Geriatric or cardiac rehabilitation? Predictors of treatment pathways in advanced age patients after transcatheter aortic valve implantation

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Objectives

The aim of the study was to find predictors of allocating patients after transcatheter aortic valve implantation (TAVI) to geriatric (GR) or cardiac rehabilitation (CR) and describe this new patient group based on a differentiated characterization. We assume that patients referred to GR differ to those referred to CR in several physical and psychological domains.

Design

From 10/2013 to 07/2015, 344 patients with an elective TAVI were consecutively enrolled in this prospective multicentric cohort study. Before the intervention, sociodemographic parameters, echocardiographic data, comorbidities, 6-min walk distance (6MWD), quality of life and frailty (score indexing activities of daily living [ADL], cognition, nutrition and mobility) were documented. Out of these, predictors for assignment to CR or GR after TAVI were identified using a multivariable regression model.

Results

After the exclusion of 291 patients mainly due to patient refusal, 344 patients scheduled for TAVI could be enrolled prior to the procedure. 333 (96.8 %) patients were alive at discharge, whereby 198 (59.5 %) patients underwent CR after the intervention and 51 (15.3 %) patients were allocated to GR. 52 (15.1 %) patients rejected rehabilitation and were discharged home (Figure 1). Thus, data of 249 patients in CR and GR were analyzed.

Figure 1   CONSORT flow diagram of inclusion process
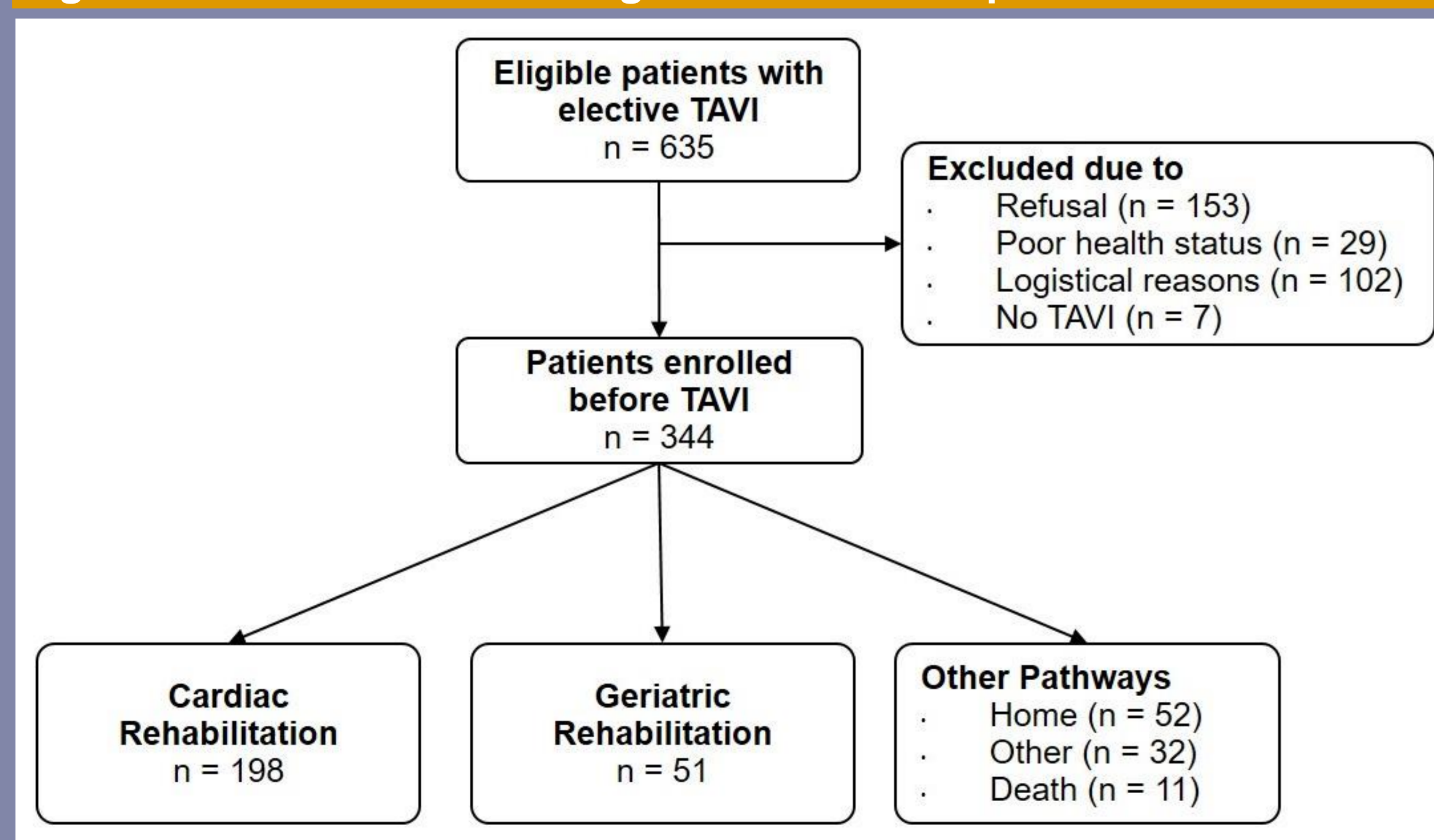
TAVI - transcatheter aortic valve implantation

Table 1 Baseline characteristics (Total cohort, cardiac vs. geriatric rehabilitation patients)

Patient characteristics	Total cohort (n = 249)	CR (n = 198)	GR (n = 51)	p-value
Age, years	80.7 ± 5.1	80.3 ± 4.9	82.6 ± 5.4	0.003
Sex, male	102 (41.0)	87 (43.9)	15 (29.4)	0.060
NYHA III/IV	241 (96.8)	190 (96.0)	51 (100.0)	0.145
BMI, kg/m²	28.0 ± 4.8	28.0 ± 4.6	27.8 ± 5.4	0.818
Physical activity (subjective)				< 0.001
Inactive (< 90 min/week)	75 (30.1)	45 (22.7)	30 (58.8)	
Active (≥ 90 - 150 min/week)	64 (25.7)	59 (29.8)	5 (9.8)	
Very active (> 150 min/week)	110 (44.2)	94 (47.5)	16 (31.4)	
Level of care				< 0.001
None	207 (83.1)	181 (91.4)	26 (51.0)	
1	36 (14.5)	16 (8.1)	20 (39.2)	
2	6 (2.4)	1 (0.5)	5 (9.8)	
Diabetes mellitus	106 (42.6)	82 (41.4)	24 (47.1)	0.467
Log. EuroSCORE, %	16.5 ± 12.1	15.0 ± 10.9	22.5 ± 14.6	0.001
Comorbidities, no.	2.2 ± 1.3	2.1 ± 1.2	2.5 ± 1.4	0.051
Coronary artery disease	159 (63.9)	124 (62.6)	35 (68.6)	0.426
COPD	47 (18.9)	33 (16.7)	14 (27.5)	0.079
Peripheral artery disease	57 (22.9)	37 (18.7)	20 (39.2)	0.002
Chronic kidney disease	114 (45.8)	85 (42.9)	29 (56.9)	0.075
Stroke/Transient ischemic attack	34 (13.7)	30 (15.2)	4 (7.8)	0.175
Length of hospital stay, days	11.1 ± 4.3	10.2 ± 3.8	14.6 ± 4.6	< 0.001

Categorical variables are presented in n (%), metric variables in mean ± SD.
CR = cardiac rehabilitation, GR = geriatric rehabilitation, NYHA - New York Heart Association, BMI - Body-Mass-Index, COPD = chronic obstructive pulmonary disease

Out of these, who were 80.7 ± 5.1 years old and 59.0 % female, 198 patients underwent CR and 51 patients GR. GR patients were older, less physically active and more often had a level of care, peripheral artery disease as well as a lower left ventricular ejection fraction. The groups also varied in 6MWD (details see Table 2). Furthermore, individual components of frailty revealed prognostic impact: higher values in instrumental ADL reduced the probability for referral to GR (OR: 0.49, p < 0.001), while an impaired mobility was positively associated with referral to GR (OR: 3.97, p = 0.046). Clinical parameters like stroke (OR: 0.19 of GR, p = 0.038) and the EuroSCORE (OR: 1.04 of GR, p = 0.026) were also predictive (Figure 2).

Table 2 Baseline assessments (Total cohort, cardiac vs. geriatric rehabilitation patients)

Assessments	Total cohort (n = 249)	CR (n = 198)	GR (n = 51)	p-value
6MWD, m	239.6 ± 117.9	250.6 ± 115.8	180.3 ± 113.5	0.006
Health related quality of Life				
SF-12 PCS, points	33.1 ± 10.1	33.7 ± 9.8	30.9 ± 11.0	0.085
SF-12 MCS, points	50.5 ± 10.4	50.8 ± 10.5	49.1 ± 9.8	0.285
Emotional Status				
HADS Anxiety, points	5.7 ± 3.9	5.9 ± 3.8	5.9 ± 4.1	0.176
HADS Depression, points	5.6 ± 3.7	5.4 ± 3.5	6.5 ± 4.1	0.050
Frailty-Index, points	2.4 ± 1.6	2.1 ± 1.4	3.8 ± 1.7	< 0.001
Frailty-Index, ≥ 3 pts.	106 (42.6)	67 (33.8)	39 (76.5)	< 0.001
MMSE, points	27.1 ± 2.7	27.3 ± 2.6	26.3 ± 3.3	0.045
MNA-SF, points	11.7 ± 2.3	11.9 ± 2.1	11.1 ± 2.9	0.053
ADL, points	94.2 ± 11.7	97.3 ± 6.8	82.2 ± 17.8	< 0.001
IADL, points	7.0 ± 1.6	7.4 ± 1.1	5.3 ± 2.0	< 0.001
TUG, sec.	14.2 ± 7.3	13.0 ± 6.5	19.0 ± 8.5	< 0.001
Subjective mobility disability	191 (76.7)	150 (75.8)	41 (80.4)	0.485

Categorical variables are presented in n (%), metric variables in mean ± SD.
CR - cardiac rehabilitation, GR - geriatric rehabilitation, 6MWD= 6-minute walk distance, SF-12 - Short Form 12, PCS - physical component summary, MCS - mental component summary, HADS - Hospital Anxiety and Depression Scale, MMSE - Mini Mental State Exam, MNA-SF - Mini Nutritional Assessment Short Form, ADL - Activities of Daily Living, IADL - Instrumental Activities of Daily Living, TUG - Timed Up and Go Test.

Figure 2 Predictors of treatment pathways in patients after TAVI
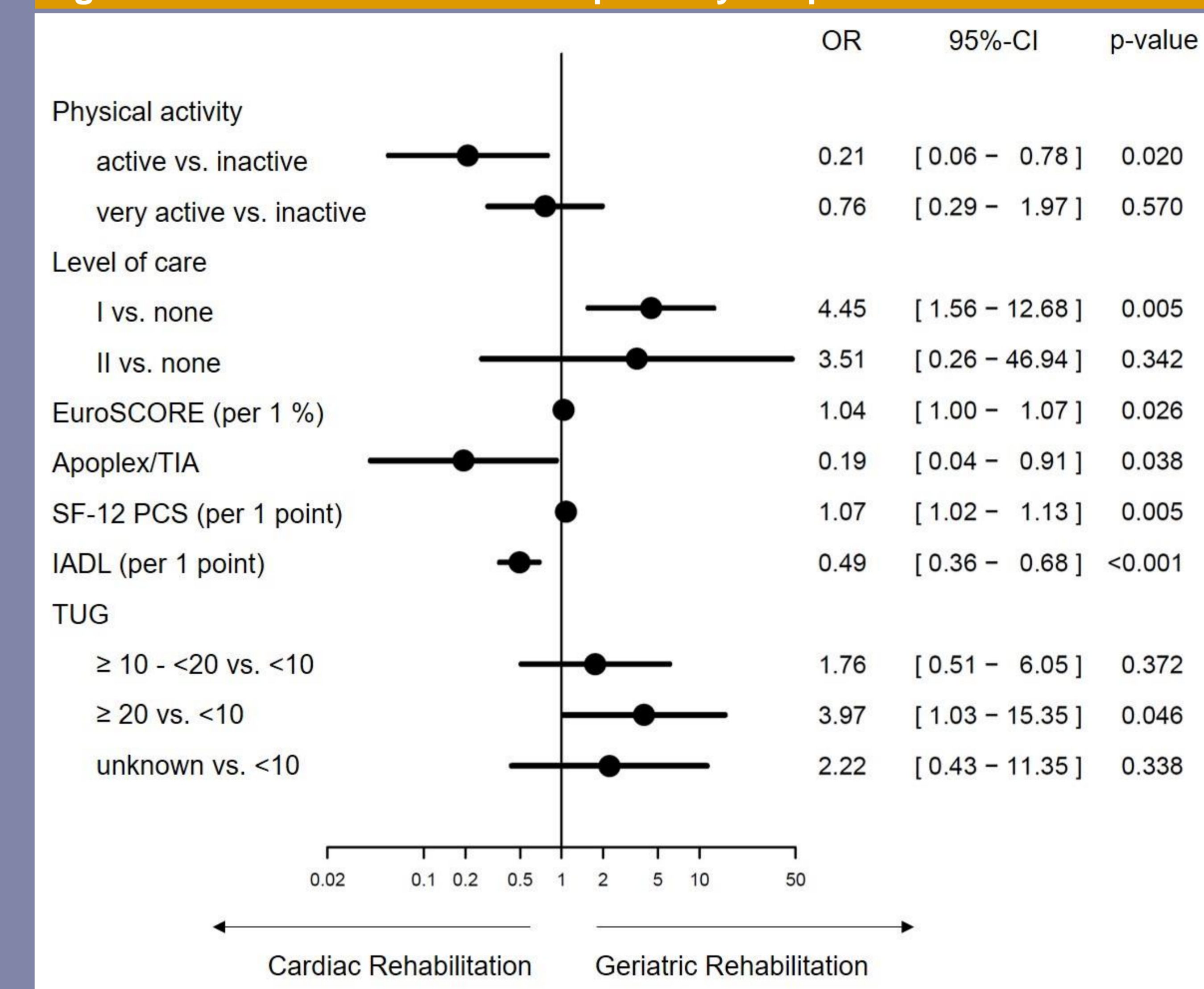
OR - Odds Ratio, CI - confidence interval, TIA - transient ischemic attack, SF-12 - Short Form 12, PCS - physical component summary, IADL - Instrumental Activities of Daily Living, TUG - Timed Up and Go Test. Apoplex is synonymous with previous stroke.
Exemplary explanation: The odds of being referred to geriatric rehabilitation is 4.45 times higher in patients with a level of care 1 versus patients with no level of care.

Conclusion

Advanced age patients after TAVI referred to CR or GR differ in several parameters and seem to be different patient groups with specific needs, e. g. regarding activities of daily living and mobility. Thus, our data prove the eligibility of both CR and GR settings.

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