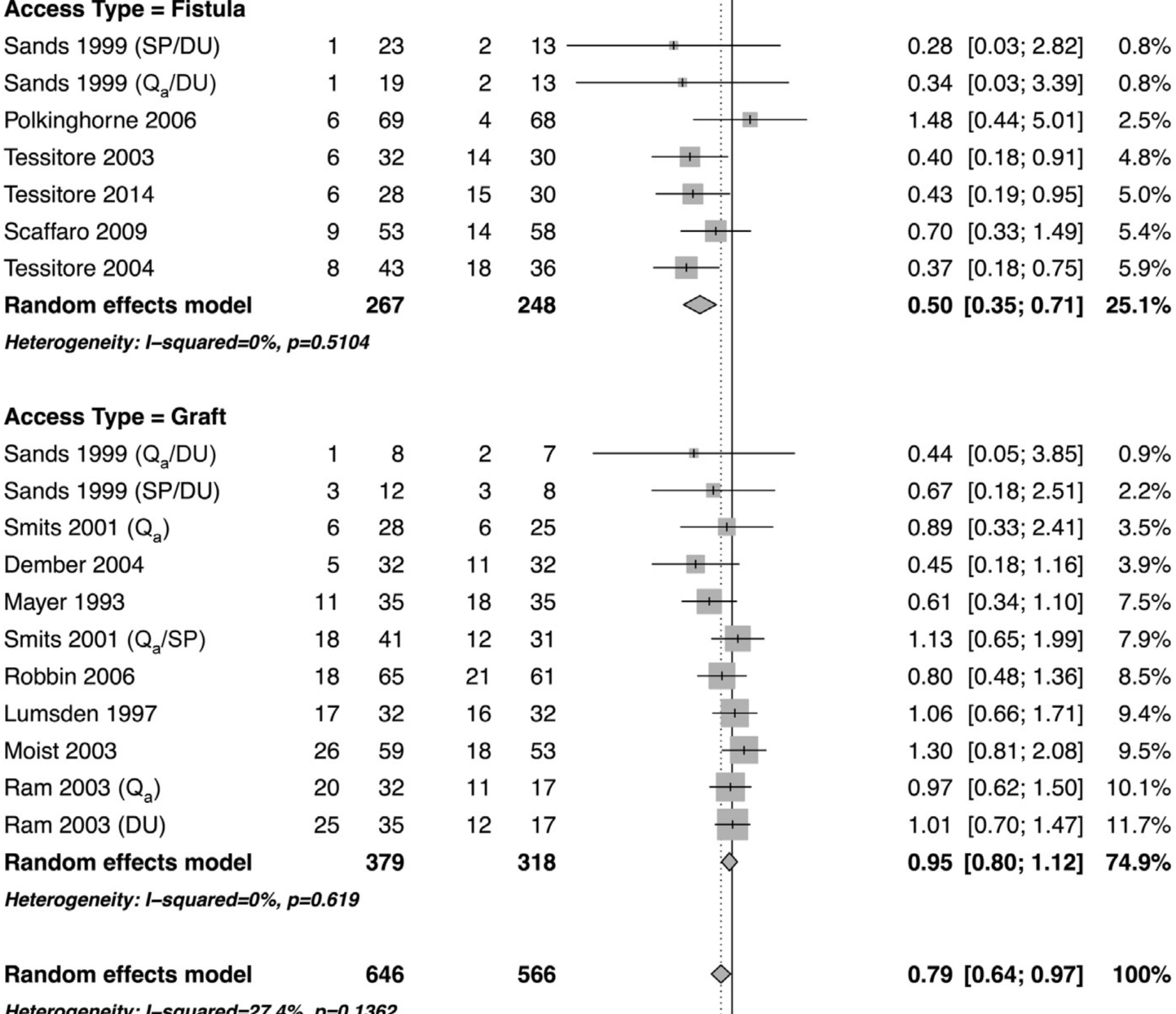
	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Intention-to-treat analysis (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	
04	+	?	+	–	?	–	+	
97	+	–	–	–	?	?	+	
	?	?	?	–	?	?	+	
	?	?	–	–	?	–	+	
	+	+	+	+	?	+	+	
e 2006	+	+	?	+	+	+	+	
	+	+	+	+	?	+	–	
6	+	+	+	–	?	+	+	
	?	?	?	–	?	–	+	
09	?	–	?	–	?	?	+	
1	?	?	?	–	?	?	+	
03	?	–	–	–	?	+	+	
04	?	–	–	–	?	–	+	
14	?	?	?	–	?	+	+	

nts

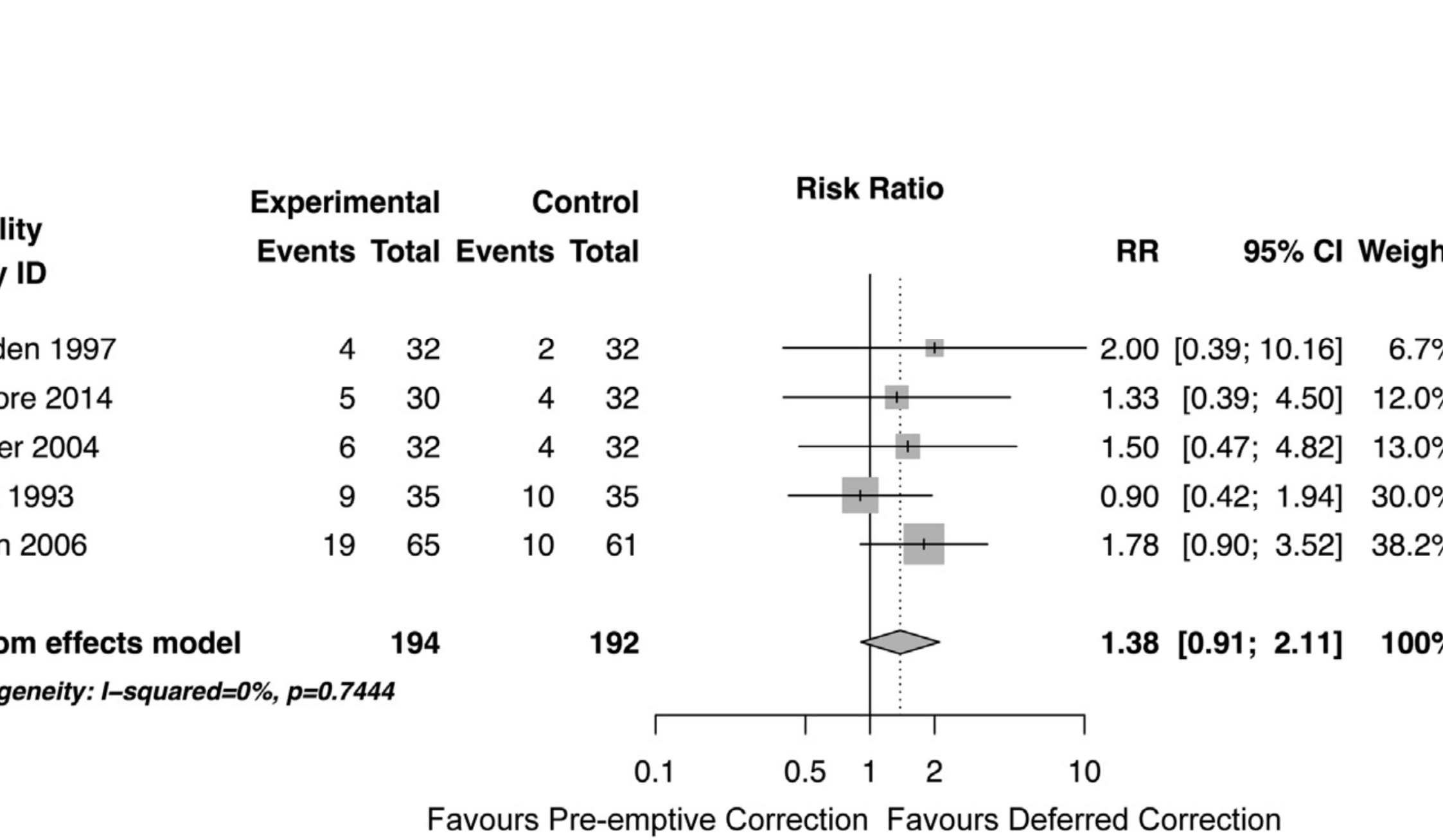

Study ID
Access Type = Fistula
Tessitore 2004 4 43 5 36 0.67 [0.19; 2.31] 3.2%
Tessitore 2003 4 32 6 30 0.62 [0.20; 2.00] 3.6%
Scaffaro 2009 4 53 10 58 0.44 [0.15; 1.31] 4.1%
Tessitore 2014 5 28 13 30 0.41 [0.17; 1.01] 6.2%
Random effects model 156 154 0.50 [0.29; 0.86] 17.1%
Heterogeneity: I–squared=0%, p=0.8983
Access Type = Graft
Ram 2003 (DU) 9 35 5 17 0.87 [0.35; 2.21] 5.7%
Ram 2003 (Qa) 9 32 5 17 0.96 [0.38; 2.40] 5.8%
Moist 2003 9 59 8 53 1.01 [0.42; 2.43] 6.4%
Mayer 1993 10 35 10 35 1.00 [0.48; 2.10] 9.0%
Malik 2005 11 97 20 92 0.52 [0.26; 1.03] 10.7%
Dember 2004 14 32 14 32 1.00 [0.57; 1.74] 16.0%
Robbin 2006 27 65 26 61 0.97 [0.65; 1.47] 29.3%
Random effects model 355 307 0.90 [0.71; 1.15] 82.9%
Heterogeneity: I–squared=0%, p=0.8173
Random effects model 511 461 0.81 [0.65; 1.02] 100%
Heterogeneity: I–squared=0%, p=0.6929
Test for subgroup differences: Q=3.8, df=1, p=0.0507

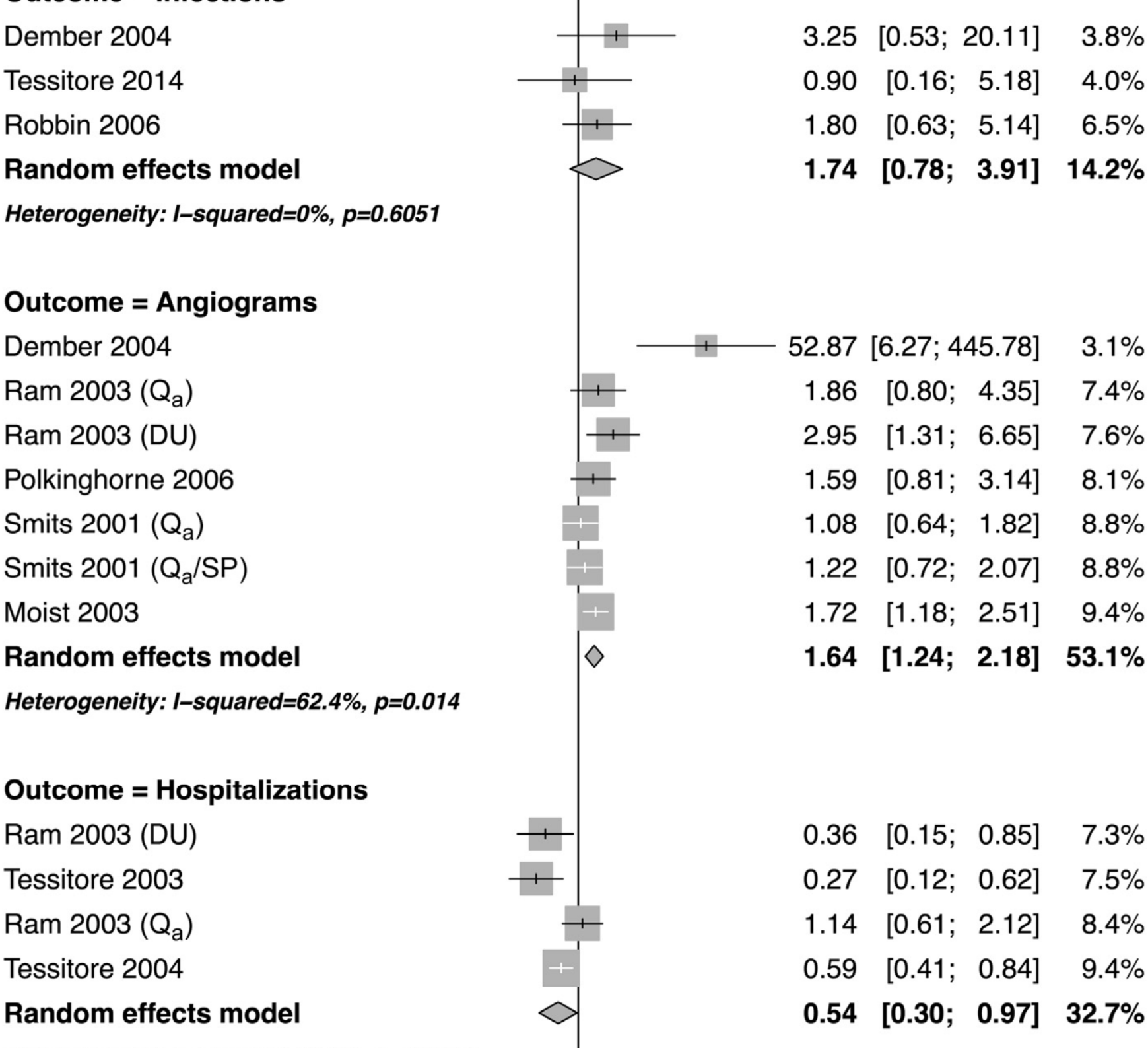
ubgroup	Pre-emptive correction Events	Total	Deferred correction Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
ary prophylaxis						
5	11	97	20	92	10.7%	0.52 [0.26, 1.03]
3	10	35	10	35	9.0%	1.00 [0.48, 2.10]
3	9	59	8	53	6.4%	1.01 [0.42, 2.43]
DU	9	35	5	17	5.7%	0.87 [0.35, 2.21]
QA	9	32	5	17	5.8%	0.96 [0.38, 2.40]
06	27	65	26	61	29.3%	0.97 [0.65, 1.47]
009	4	53	10	58	4.1%	0.44 [0.15, 1.31]
95% CI)		**376**		**333**	**71.0%**	**0.84 [0.65, 1.10]**
ts	79		84			
eity: Tau^2 = 0.00; Chi^2 = 4.32, df = 6 (P = 0.63); I^2 = 0%						
erall effect: Z = 1.26 (P = 0.21)						
ndary prophylaxis						
004	14	32	14	32	16.0%	1.00 [0.57, 1.74]
2003	4	32	6	30	3.6%	0.63 [0.20, 2.00]
2004a	4	43	5	36	3.2%	0.67 [0.19, 2.31]
2014	5	28	13	30	6.2%	0.41 [0.17, 1.01]
95% CI)		**135**		**128**	**29.0%**	**0.75 [0.49, 1.13]**
ts	27		38			
eity: Tau^2 = 0.00; Chi^2 = 2.98, df = 3 (P = 0.39); I^2 = 0%						
erall effect: Z = 1.39 (P = 0.16)						
% CI)		**511**		**461**	**100.0%**	**0.81 [0.65, 1.02]**
ts	106		122			
eity: Tau^2 = 0.00; Chi^2 = 7.52, df = 10 (P = 0.68); I^2 = 0%						
erall effect: Z = 1.81 (P = 0.07)						
bgroup differences: Chi^2 = 0.24, df = 1 (P = 0.62), I^2 = 0%						




Access Type = Fistula
Sands 1999 (SP/DU) 1 23 2 13 0.28 [0.03; 2.82] 0.8%
Sands 1999 (Qa/DU) 1 19 2 13 0.34 [0.03; 3.39] 0.8%
Polkinghorne 2006 6 69 4 68 1.48 [0.44; 5.01] 2.5%
Tessitore 2003 6 32 14 30 0.40 [0.18; 0.91] 4.8%
Tessitore 2014 6 28 15 30 0.43 [0.19; 0.95] 5.0%
Scaffaro 2009 9 53 14 58 0.70 [0.33; 1.49] 5.4%
Tessitore 2004 8 43 18 36 0.37 [0.18; 0.75] 5.9%
Random effects model 267 248 0.50 [0.35; 0.71] 25.1%
Heterogeneity: I–squared=0%, p=0.5104
Access Type = Graft
Sands 1999 (Qa/DU) 1 8 2 7 0.44 [0.05; 3.85] 0.9%
Sands 1999 (SP/DU) 3 12 3 8 0.67 [0.18; 2.51] 2.2%
Smits 2001 (Qa) 6 28 6 25 0.89 [0.33; 2.41] 3.5%
Dember 2004 5 32 11 32 0.45 [0.18; 1.16] 3.9%
Mayer 1993 11 35 18 35 0.61 [0.34; 1.10] 7.5%
Smits 2001 (Qa/SP) 18 41 12 31 1.13 [0.65; 1.99] 7.9%
Robbin 2006 18 65 21 61 0.80 [0.48; 1.36] 8.5%
Lumsden 1997 17 32 16 32 1.06 [0.66; 1.71] 9.4%
Moist 2003 26 59 18 53 1.30 [0.81; 2.08] 9.5%
Ram 2003 (Qa) 20 32 11 17 0.97 [0.62; 1.50] 10.1%
Ram 2003 (DU) 25 35 12 17 1.01 [0.70; 1.47] 11.7%
Random effects model 379 318 0.95 [0.80; 1.12] 74.9%
Heterogeneity: I–squared=0%, p=0.619
Random effects model 646 566 0.79 [0.64; 0.97] 100%
Heterogeneity: I–squared=27.4%, p=0.1362

IS


lity
y ID
Experimental
Events Total
Control
Events Total
Risk Ratio
RR 95% CI Weigh
den 1997 4 32 2 32 2.00 [0.39; 10.16] 6.7%
ore 2014 5 30 4 32 1.33 [0.39; 4.50] 12.0%
er 2004 6 32 4 32 1.50 [0.47; 4.82] 13.0%
1993 9 35 10 35 0.90 [0.42; 1.94] 30.0%
n 2006 19 65 10 61 1.78 [0.90; 3.52] 38.2%
om effects model 194 192 1.38 [0.91; 2.11] 100%
geneity: I–squared=0%, p=0.7444
0.1
0.5
1
2
10
Favours Pre-emptive Correction
Favours Deferred Correction


Dember 2004 3.25 [0.53; 20.11] 3.8%
Tessitore 2014 0.90 [0.16; 5.18] 4.0%
Robbin 2006 1.80 [0.63; 5.14] 6.5%
Random effects model 1.74 [0.78; 3.91] 14.2%
Heterogeneity: I–squared=0%, p=0.6051
Outcome = Angiograms
Dember 2004 52.87 [6.27; 445.78] 3.1%
Ram 2003 (Qa) 1.86 [0.80; 4.35] 7.4%
Ram 2003 (DU) 2.95 [1.31; 6.65] 7.6%
Polkinghorne 2006 1.59 [0.81; 3.14] 8.1%
Smits 2001 (Qa) 1.08 [0.64; 1.82] 8.8%
Smits 2001 (Qa/SP) 1.22 [0.72; 2.07] 8.8%
Moist 2003 1.72 [1.18; 2.51] 9.4%
Random effects model 1.64 [1.24; 2.18] 53.1%
Heterogeneity: I–squared=62.4%, p=0.014
Outcome = Hospitalizations
Ram 2003 (DU) 0.36 [0.15; 0.85] 7.3%
Tessitore 2003 0.27 [0.12; 0.62] 7.5%
Ram 2003 (Qa) 1.14 [0.61; 2.12] 8.4%
Tessitore 2004 0.59 [0.41; 0.84] 9.4%
Random effects model 0.54 [0.30; 0.97] 32.7%

Summary of findings

ess loss (over one	**Higher risk population (people using a graft for hemodialysis)**		**RR** 0.90 [0.71, 1.15]	662 (7 cohorts form 6 studies)	⊕⊕⊖⊖ **moderate**	Sub-gr analys
	150 per 1000	**135 per 1000** (107 to 172)				
	Lower risk population (people using a fistula for hemodialysis)		**RR** 0.5 [0.29, 0.86]	310 (4 studies)	⊕⊖⊖⊖ **low**	
	100 per 1000	**50 per 1000** (29 to 86)				
giograms patient-years)	**People using any arteriovenous access (fistula or graft)**		**RR** 1.78 [1.18, 2.67]	539 (7 cohorts form 5 studies)	⊕⊖⊖⊖ **low**	Second outcor
	300 per 1000	**534 per 1000** (354 to 801)				
over one year)	**People using any arteriovenous access (fistula or graft)**		**RR** 1.38 [0.90, 2.11]	586 (5 studies)	⊕⊖⊖⊖ **low**	Second outcor
	150 per 1000	**207 per 1000** (135 to 317)				

Limitations

and low quality studies available; **low confidence in**

s from people using **grafts**

information reported for **complex strategies** (algorith
referral, intervention details)

t or no data on: resource use, cost; patient outcomes
rspectives

Clinical implications

of surveillance/pre-emptive correction in grafts; **pote**
fistulas

otential for harm/inconvenience patients need to be ir
naking

cal monitoring?

s when proposing graft to patients (and to the nephrol
y)?

Research implications

earch: RCT of ~ 1,000 participants per arm recruited

ved for 3 years will have a power >90% to detect as si

P of 0.01 a 30% or greater reduction in HR for access

risk 0.1; drop-out 0.1)

Summary

e stenosis correction **may** reduce the risk of thrombos
access loss; uncertain benefits in terms of hospitaliz

n fistulas but effects may not be significantly different

arms under-reported

ws ignored

topic needing large and good quality studies

Thank you

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in Thrombosis Rate and Improvement in Assisted and Secondary Patency. A Randomized Clinical Trial

Ines Aragoncillo,[1] Soraya Abad,[1] Silvia Caldés,[2] Antonio Cirugeda,[2] Almudena Vega,[1] Cristina Fernandez,[4] Cristina Moratilla,[3] Nicolás Macías,[1] Juan Manuel Lopez Gomez,[1] Fernando De Alvaro Moreno.[2]

[1]Nephrology, H Gregorio Marañon, Madrid, Spain; [2]Nephrology, H Infanta Sofia, Madrid, Spain; [3]Nephrology, Clinica Fuensanta, Madrid, Spain; [4]Nephrology, H Clinico, Madrid, Spain.

Background: Stenosis is the main cause of arteriovenous fistula (AVF) failure. It is still unclear if surveillance based on Vascular Access Blood Flow (Q_A) enhances AVF function and longevity.

Methods: 3-year follow up randomized, controlled, multicentric, open-label trial, comparing Q_A surveillance (pre-emptive repair of subclinical stenoses with angioplasty and/or open surgery) with standard monitoring/surveillance (intervention based on classic criteria) in mature autologous AVFs. AVFs were randomized to either control group (surveillance based on venous pressure, recirculation, dialysis dose…; n=104) or to Q_A group [Q_A was measured quarterly using doppler ultrasound (*M-Turbo*®)and ultrasound dilution method (Transonic®)n=103]. The criteria for intervention in Q_A group were 25% reduction in Q_A, Q_A <500 ml/min or significant stenosis with >50% reducción in vessel lumen and haemodinamic repercussion [Peak Sistolic Velocity (PSV) >400ml/min or PSV stenosis/PSV pre-stenosis > 3).

Results: Significant reduction in thrombosis rate (0,025 thrombosis/patient/year in the Q_A group compared with 0,086 thrombosis/patient/year in control group. p= 0,007) Significant improvement in assisted primary patency rate and secondary patency rate in Q_A group (HR 0,30 CI 0,11-0,82. P=0,011 / HR 0,49 CI 0,26-0,93. p=0,030) No differences in non-assisted primary patency rate between groups (HR 0,98 CI 0,57-1,61. p=0,935). Higher needs of central venous catether and hospitalizations related with VA in control group (p<0,001 / p=0,003). - Higher total VA related costs in control group (217.845 € vs 124.186 €, p=0,029).