BETAMI-DANBLOCK

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Betablokátory po IM

Beta-blockers		
Beta-blockers are recommended in ACS patients with LVEF ≤40% regardless of HF symptoms.[801,870–872]	I	A
Routine beta-blockers for all ACS patients regardless of LVEF should be considered.[798,873–878]	IIa	B

Recommendation for Beta-Blocker Therapy
Referenced studies that support recommendation are summarized in the Evidence Table.

COR	LOE	Recommendation
1	A	**1.** In patients with ACS without contraindications, early (<24 hours) initiation of oral beta-blocker therapy is recommended to reduce risk of reinfarction and ventricular arrhythmias.[1–5]

Byrne European Heart Journal 2023; Rao Circulation 2025

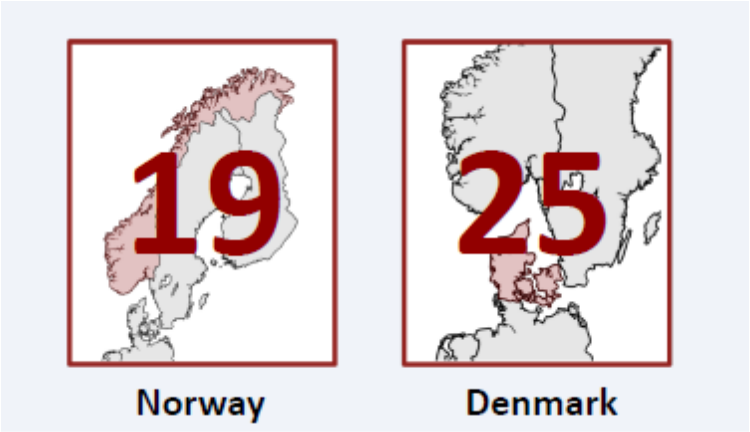
BETAMI-DANBLOCK

BETAMI Study
BEta-Blocker Treatment after Acute Myocardial Infarction

DANBLOCK

- **BETAMI** trial (Norwegian Beta-Blocker Treatment **after Acute Myocardial Infarction in Revascularized** Patients without Reduced Left Ventricular Ejection Fraction)

- **DANBLOCK** trial (Danish Trial of Beta-Blocker Therapy **after Myocardial Infarction** without Heart Failure)



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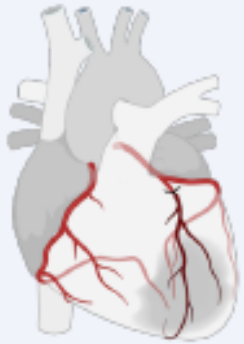
Design studie

A randomized, open-label, blinded end point evaluation superiority trial

Inclusion criteria



- Myocardial infarction ≤14 days
- Mildly reduced or preserved LVEF (≥40%)
- Coronary revascularization *(BETAMI)*

Exclusion criteria

- Indication/contraindication to beta-blocker therapy
- Heart failure
- Unsuitable for participation

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Cílové ukazatele

BETAMI-DANBLOCK: Endpoints

Primary composite endpoint:

All-cause mortality or MACE

- *Recurrent myocardial infarction*
- *Unplanned coronary revascularization*
- *Heart failure*
- *Ischemic stroke*
- *Malignant ventricular arrhythmias*

Secondary endpoints:

- Each component of the primary endpoint
- Hospitalizations for pacemaker implantation
- Second- or third-degree AV-block

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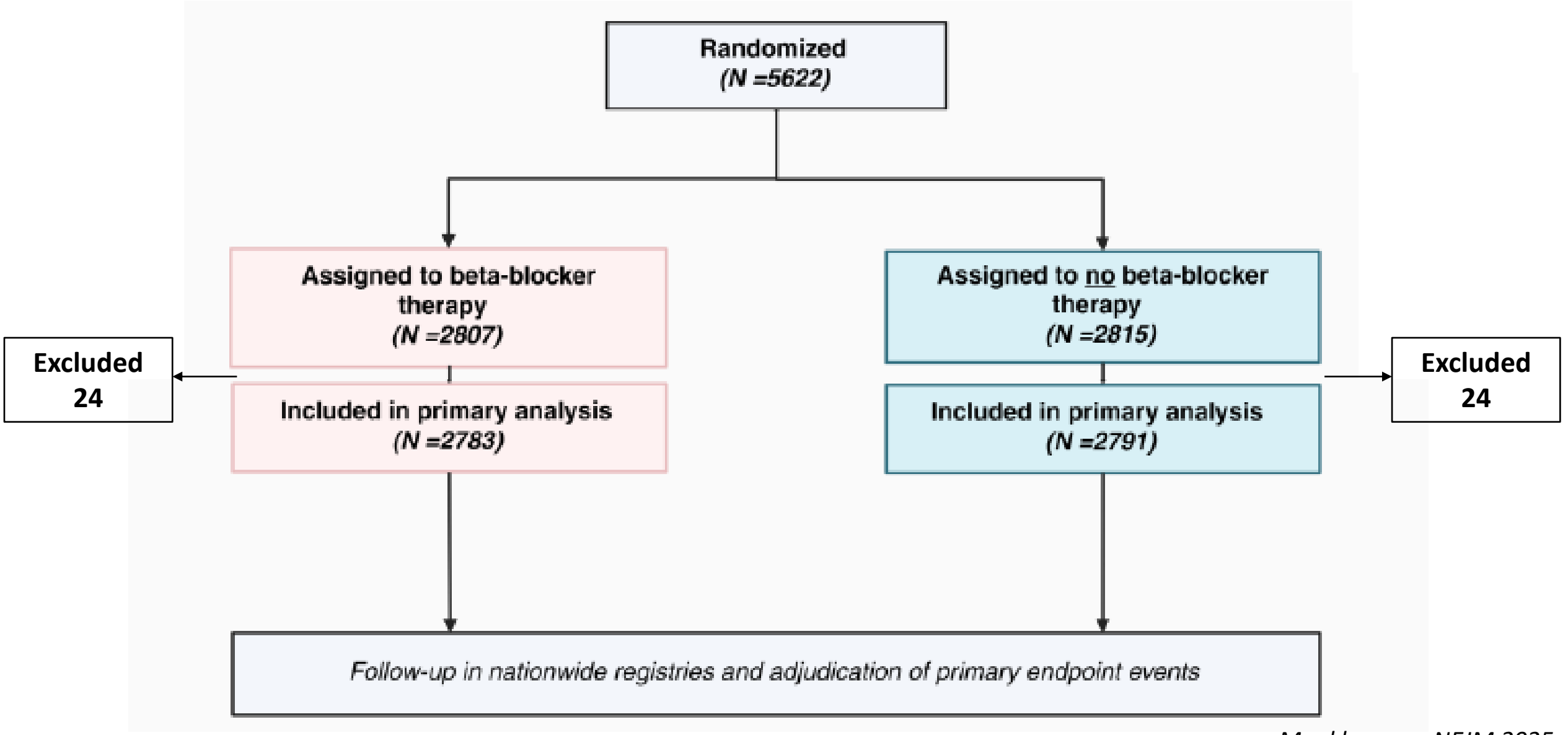
CONSORT diagram



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Použité betablokátory

Type of beta-blocker	No./Total no. (%)	Median dosage mg (IQR)
Metoprolol succinate (long-acting)	2630 / 2783 (94.5)	50 (25-50)
Carvedilol	12 / 2783 (0.4)	12.5 (12.5-25)
Bisoprolol	82 / 2783 (2.9)	2.5 (2.5-5.0)
Other	36 / 2783 (1.3)	-
Missing	23 / 2783 (0.8)	-

Metoprolol, dosage mg	Baseline, No./Total no. (%)	6 months follow-up, No./Total no. (%)
≤25	811 / 2636 (30.8)	631 / 2220 (28.4)
26-50	1705 / 2636 (64.7)	1403 / 2220 (63.2)
51-75	8 / 2636 (0.3)	0 / 2220 (0)
76-100	108 / 2636 (4.1)	184 / 2220 (8.3)
≥100	4 / 2636 (0.2)	2 / 2220 (0.1)

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Průběh studie

BETAMI-DANBLOCK: Follow-up

Median follow-up: 3.5 years (IQR 2.2-4.6)

Adherence at 6 months: 89% in the beta-blocker group and 89% in the no beta-blocker group

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Charakteristika souboru

Characteristic	Beta-Blockers (N=2783)	No Beta-Blockers (N=2791)
Median age - yr (IQR)	63 (55 - 71)	62 (55 - 71)
Women - no./total no. (%)	601 / 2783 (21.6)	562 / 2791 (20.2)
Country - no./total no. (%)		
Denmark	1352 / 2783 (48.6)	1355 / 2791 (48.5)
Norway	1431 / 2783 (51.4)	1436 / 2791 (51.5)
Risk factors - no./total no. (%)		
Current smoker	640 / 2279 (28.1)	614 / 2259 (27.2)
Median Body Mass Index - kg/m^2 (IQR)	28 (25 - 30)	28 (25 - 31)
Hypertension	1126 / 2783 (40.5)	1150 / 2791 (41.2)
Diabetes mellitus	332 / 2783 (11.9)	363 / 2791 (13.0)
Hypercholesterolemia	801 / 2775 (28.9)	808 / 2787 (29.0)
Median low-density lipoprotein cholesterol - mmol/l (IQR)	3.3 (2.6-4.0)	3.3 (2.5-4.0)
Previous cardiovascular disease - no./total no. (%)		
Coronary artery disease	290 / 2783 (10.4)	298 / 2791 (10.7)
Peripheral artery disease	82 / 2777 (3.0)	83 / 2790 (3.0)
Stroke	81 / 2783 (2.9)	74 / 2791 (2.7)
Atrial fibrillation/flutter	52 / 2775 (1.9)	57 / 2789 (2.0)
Prior beta-blocker therapy	308 / 2775 (11.1)	284 / 2788 (10.2)

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Charakteristika souboru

Index MI - no./total no. (%)	Beta-Blockers (N=2783)	No Beta-Blockers (N=2791)
ST-elevation MI	1329 / 2782 (47.8)	1316 / 2791 (47.2)
LVEF 40-49%	446 / 2778 (16.1)	406 / 2791 (14.5)
In hospital course - no./total no. (%)		
Percutaneous coronary intervention	2582 / 2780 (92.9)	2577 / 2785 (92.3)
Coronary-artery bypass grafting	46 / 2780 (1.7)	56 / 2785 (2.0)
No revascularization	176 / 2783 (6.3)	170 / 2791 (6.1)

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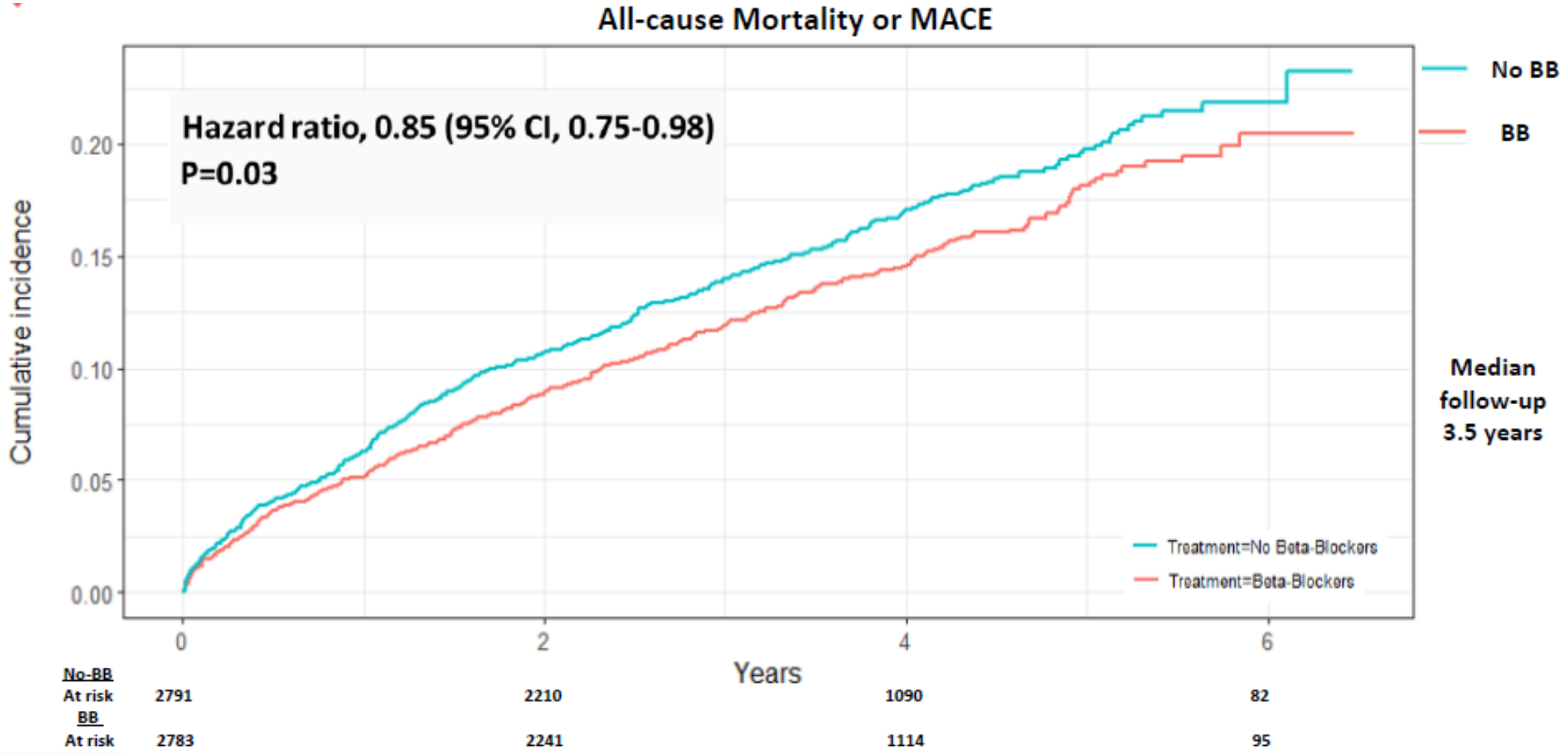
Primární cílový ukazatel



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Sekundární cílové ukazatele

End Point	Beta-Blockers (N=2783)	No Beta-Blockers (N=2791)	Hazard Ratio (95% CI)
		number (percent)	
Secondary end points			
Death from any cause	118 (4.2)	124 (4.4)	0.94 (0.73–1.21)
Myocardial infarction	138 (5.0)	186 (6.7)	0.73 (0.59–0.92)
Unplanned coronary revascularization	108 (3.9)	110 (3.9)	0.99 (0.76–1.29)
Ischemic stroke	45 (1.6)	35 (1.3)	1.30 (0.84–2.03)
Heart failure	42 (1.5)	52 (1.9)	0.78 (0.52–1.18)
Malignant ventricular arrhythmias‡	15 (0.5)	18 (0.6)	0.82 (0.42–1.64)
Implantation of a pacemaker or second- or third-degree atrioventricular block	49 (1.8)	49 (1.8)	1.00 (0.67–1.49)
Safety end point			
Composite of death from any cause, myocardial infarction, heart failure, or malignant ventricular arrhythmia at 30 days	21 (0.8)	32 (1.1)	

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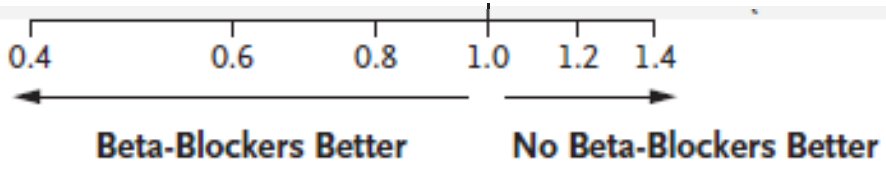
Podskupinová analýza

Subgroup	Beta-Blockers	No Beta-Blockers	Hazard Ratio (95% CI)
	no. of events/total no. of patients (%)		
All patients	394/2783 (14.2)	454/2791 (16.3)	0.85 (0.75–0.98)
Sex			
Female	89/601 (14.8)	107/561 (19.1)	0.77 (0.62–0.96)
Male	305/2182 (14.0)	347/2230 (15.6)	0.91 (0.81–1.03)
Age			
<70 yr	225/2001 (11.2)	281/2029 (13.8)	0.82 (0.71–0.95)
≥70 yr	169/782 (21.6)	173/762 (22.7)	0.85 (0.59–1.21)
Country			
Norway	204/1431 (14.3)	235/1436 (16.4)	0.86 (0.72–1.02)
Denmark	190/1352 (14.1)	219/1355 (16.2)	0.84 (0.67–1.04)



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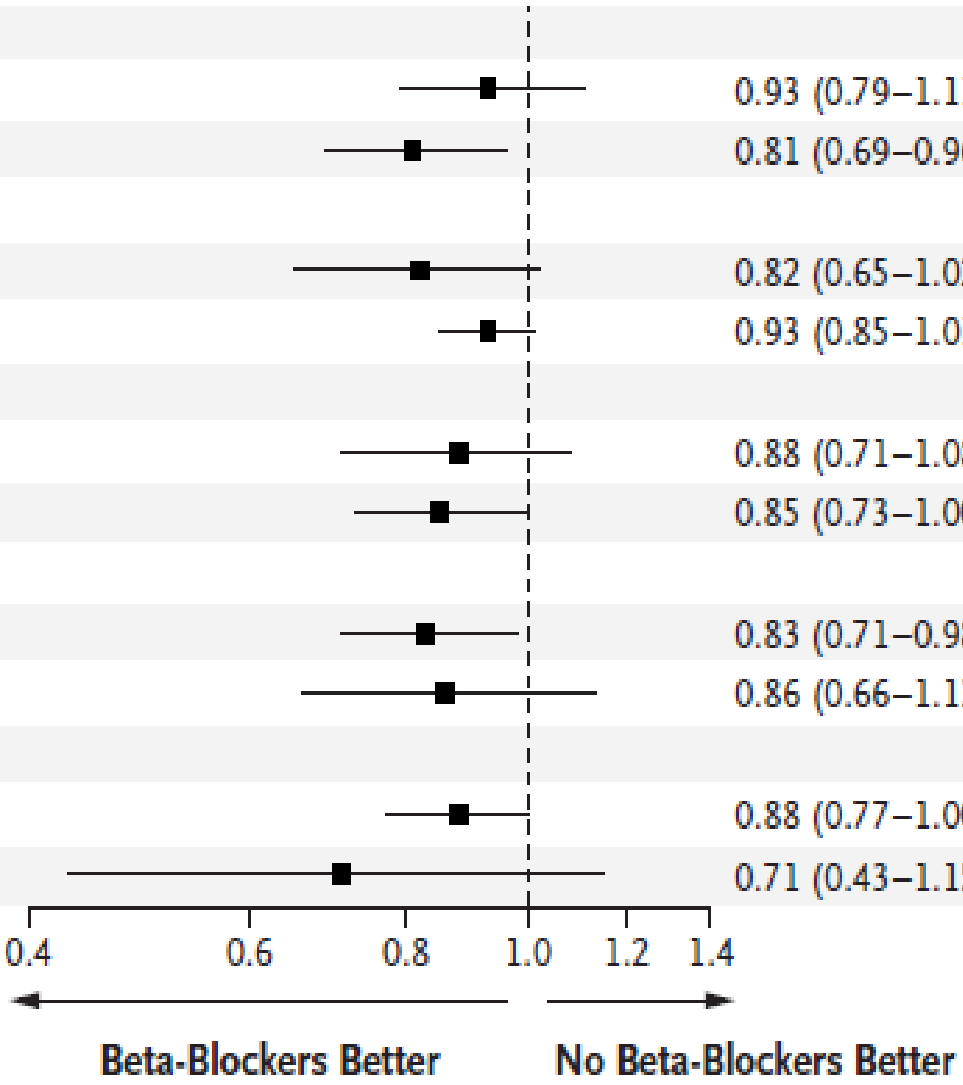
Podskupinová analýza

Subgroup	Beta-Blockers	No Beta-Blockers	Hazard Ratio (95% CI)
	no. of events/total no. of patients (%)		
Type of myocardial infarction			
NSTEMI	230/1453 (15.8)	246/1475 (16.7)	0.93 (0.79–1.11)
STEMI	164/1330 (12.3)	208/1316 (15.8)	0.81 (0.69–0.96)
Left ventricular ejection fraction			
40–49%	82/446 (18.4)	95/406 (23.4)	0.82 (0.65–1.02)
≥50%	312/2333 (13.4)	359/2385 (15.1)	0.93 (0.85–1.01)
Beta-blocker dose			
<50 mg	112/801 (14.0)	454/2791 (16.3)	0.88 (0.71–1.08)
≥50 mg	257/1813 (14.2)	454/2791 (16.3)	0.85 (0.73–1.00)
Hypertension			
No	198/1656 (12.0)	232/1642 (14.1)	0.83 (0.71–0.98)
Yes	196/1127 (17.4)	222/1149 (19.3)	0.86 (0.66–1.13)
Diabetes			
No	326/2451 (13.3)	364/2428 (15.0)	0.88 (0.77–1.00)
Yes	68/332 (20.5)	90/363 (24.8)	0.71 (0.43–1.15)



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Limitace studie

- Studie měla otevřený design

- Dvě samostatné studie s podobným designem byly sloučené a primární endpoint byl stanoven až v jejich průběhu

- Téměř 2/3 pacientů byli léčeni dlouhodobě působícím metoprololem v dávce 50 mg

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Závěr

BETAMI Study
BEta-Blocker Treatment after Acute Myocardial Infarction

DANBLOCK

- Dlouhodobá terapie BB, zahájená do 14 dní po IM s EF LK ≥40% významně snižuje riziko úmrtí nebo MACE

- Studie podporuje podávání BB v rámci sekundární prevence po IM

- Nebyl významný rozdíl v bezpečnostním profilu mezi oběma skupinami

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Postavení betablokátorů u pacientů po IM

- Máme dostatečnou evidenci podporující terapii BB po IM u pacientů s EF LK ≤40%

- Kontroverzní výsledky u pacientů s EF LK >40% ze studií REBOOT, BETAMI-DANBLOCK (2025)

- Žádná z uvedených studií nebyla primárně zaměřena na hodnocení vlivu BB u nemocných po IM s mírně redukovanou EF LK

Byrne European Heart Journal 2023; Rao Circulation 2025

Meta-analýza účinku betablokátorů u pacientů po IM s EF LK 40-49%

REBOOT

BETAMI Study
BEta-Blocker Treatment after Acute Myocardial Infarction

DANBLOCK

CAPITAL-RCT

Studie	N =14418	N =1885 (13%)
REBOOT	8505	979 (12%)
BETAMI	2867	422 (15%)
DANBLOCK	2707	430 (16%)
CAPITAL-RCT	339	54 (16%)

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Charakteristika souboru

	β-blocker group (n=991)	No β-blocker group (n=894)
Demographics		
Median age, years	63 (55–71)	62 (55–71)
Sex		
Male	791/991 (80%)	735/894 (82%)
Female	200/991 (20%)	159/894 (18%)
Country		
Spain	327/991 (33%)	285/894 (32%)
Italy	188/991 (19%)	179/894 (20%)
Denmark	226/991 (23%)	204/894 (23%)
Norway	220/991 (22%)	202/894 (23%)
Japan	30/991 (3%)	24/894 (3%)

	β-blocker group (n=991)	No β-blocker group (n=894)
Medical history		
Current smoker	360/887 (41%)	336/812 (41%)
Hypertension	467/990 (47%)	430/892 (48%)
Diabetes	191/989 (19%)	178/891 (20%)
Dyslipidaemia	380/991 (38%)	346/892 (39%)
Previous myocardial infarction*†	80/740 (11%)	69/666 (10%)
Index myocardial infarction		
STEMI	674/991 (68%)	605/894 (68%)
Median LVEF†	45·0 (45·0–47·5)	45·0 (45·0–47·5)

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Charakteristika souboru

β blocker therapy		
Previous β blocker therapy	105/988 (11%)	100/889 (11%)
Type of β blocker at randomisation		
Metoprolol	485/984 (49%)	..
Bisoprolol	430/984 (44%)	..
Carvedilol	46/984 (5%)	..
Other	23/984 (2%)	..

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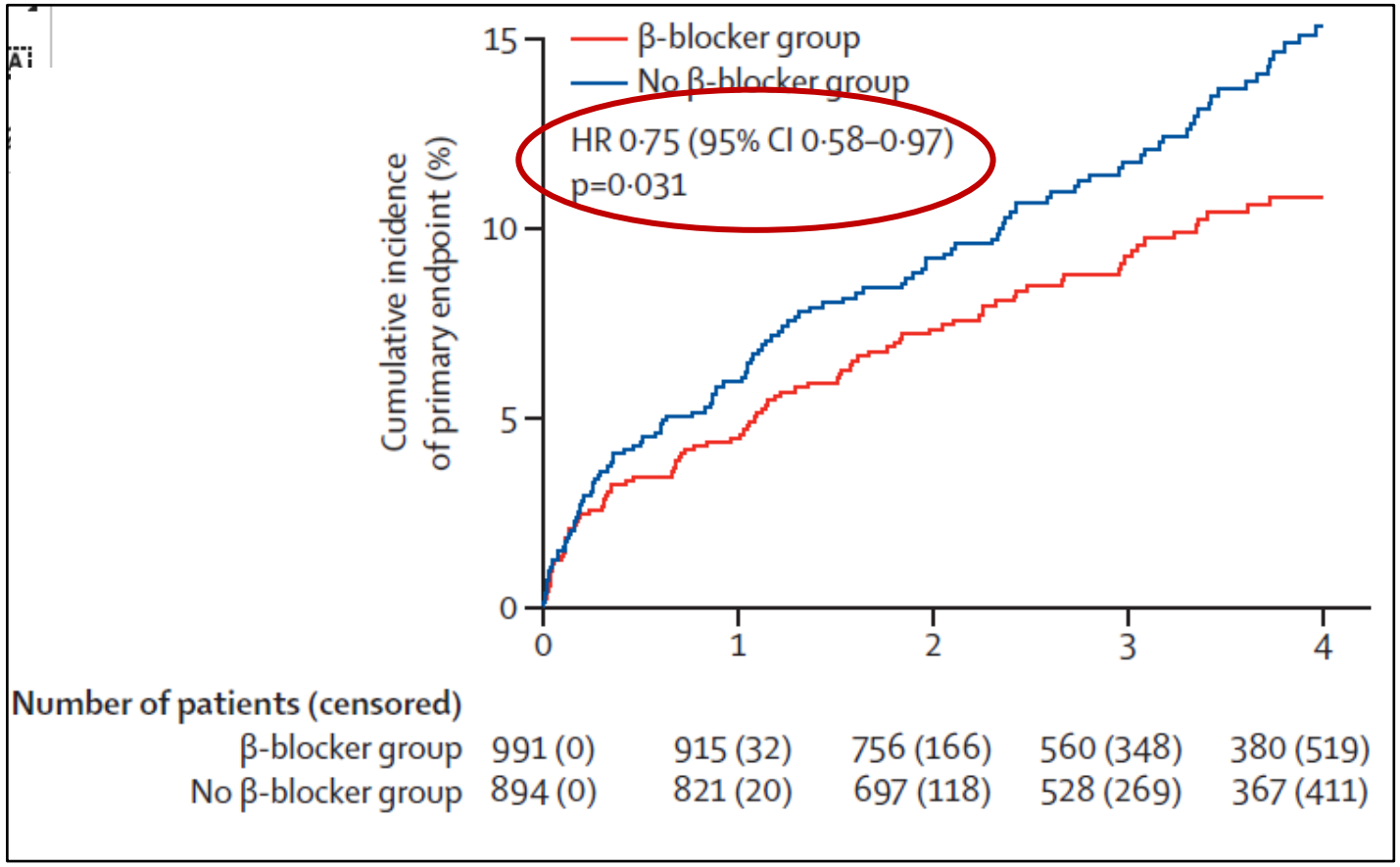
Primární cílový ukazatel

Celková mortalita, další IM a srdeční selhání



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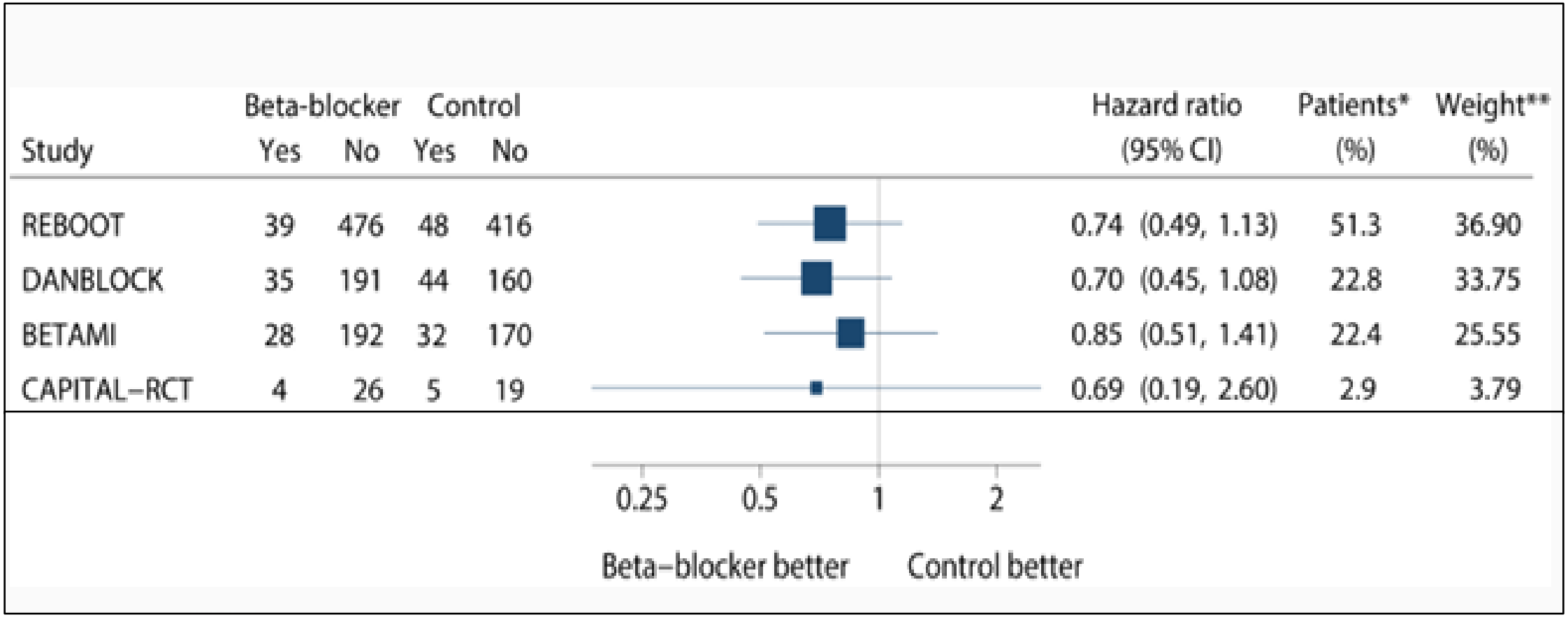
Výskyt primárního cílového ukazatele v jednotlivých studiích



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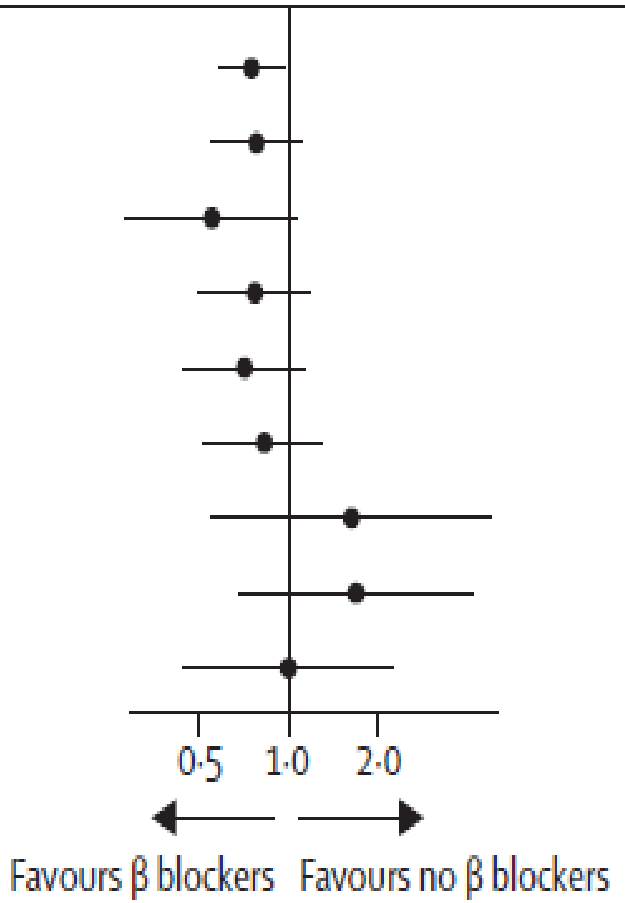
Primární, sekundární a bezpečnostní cílový ukazatel

	Patients with event, n (%)		Hazard ratio (95% CI)	p value
	β-blocker group (n=991)	No β-blocker group (n=991)		
Primary endpoint*	106 (11%)	129 (14%)	0·75 (0·58–0·97)	0·031
All-cause death	58 (6%)	69 (8%)	0·78 (0·55–1·11)	0·169
Cardiac death†	14 (2%)	23 (3%)	0·55 (0·28–1·06)	0·076
Myocardial infarction	39 (4%)	46 (5%)	0·77 (0·50- 1·18)	0·230
Heart failure	30 (3%)	39 (4%)	0·71 (0·44–1·14)	0·152
Unplanned coronary revascularisation	35 (4%)	38 (4%)	0·83 (0·52–1·31)	0·420
Malignant ventricular arrhythmia‡	9 (1%)	5 (1%)	1·64 (0·55–4·89)	0·375
Hospital admission for stroke	13 (1%)	7 (1%)	1·70 (0·68–4·25)	0·260
Second-degree or third-degree atrioventricular block§	12 (1%)	11 (1%)	1·00 (0·44–2·27)	0·984



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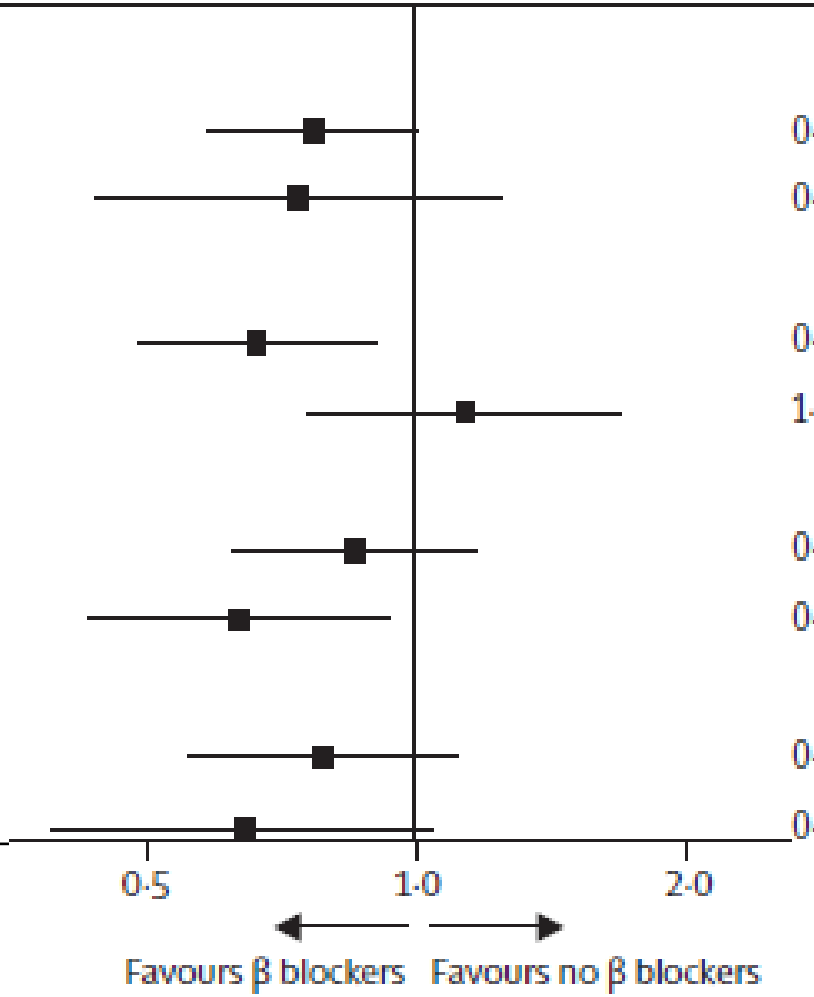
Podskupinová analýza

	β-blocker group		No β-blocker group		Hazard ratio (95% CI)	$p_{interaction}$ value
	Number of patients	Patients with event, n (%)	Number of patients	Patients with event, n (%)		
Sex						0·906
Male	791	82 (10%)	735	103 (14%)	0·76 (0·57–1·01)	
Female	200	24 (12%)	159	26 (16%)	0·73 (0·42–1·27)	
Age, years						0·035
<75	826	60 (7%)	746	88 (12%)	0·65 (0·47–0·90)	
≥75	165	46 (28%)	148	41 (28%)	1·15 (0·75–1·76)	
Myocardial infarction type						0·233
STEMI	674	67 (10%)	605	73 (12%)	0·85 (0·61–1·19)	
Non-STEMI	317	39 (12%)	289	56 (19%)	0·62 (0·41–0·93)	
LVEF*						0·502
40–45%	458	51 (11%)	442	64 (14%)	0·78 (0·54–1·13)	
46–49%	311	26 (8%)	249	33 (13%)	0·63 (0·37–1·05)	



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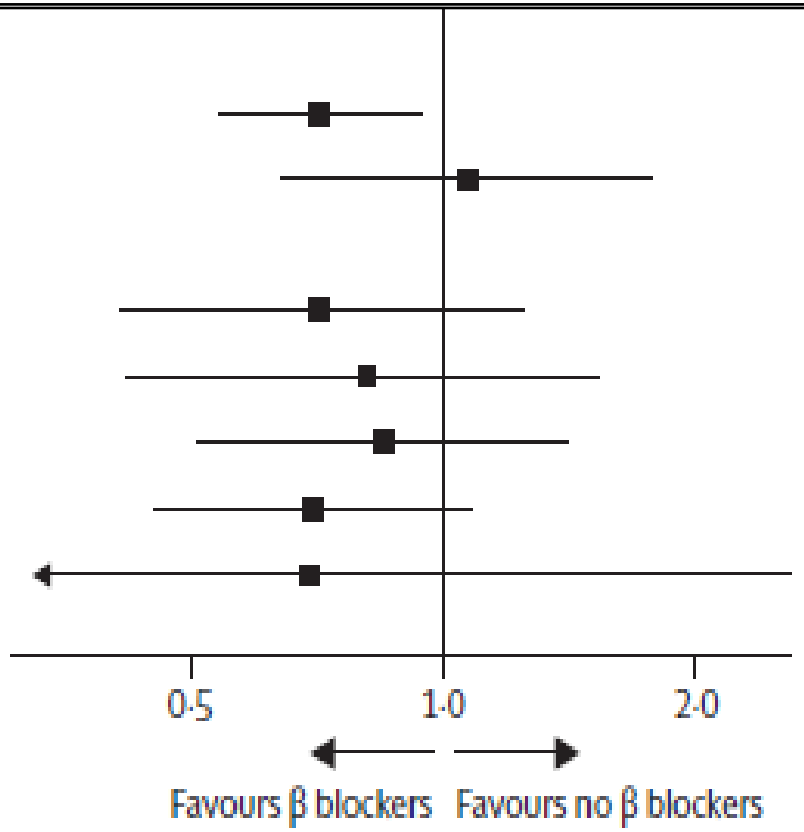
Podskupinová analýza

	β-blocker group		No β-blocker group		Hazard ratio (95% CI)	$p_{interaction}$ value
	Number of patients	Patients with event, n (%)	Number of patients	Patients with event, n (%)		
β-blocker dosage						0·038†
Median or less	862	89 (10%)	894	129 (14%)	0·71 (0·54–0·94)	
Greater than median	129	17 (13%)	894	129 (14%)	1·07 (0·64–1·77)	
Country						0·980
Spain	327	22 (7%)	285	27 (9%)	0·71 (0·41–1·25)	
Italy	188	17 (9%)	179	21 (12%)	0·81 (0·42–1·53)	
Norway	220	28 (13%)	202	32 (16%)	0·85 (0·51–1·41)	
Denmark	226	35 (15%)	204	44 (22%)	0·70 (0·45–1·08)	
Japan	30	4 (13%)	24	5 (21%)	0·69 (0·19–2·60)	



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Závěr

- Dlouhodobá terapie BB byla spojená s 25% snížením rizika výskytu primárního kompozitního cílového ukazatele (celková mortalita, další IM, nebo HF) u pacientů s IM s EF 40-49%

- Účinky BB byly konzistentní u jednotlivých složek primárního endpointu
- Účinky BB byly konzistentní ve všech zahrnutých studiích a ve všech 5 zemích, kde studie probíhaly

- Tato metaanalýza podporuje užívaní BB u pacientů s IM bez srdečního selhání s mírně redukovanou EF LK