

List of heart failure codes used for analysis (taken from International Classification of Diseases, 10th version (ICD-10))

I11.0 Hypertensive heart disease with (congestive) heart failure

I42.0 Dilated cardiomyopathy

I42.9 Cardiomyopathy, unspecified

I50.0 Congestive heart failure

I50.1 Left ventricular failure

I50.2 Systolic (congestive) heart failure

I50.3 Diastolic (congestive) heart failure

I50.4 Combined systolic and diastolic heart failure

I50.9 Heart failure, unspecified

**Table i.** Covariates included in the multivariable adjustment with details of regression analysis

	<b>Hazard ratio</b>	<b>95% CI</b>	<b>p-value*</b>
<b>Full model</b>			
Cohort	0.901	0.853 to 0.953	< 0.001
Age (at index procedure)	1.087	1.085 to 1.089	< 0.001
ASA grade 1 (at index procedure)	1.266	1.209 to 1.326	< 0.001
ASA grade 2	2.194	2.084 to 2.311	< 0.001
ASA grade 3	3.037	2.678 to 3.444	< 0.001
ASA grade 4	2.25	1.244 to 4.069	0.007
Charlson Index	1.125	1.111 to 1.138	< 0.001
Number of hospital admissions in five yrs prior to index procedure	1.001	1.000 to 1.001	0.07
Number of inpatient admission days in five yrs prior to index procedure	1.003	1.002 to 1.003	< 0.001
Gender	0.729	0.709 to 0.749	< 0.001
Prior diabetes	1.294	1.240 to 1.350	< 0.001
Prior hypertension	1.351	1.314 to 1.390	< 0.001
Prior coronary heart disease	1.663	1.610 to 1.718	< 0.001
<b>Age</b>			
Cohort	0.869	0.822 to 0.919	< 0.001
Age at index procedure	1.097	1.095 to 1.099	< 0.001
<b>Age and gender</b>			
Cohort	0.818	0.774 to 0.865	< 0.001
Age at index procedure	1.1	1.098 to 1.102	< 0.001
Gender	0.67	0.652 to 0.688	< 0.001
<b>Age, gender and Charlson Index</b>			
Cohort	0.842	0.797 to 0.890	< 0.001
Age at index procedure	1.098	1.096 to 1.099	< 0.001
Gender	0.691	0.673 to 0.710	< 0.001
Charlson Index	1.27	1.257 to 1.282	< 0.001
<b>Age, gender, and morbidity indicators</b>			
Cohort	0.88	0.833 to 0.931	< 0.001
Age at index procedure	1.092	1.090 to 1.094	< 0.001
Gender	0.73	0.710 to 0.750	< 0.001
Prior diabetes	1.355	1.298 to 1.414	< 0.001
Prior hypertension	1.424	1.384 to 1.465	< 0.001
Prior coronary heart disease	1.843	1.785 to 1.903	< 0.001
Charlson Index	1.153	1.139 to 1.166	< 0.001
Number of hospital admissions in five yrs prior to index procedure	1.001	1.000 to 1.002	0.002
Number of inpatient admission days in five yrs prior to index procedure	1.003	1.002 to 1.003	< 0.001

\*Cox PH model

ASA, American Society of Anesthesiologists; CI, confidence interval

**Table ii.** Subgroup analysis of heart failure risk in older subjects with metal-on-metal hips. Propensity-matched data for all metal-on-metal hips and unmatched data for articular surface replacement and articular surface replacement XL implants (due to small cohort sizes).

Age (yrs)	MoM (case), n	Non-MoM (control), n	Hazard ratio	95% CI	p-value*
All MoM hip brands					
85+	523	523	1.329	0.954 to 1.851	0.093
65 to 84	14 502	14 502	0.949	0.853 to 1.056	0.334
ASR patients only					
85+	20	26 686	0.605	0.151 to 2.423	0.478
65 to 84	1011	313 306	0.845	0.642 to 1.114	0.232
ASR XL patients only					
85+	20	26 686	0.605	0.151 to 2.423	0.478
65 to 84	766	313 306	0.955	0.710 to 1.285	0.761

\*Cox PH model

MoM, metal-on-metal; CI, confidence interval; ASR, articular surface replacement

**Table iii.** Baseline characteristics of patients with implanted metal-on-metal (MoM) hip prostheses (separated into modular and resurfacing hip types) and Non-MoM controls.

	Modular	p-value	Resurfacing	p-value	Non-MoM
Number of patients	25 656		27 870		482 247
Mean follow-up, yrs (SD)	7.0 (1.9)	< 0.001*	7.4 (2.5)	< 0.001*	4.6 (3)
Mean age, yrs (SD)	63.2 (11.3)	< 0.001*	54.3 9.1	< 0.001*	69.2 (11)
Gender, n (%)		< 0.001†		< 0.001†	
Male	13 100 (51.1)		19 599 (70.3)		183 867 (38.1)
Female	12 556 (48.9)		8271 (0.3)		298 380 (61.9)
Mean Body mass index, kg/m <sup>2</sup> (SD)	28.6 (5.7)	0.002*	28.2 (4.7)	< 0.001*	28.5 (5.3)
Prior type 2 diabetes, n (%)	1410 (5.5)	< 0.001†	624 (2.2)	< 0.001†	38 575 (8)
Prior hypertension, n (%)	7250 (28.3)		3921 (14.1)		197 830 (41)
Prior coronary heart disease, n (%)	2041 (8)	< 0.001†	925 (0)	< 0.001†	53 239 (11)
Mean Charlson Index (SD)	0.3 (0.8)		0.2 (0.5)		0.5 (1)
Prior hospitalisations					
Mean total admissions (SD)	1.6 (3.3)	< 0.001*	1.1 (3.1)	< 0.001*	2.1 (7.6)
Mean hospitalized days (SD)	5.9 (21.9)	< 0.001*	3.0 (12.2)	< 0.001*	6.5 (20.3)
ASA, n (%)		< 0.001†		< 0.001†	
P1 - Fit and healthy	7102 (27.7)		13 789 (49.5)		79 107 (16.4)
P2 - Mild disease not incapacitating	15 889 (61.9)		13 267 (47.6)		335 415 (69.6)
P3 - Incapacitating systemic disease	2573 (10)		789 (2.8)		65 896 (13.7)
P4 - Life threatening disease	81 (0.3)		19 (0.1)		1742 (0.4)
P5 - Expected to die within 24 hrs	11 (0)		6 (0)		87 (0)
Ethnicity, n (%)		< 0.001†		< 0.001†	
Asian	95 (0.4)		118 (0.4)		1531 (0.3)
Black	154 (0.6)		245 (0.9)		2229 (0.5)
Chinese	6 (0)		4 (0)		158 (0)
Mixed	35 (0.1)		63 (0.2)		638 (0.1)
Not recorded	4180 (16.3)		4504 (16.2)		63 900 (13.3)
Other	69 (0.3)		132 (0.5)		1597 (0.3)
White	20 038 (78.1)		20 352 (73.0)		398 401 (82.6)

\*Student's t-test

†chi-squared test

MoM, metal-on-metal; SD, standard deviation; ASA, American Society of Anesthesiologists

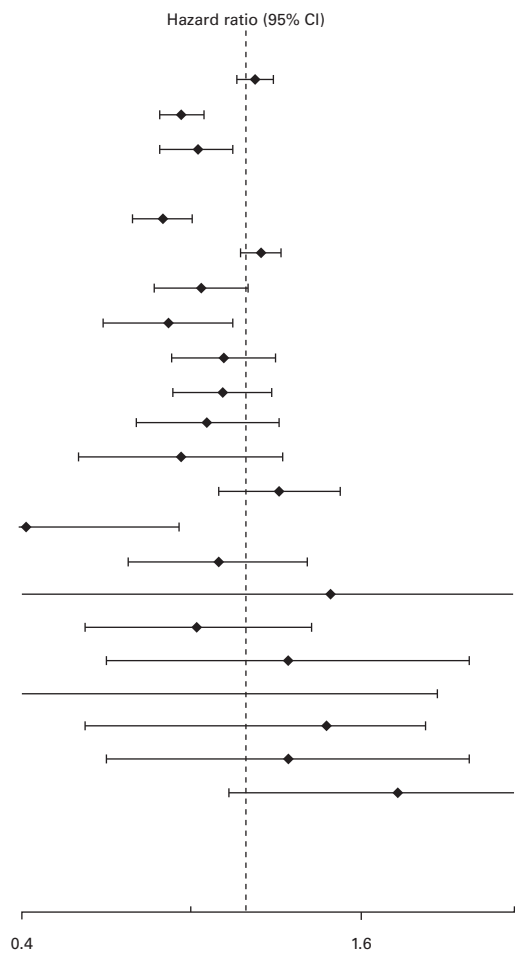


Fig. a

Adjusted hazard ratio (aHR) of heart failure for patients with implanted metal-on-metal (MoM) hip prostheses compared with non-MOM controls by head size (mm) and device