

AIAC e AIAC Emilia-Romagna

**“LE INFEZIONI NEL PAZIENTE CON DEVICES: UN PROBLEMA IRRISOLTO DA
CONOSCERE, APPROFONDIRE E RISOLVERE”**

I fattori di rischio per le infezioni dei CIED

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Risk factors for cardiac implantable electronic device infection: a systematic review and meta-analysis

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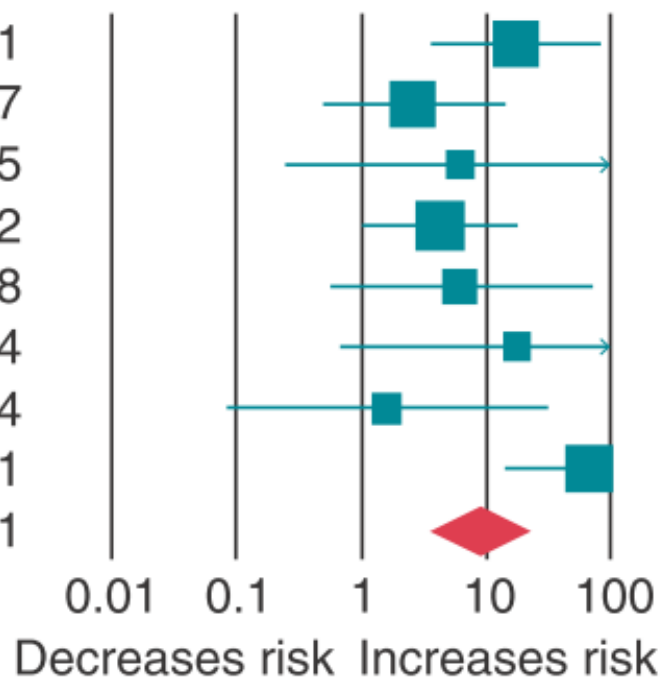
Electronic searches (up to January 2014) were performed in PubMed, Scopus, and Web of Science databases. 60 studies (21 prospective, 9 case–control, and 30 retrospective cohort studies) met the inclusion criteria.

*The average device infection rate was **1–1.3%**.*

Significant host-related risk factors for infection

End-stage renal disease (OR, 95% CI)

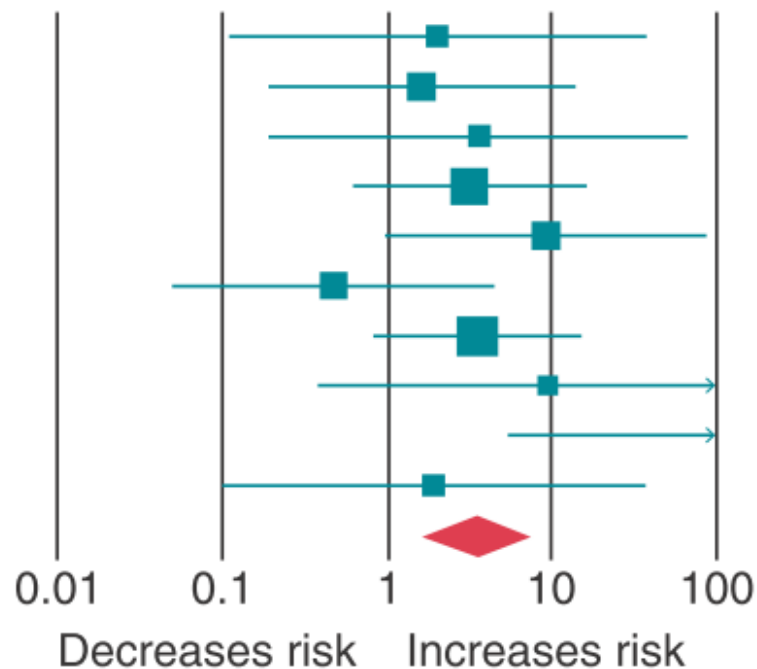
Romeyer 2010	17.10	3.58	81.71
Bloom 2006	2.61	0.49	13.87
Sohail 2007	6.16	0.24	155.95
Sohail 2011	4.29	1.04	17.72
Dasgupta 2007	6.26	0.55	70.88
Ito 2009	17.29	0.66	453.44
Bloom 2011	1.62	0.08	31.74
Tompkins 2011	66.90	14.30	313.01
	8.73	3.42	22.31



Significant host-related risk factors for infection

Corticosteroid use (OR, 95% CI)

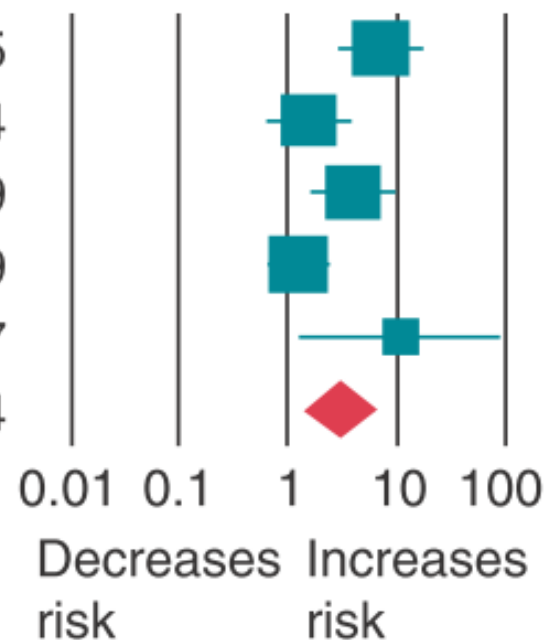
Ramsdale 1984	2.01	0.11	37.47
Glieca 1987	1.62	0.19	13.81
Oliveira 2009	3.59	0.19	67.05
Bloom 2006	3.17	0.62	16.24
Sohail 2007	9.12	0.97	85.77
Gould 2008	0.47	0.05	4.55
Sohail 2011	3.52	0.82	15.19
Raad 2012	9.34	0.36	239.90
Cengiz 2010	107.06	5.46	2098.91
Bloom 2011	1.90	0.10	37.37
	3.44	1.62	7.32



Significant host-related risk factors for infection

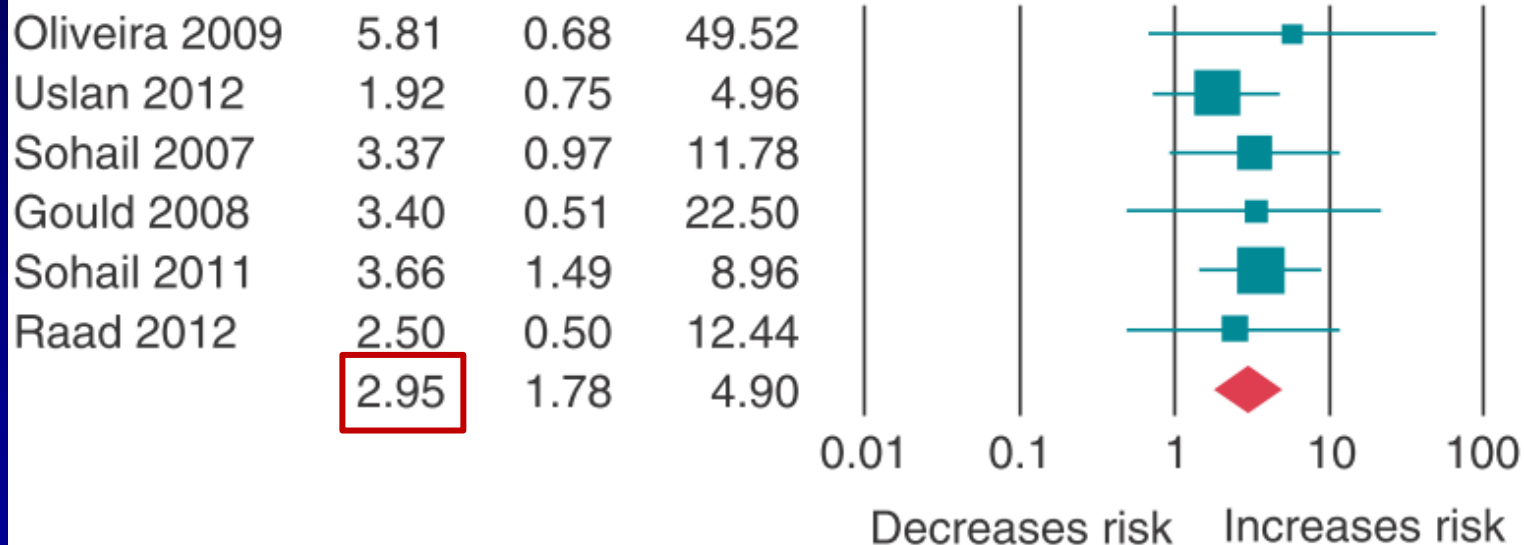
Renal insufficiency (OR, 95% CI)

Bloom 2006	7.17	2.91	17.65
Sohail 2007	1.54	0.62	3.84
Lekkerkerker 2008	3.94	1.64	9.49
Sohail 2011	1.25	0.65	2.39
Tompkins 2011	10.83	1.30	90.17
	3.02	1.38	6.64



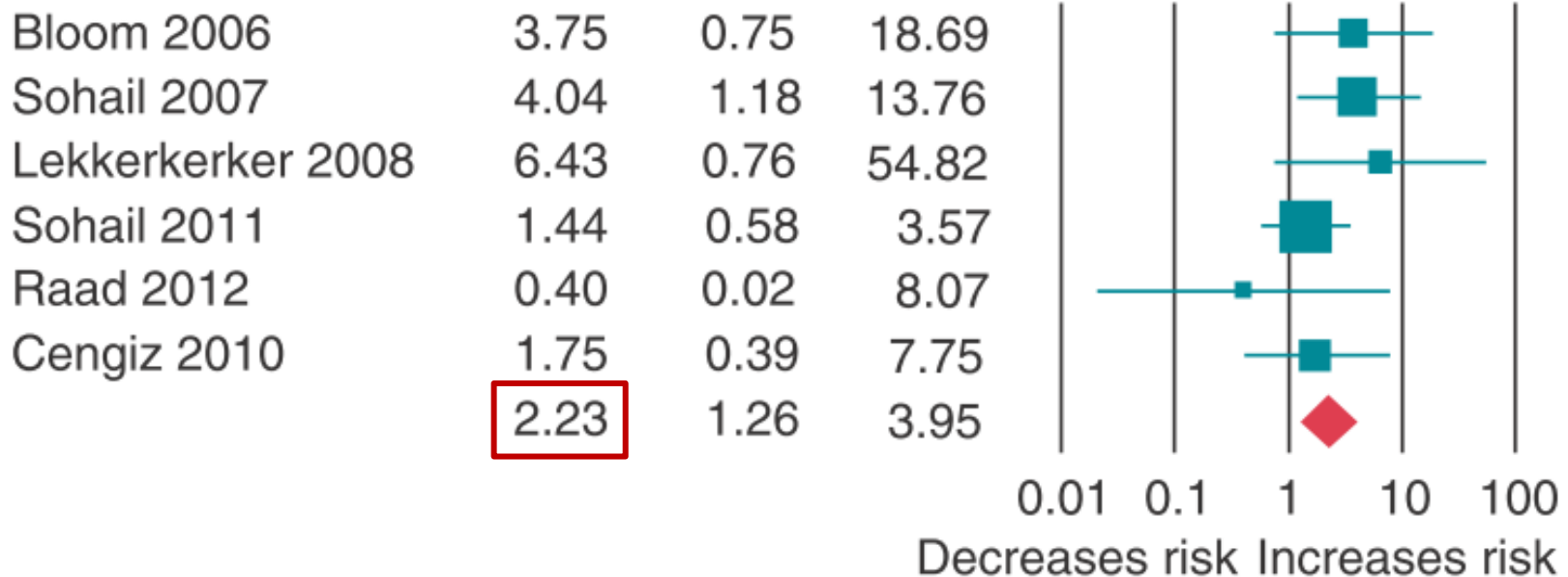
Significant host-related risk factors for infection

Chronic obstructive pulmonary disease (OR, 95% CI)



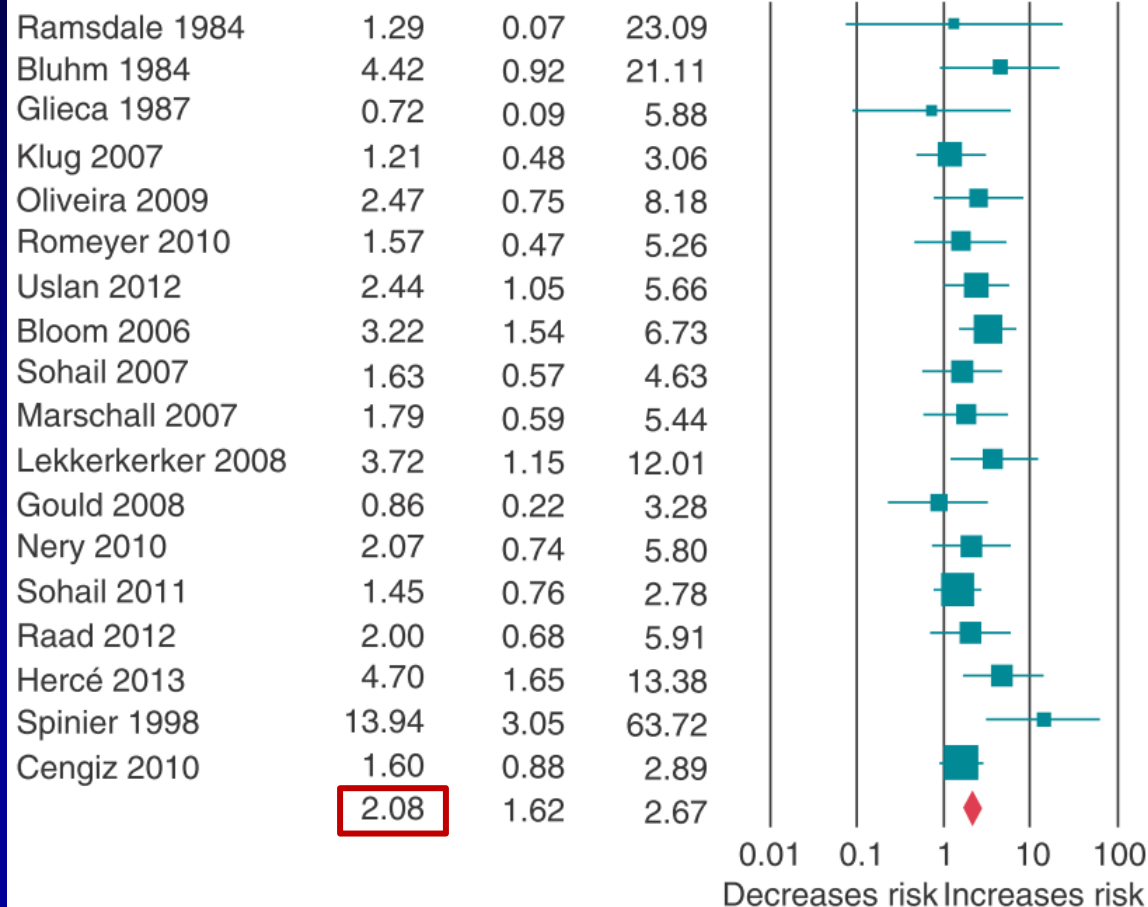
Significant host-related risk factors for infection

Malignancy (OR, 95% CI)



Significant host-related risk factors for infection

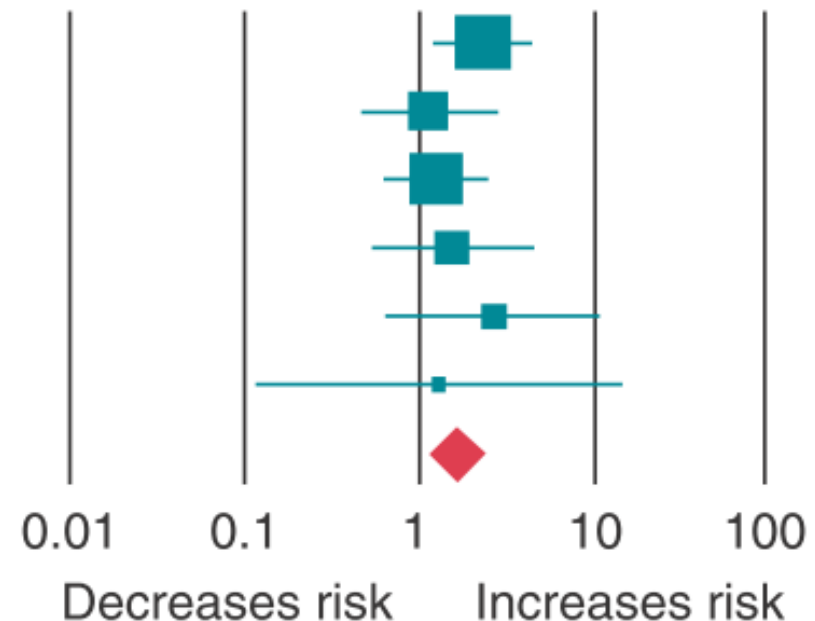
Diabetes mellitus (OR, 95% CI)



Significant host-related risk factors for infection

Congestive heart failure (OR, 95% CI)

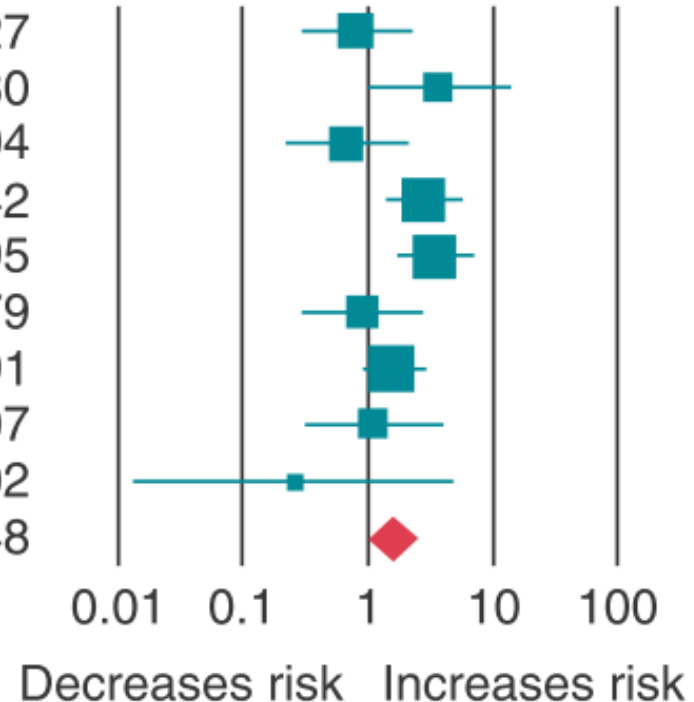
Bloom 2006	2.35	1.23	4.51
Sohail 2007	1.15	0.47	2.83
Sohail 2011	1.27	0.64	2.53
Raad 2012	1.57	0.54	4.60
Spinler 1998	2.69	0.64	11.24
Bloom 2011	1.31	0.12	14.55
	1.65	1.14	2.39



Significant host-related risk factors for infection

Oral anticoagulants (OR, 95% CI)

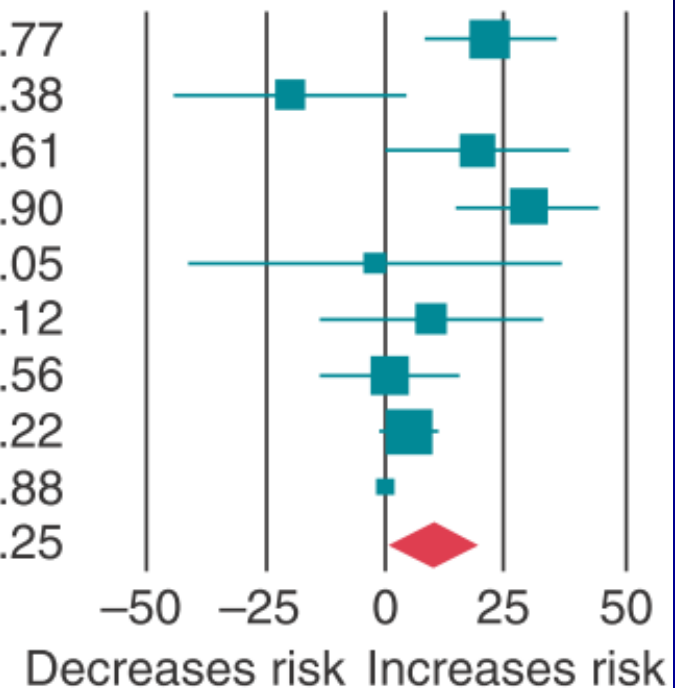
Klug 2007	0.81	0.29	2.27
Oliveria 2009	3.68	0.98	13.80
Romeyer 2010	0.67	0.22	2.04
Bloom 2006	2.76	1.41	5.42
Lekkerkerker 2008	3.40	1.67	6.95
Gould 2008	0.89	0.29	2.79
Sohail 2011	1.62	0.90	2.91
Raad 2012	1.12	0.31	4.07
Bloom 2011	0.26	0.01	5.02
	1.59	1.01	2.48



Significant procedure-related risk factors for infection

Procedure duration (WMD, 95% CI)

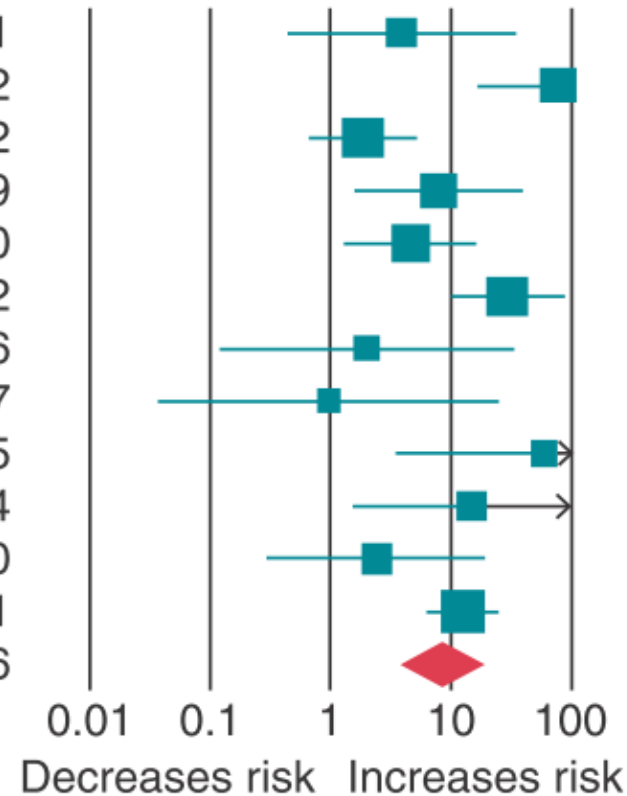
Mounsey 1994	22.00	8.23	35.77
Bertaglia 2006	-19.80	-43.98	4.38
Oliveira 2009	19.50	0.39	38.61
Romeyer 2010	30.00	15.10	44.90
Metais 2011	-2.00	-41.05	37.05
Uslan 2012	9.80	-13.52	33.12
Lekkerkerker 2008	1.00	-13.56	15.56
Gould 2008	5.00	-1.22	11.22
Spinler 1998	0.00	-50.88	50.88
	9.89	0.52	19.25



Significant procedure-related risk factors for infection

Hematoma (OR, 95% CI)

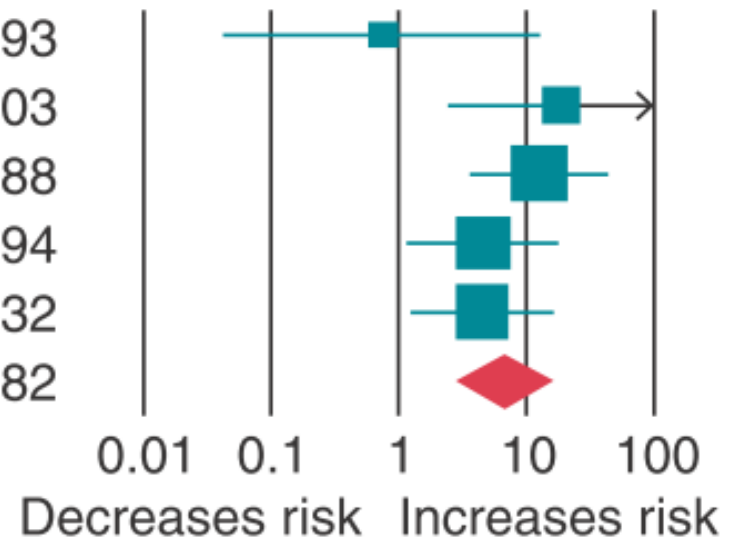
Ramsdale 1984	3.94	0.45	34.31
Glieca 1987	77.57	17.15	350.82
klug 2007	1.88	0.68	5.22
Oliveira 2009	8.08	1.64	39.89
Romeyer 2010	4.71	4.35	16.40
Uslan 2012	29.50	9.76	89.12
Sohail 2007	2.04	0.12	33.76
Nery 2010	0.97	0.04	24.67
Sohail 2011	60.40	3.52	1037.55
Raad 2012	15.14	1.57	146.44
Wiegand 2004	2.44	0.30	19.60
Cengiz 2010	12.80	6.55	25.01
	8.46	4.01	17.86



Significant procedure-related risk factors for infection

Lead dislodgement/repositioning (OR, 95% CI)

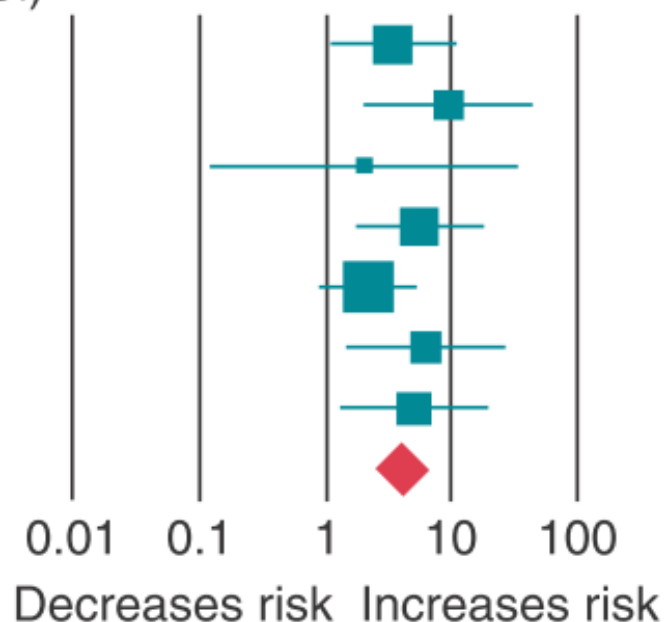
Ramsdale 1984	0.75	0.04	12.93
Glieca 1987	18.60	2.37	146.03
Mounsey 1994	12.55	3.59	43.88
Romeyer 2010	4.53	1.15	17.94
Nery 2010	4.47	1.22	16.32
	6.36	2.93	13.82



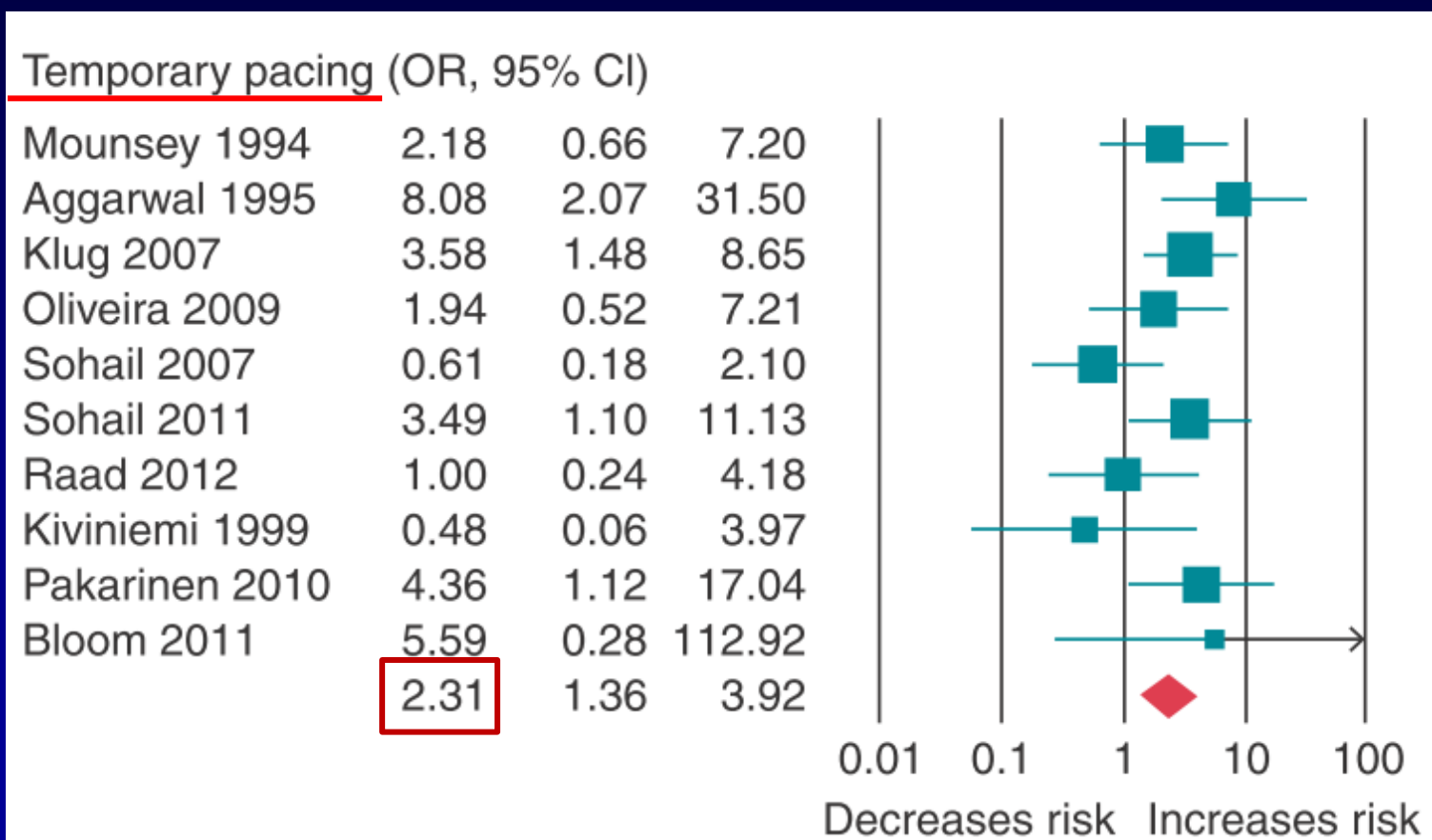
Significant procedure-related risk factors for infection

Abdominal generator pocket (OR, 95% CI)

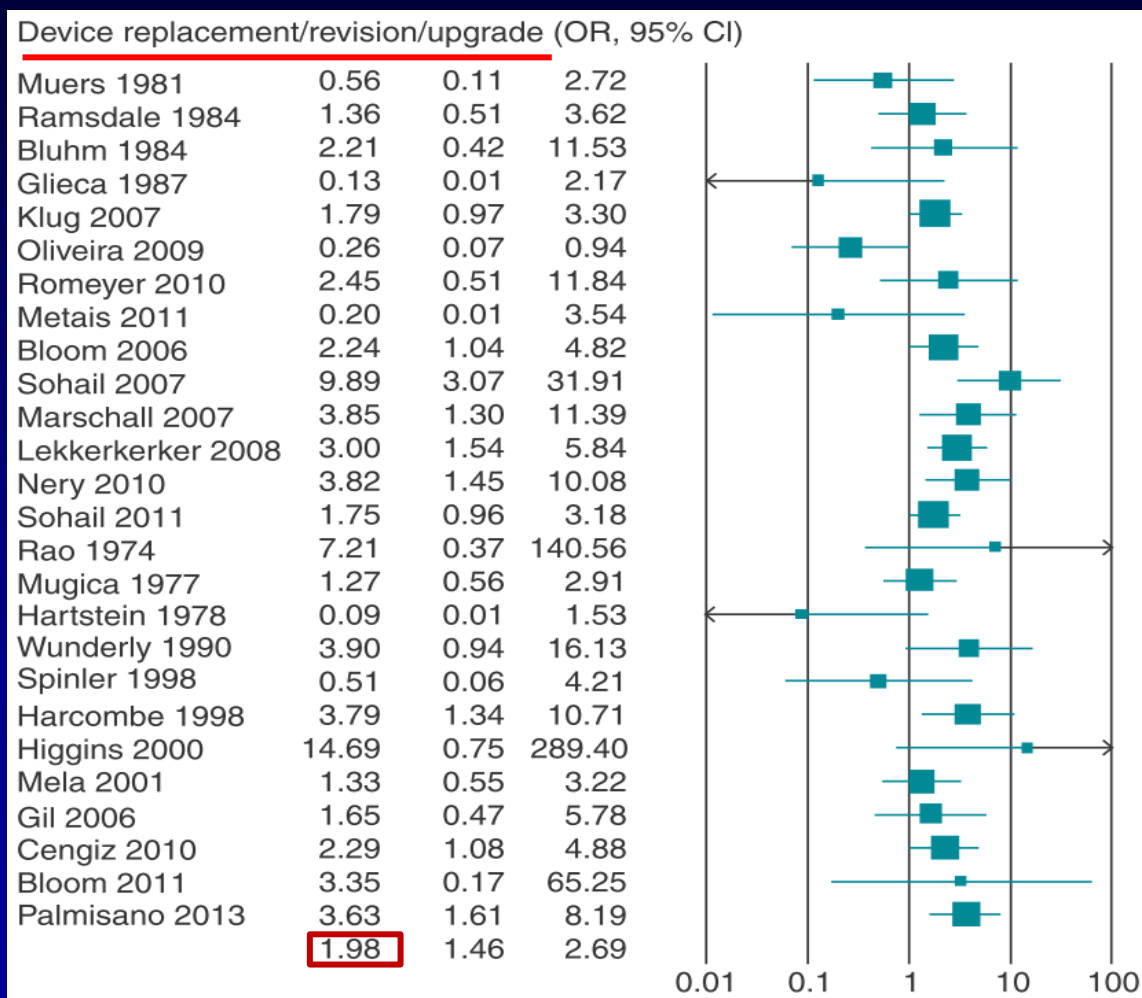
Kron 2003	3.48	1.09	11.06
Uslan 2012	9.41	2.05	43.28
Sohail 2007	2.04	0.12	33.76
Marschall 2007	5.60	1.76	17.87
Sohail 2001	2.19	0.90	5.35
Mela 2001	6.27	1.45	27.08
Gil 2006	5.03	1.32	19.16
	4.01	2.48	6.49



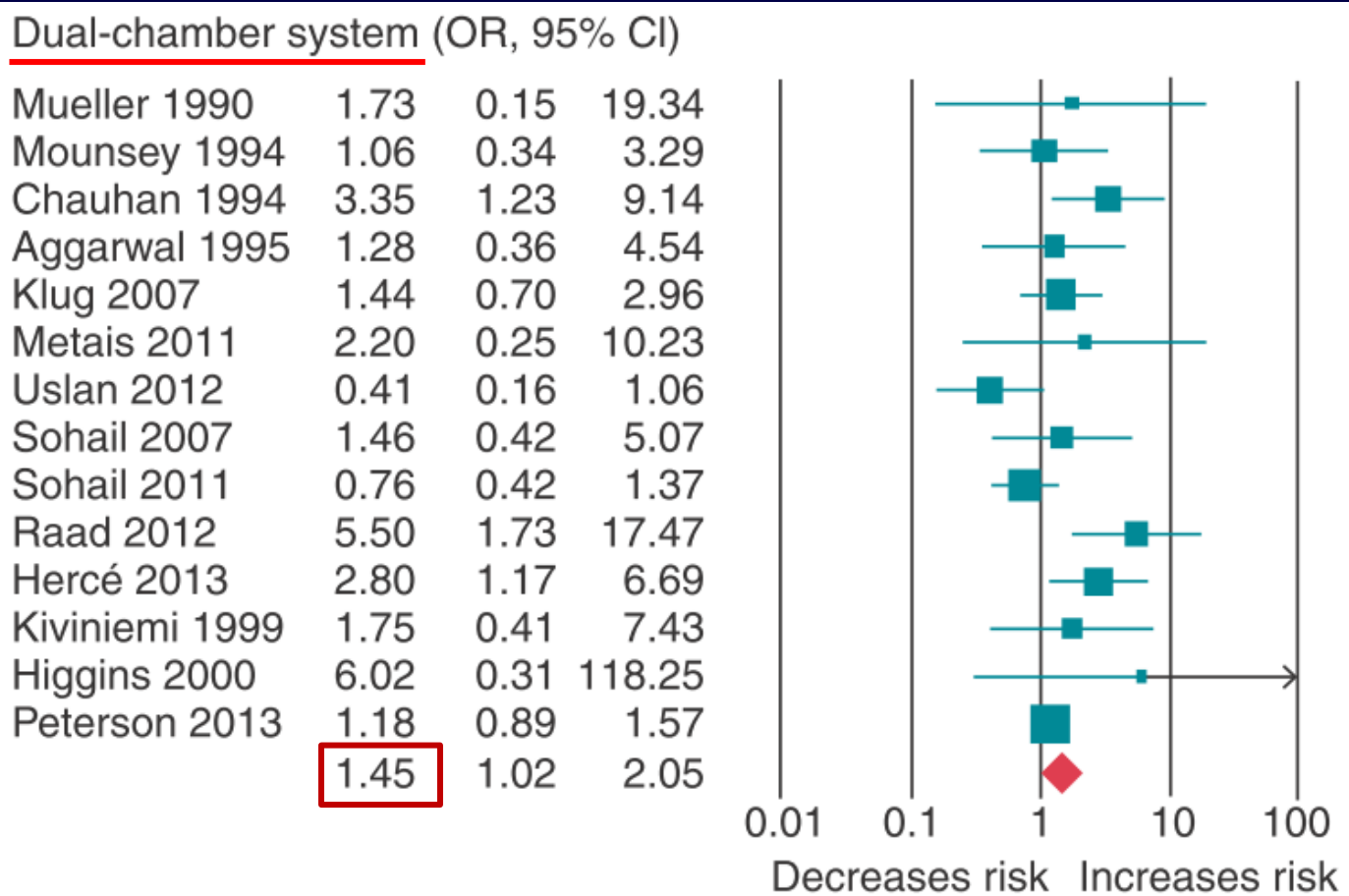
Significant procedure-related risk factors for infection



Significant procedure-related risk factors for infection



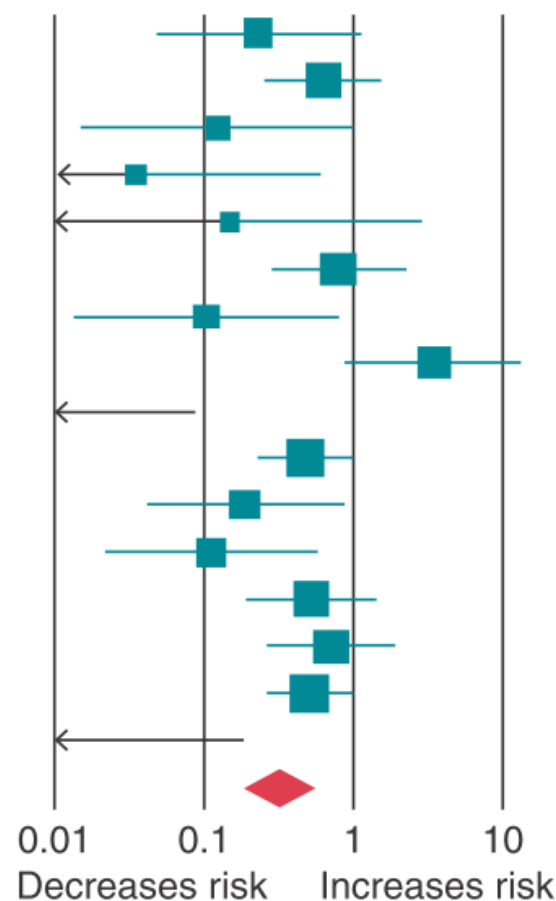
Significant procedure-related risk factors for infection



Significant procedure-related risk factors for infection

Antibiotic prophylaxis (OR, 95% CI)

Muers 1981	0.23	0.05	1.14
Ramsdale 1984	0.63	0.26	1.56
Bluhm 1984	0.13	0.01	1.06
Glieca 1987	0.04	0.00	0.60
Bru 1991	0.15	0.01	2.91
Lüninghake 1993	0.81	0.28	2.32
Mounsey 1994	0.10	0.01	0.80
Aggarwal 1995	3.52	0.90	13.78
Kron 2003	0.01	0.00	0.09
Klug 2007	0.48	0.23	1.00
Oliveira 2009	0.19	0.04	0.86
Sohail 2007	0.11	0.02	0.58
Sohail 2011	0.53	0.20	1.45
Hercé 2013	0.72	0.27	1.94
Mugica 1977	0.51	0.26	0.99
Cengiz 2010	0.01	0.00	0.18
	0.32	0.18	0.55



Arrhythmia/Electrophysiology

Rates of and Factors Associated With Infection in 200 909 Medicare Implantable Cardioverter-Defibrillator Implants Results From the National Cardiovascular Data Registry

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Background—The rate of implantable cardioverter-defibrillator (ICD) infections has been increasing faster than that of implantation. We sought to determine the rate and predictors of ICD infection in a large cohort of Medicare patients.

Methods and Results—Cases submitted to the ICD Registry from 2006 to 2009 were matched to Medicare fee-for-service claims data using indirect patient identifiers. ICD infections occurring within 6 months of hospital discharge after implantation were identified by ICD-9 codes. Logistic regression was used to examine factors associated with risk of ICD infection. Of 200 909 implants, 3390 patients (1.7%) developed an ICD infection. The infection rate was 1.4%, 1.5%, and 2.0% for single, dual, and biventricular ICDs, respectively ($P<0.001$). Generator replacement had a higher rate compared with initial implant (1.9% versus 1.6%, $P<0.001$). The factors associated with infection were adverse event during implant requiring reintervention (odds ratio [OR], 2.692; 95% confidence interval [CI], 2.304–3.145), previous valvular surgery (OR, 1.525; 95% CI, 1.375–1.692), reimplantation for device upgrade, malfunction, or manufacturer advisory (OR, 1.354; 95% CI, 1.196–1.533), renal failure on dialysis (OR, 1.342; 95% CI, 1.123–1.604), chronic lung disease (OR, 1.215; 95% CI, 1.125–1.312), cerebrovascular disease (OR, 1.172; 95% CI, 1.076–1.276), and warfarin (OR, 1.155; 95% CI, 1.060–1.257).

Conclusions—Patients who developed an ICD infection were more likely to have had peri-ICD implant complications requiring early reintervention, previous valve surgery, device replacement for reasons other than battery depletion, and increased comorbidity burden. Efforts should be made to carefully consider when to reenter the pocket at any time other than battery replacement. (*Circulation*. 2014;130:1037-1043.)

Complications after cardiac implantable electronic device implantations: an analysis of a complete, nationwide cohort in Denmark

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See page 1167 for the editorial comment on this article (doi:10.1093/eurheartj/eh568)

Aims

Complications after cardiac implantable electronic device (CIED) treatment, including permanent pacemakers (PMs), cardiac resynchronization therapy devices with defibrillators (CRT-Ds) or without (CRT-Ps), and implantable cardioverter defibrillators (ICDs), are associated with increased patient morbidity, healthcare costs, and possibly increased mortality.

Methods and results

Population-based cohort study in all Danish patients who underwent a CIED procedure from May 2010 to April 2011. Data on complications were gathered on review of all patient charts while baseline data were obtained from the Danish Pacemaker and ICD Register. Adjusted risk ratios (aRRs) with 95% confidence intervals were estimated using binary regression. The study population consisted of 5918 consecutive patients. A total of 562 patients (9.5%) experienced at least one complication. The risk of any complication was higher if the patient was a female (aRR 1.3; 1.1–1.6), underweight (aRR 1.5; 1.1–2.3), implanted in a centre with an annual volume <750 procedures (0–249 procedures: aRR 1.6; 1.1–2.2, 250–499: aRR 2.0; 1.6–2.7, 500–749: aRR 1.5; 1.2–1.8), received a dual-chamber ICD (aRR 2.0; 1.4–2.7) or CRT-D (aRR 2.6; 1.9–3.4), underwent system upgrade or lead revision (aRR 1.3; 1.0–1.7), had an operator with an annual volume <50 procedures (aRR 1.9; 1.4–2.6), or underwent an emergency, out-of-hours procedure (aRR 1.5; 1.0–2.3).

Conclusion

CIED complications are more frequent than generally acknowledged. Both patient- and procedure-related predictors may identify patients with a particularly high risk of complications. This information should be taken into account both in individual patient treatment and in the planning of future organization of CIED treatment.

IMpact of poCKet rEvision on the rate of InfecTion and other CompLications in patients rEquiring pocket mAnipulation for generator replacement and/or lead replacement or revision (MAKE IT CLEAN): A prospective randomized study



Swab and tissue cultures of the fibrous capsule have been shown to grow gram-positive bacteria, most often Staphylococcus species, in 30% to 50% of patients without evidence of any clinical infection.

It has been proposed that removal of the fibrous capsule forming the pocket during device replacement procedures could reduce infection rates.

Impact of poCKET rEvision on the rate of InfecTion and other CompLications in patients rEquiring pocket mAnipulation for generator replacement and/or lead replacement or revision (MAKE IT CLEAN): A prospective randomized study

Table 5 Differences in primary and secondary outcomes between the 2 groups

Outcome during 1-year follow-up	Group A with pocket revision	Group B without pocket revision	95% Confidence interval for difference between groups	<i>P</i> value
Primary outcome				
Deep infection	0 (0)	0 (0) [NA]	NA	1
Secondary outcome				
Superficial infection	1.5% (2) [0 , 3.5]	4.7% (6) [1,8]	[-0.014, 0.08]	.16
Serosanguineous drainage	0.7% (1) [0 , 2]	7% (9) [2.5 , 11]	[0.015, 0.12]	.009
Hematoma	6.1% (8) [2,10]	0.8% (1) [0 , 2]	[0.006, 0.108]	.036
Mortality	2.2 % (3) [0 , 5]	0.8% (1) [0 , 2]	[-0.02, 0.05]	.6

Conclusions

- Increase in CIED infection rates is reported over the past decade. It is most likely that an increase in the indications for CIED implantation in patients with serious comorbidities mostly accounts for this rise.
- The meta-analysis confirmed the effectiveness of antibiotics to prevent infection in PPM, ICD, or CRT device recipients.
- Particular attention should be paid on adequate haemostasis, especially in patients at high risk undergoing to device replacement, revision or upgrade.

Significant procedure-related risk factors for infection

