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ORIGINAL ARTICLE

Early discharge after transfemoral transcatheter aortic valve implantation

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ABSTRACT

Background The aim of this study was to assess the feasibility and the safety of early discharge (within 72 h) after transfemoral transcatheter aortic valve implantation (TAVI) and to identify baseline features and/or peri-procedural variables, which may affect post-TAVI length-of-stay (LoS) duration.

Methods and results Patients discharged within 72 h of TAVI (early discharge group) were compared with consecutive patients discharged after 3 days (late discharge group). Propensity-matched cohorts of patients with a 2:1 ratio were created to better control confounding bias. Among 465 patients, 107 (23.0%) were discharged within 3 days of the procedure. Multivariable regression analysis of unmatched patients demonstrated that baseline New York Heart Association (NYHA) class IV (OR: 0.22, 95% CI 0.05 to 0.96; p=0.045) and any bleeding (OR: 0.31, 95% CI 0.74 to 0.92; p=0.031) were less likely to be associated with early discharge after TAVI. Conversely, the year of procedure (OR: 1.66, 95% CI 1.25 to 2.20; p<0.001) and the presence of a permanent pacemaker (PPM) before TAVI (OR: 2.80, 95% CI 1.36 to 5.75; p=0.005) were associated with a higher probability of early discharge. In matched populations, patients in the early discharge group reported lower incidence of in-hospital bleeding (7.9% vs 19.4%, p=0.014), major vascular complications (2.3% vs 9.1%, p=0.038) and PPM implantation (7.9% vs18.5%, p=0.021), whereas after discharge, at 30-day, no significant differences were reported between groups in terms of death (2.2% vs 1.7%, p=0.540), bleeding (0.0% vs 1.1%, p=0.444), PPM implantation (1.1% vs 0.0%, p=0.333) and re-hospitalisation (1.1% vs 1.1%, p=1.000).

Conclusions Early discharge (within 72 h) after transfemoral TAVI is feasible and does not seem to jeopardise the early safety of the procedure, when performed in a subset of patients selected by clinical judgement. Patients undergoing TAVI in unstable haemodynamic compensation and patients experiencing bleeding after the procedure demonstrated to be poorly suitable to this approach, whereas increasing experience in post-TAVI management was associated with a reduction of LoS.

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INTRODUCTION

Transcatheter aortic valve implantation (TAVI) is the treatment of choice among patients with symptomatic severe aortic stenosis (AS) deemed inoperable and a valuable alternative to surgical aortic valve replacement for high-risk surgical patients.[1–3] Despite its widespread usage, the expansion of TAVI into lower risk patient populations is still limited by complications and costs, together with the paucity of data on long-term durability of current transcatheter bioprostheses.[4] However, with increasing operators' experience and technology improvement, procedure-related complications are expected to reduce, with favourable effects in terms of postprocedural length-of-stay (LoS) and related costs. LoS has been observed as one of the main cost components in the early period after TAVI.[5] As an example, the Italian OBSERVANT study reported a mean LoS of 8.1 days.[6] However, it should be noted that in some cases hospitalisation after TAVI is likely prolonged without a real clinical need. The aim of this study was to report on the feasibility and safety of early discharge (defined as discharge within 72 h) of selected patients after transfemoral TAVI and to identify baseline features and/or peri-procedural variables that may affect post-TAVI LoS duration.

METHODS

Study population

From June 2007 to July 2014, 500 high-risk or inoperable patients with symptomatic severe AS underwent transfemoral TAVI at the Ferrarotto Hospital, Catania, Italy. For the purpose of this retrospective analysis, patients who did not have a transcatheter heart valve (THV) implanted (n=6) and patients who died in-hospital (n=29) were excluded. Among the remaining study population (n=465), consecutive patients who were discharged home within 72 h of TAVI (early discharge group) were compared with consecutive patients discharged after 3 days (late discharge group). Patients transferred to another hospital or to rehabilitation were included in the 'late discharge' group. Propensity-matched cohorts of patients with a 2:1 ratio were created to better control confounding bias.

The study was approved by the Institutional Review Board and conforms to the principles outlined in the Declaration of Helsinki. Each patient signed an informed consent for data collection and analysis.

Patient selection

The clinical indication for TAVI was deemed by a consensus of the local 'heart valve team'. Screening studies to assess the anatomical suitability for TAVI were performed in all patients before the procedure, as per common practice. Sizing of the THV was achieved by using multidetector CT[7] and an integration of echocardiography (transthoracic and/or transoesophageal), angiography and simultaneous aortography during balloon valvuloplasty.[8]

Procedure and postprocedural management

The design features of the CoreValve (Medtronic, Minneapolis, Minnesota, USA), Edwards-SAPIEN and SAPIEN XT (Edwards Lifesciences, Irvine, California, USA), Lotus (Boston Scientific, Marlborough, Massachusetts, USA) and Portico (St Jude Medical, Saint Paul, Minnesota, USA) prostheses and technical details of the procedures have been described previously.[9] All procedures were performed under general or local anaesthesia (with or without additional sedation and/or analgesia), under fluoroscopic guidance, in a standard cardiac catheterisation laboratory with surgical backup. All arterial sheaths were removed with closure devices at the end of the procedure. In case of no evidence of acute intraprocedural severe conduction disturbances (severe symptomatic bradycardia <45 bpm, symptomatic second-degree Atrio-ventricular block or third-degree Atrio-ventricular block), the temporary pacemaker was removed in the catheterisation laboratory at the end of the procedure (in both self-expanding and balloon-expandable implantation). Otherwise, it was maintained in situ and removed in the Cardiac intensive care unit (CICU) after electrophysiology consultation, aimed at assessing the need for placing a permanent pacemaker (PPM).[10] After the procedure, all patients were transferred to CICU. The attending physician decided the timing for patient transfer to the cardiology ward, if needed. Suitability for discharge (early or late) was deemed by the attending physician and by the TAVI operator, in accordance with the clinical status of the patient and the procedural outcomes. In the early discharge group, blood-work (including complete blood count, renal function and electrolytes) was prescribed in all patients at days 5–7 after discharge as outpatient. Clinical follow-up was performed through office visits and telephone contacts.

Statistical analysis

Descriptive statistics are reported as mean±SD for normally distributed continuous variables, or as median and 25th–75th percentile (IQR) otherwise. Normality of distribution was tested by means of the Kolmogorov–Smirnov test. Absolute and relative frequencies are reported for categorical variables. Continuous variables were analysed with the Student's t test or Wilcoxon rank sum test depending on the variable distribution. Differences in proportions were compared by applying the McNemar's exact test.

A multivariable analysis for early discharge was performed using a logistic regression, adjusting for all variables with a p value of <0.10 at univariate analysis (sex, age, New York Heart Association (NYHA) class IV, prior balloon aortic valvuloplasty (BAV), prior PPM, chronic renal failure, year of the procedure (2-year period), bleeding and new PPM implantation after TAVI). The variable 'major vascular complications' was excluded from the multivariable analysis because it was found to be collinear (condition index: 38.49). A p value of <0.05 (2-tailed) was considered to be statistically significant. In addition, to control for the non-random assignment of patients to either post-TAVI discharge strategy, we created two propensity-matched cohorts of patients with a 1:2 ratio (ie, one patient undergoing early discharge for every two patients undergoing late discharge) after constructing a conditional logistic-regression model that predicted the likelihood of early discharge based on the following variables, representing a parsimonious set of variables clinically relevant to selection bias and clinical outcomes: sex, age, Society of Thoracic Surgery (STS) score, NYHA IV, prior BAV, prior PPM, year of procedure (2-year period) and chronic renal failure. This analysis resulted in 89 patients undergoing short LoS matched with 178 patients undergoing standard LoS after TAVI. All data were processed using the Statistical Package for Social Sciences, V.20 (SPSS, Chicago, Illinois, USA).

Definitions and endpoints

Clinical endpoints and definitions were used in accordance with the Valve Academic Research Consortium (VARC)-2 criteria.[11] For the purposes of this study, a composite safety endpoint was defined as the composite of death, bleeding, PPM implantation and re-hospitalisation for any cause occurring after discharge and within 30 days from the procedure.

RESULTS

Patient population

Among 465 patients, 107 (23.0%) were discharged home early. Clinical and echocardiographic characteristics of the two study groups (early discharge and late discharge) are summarised in table 1. Before matching, patients in the early discharge group were slightly younger (79.5±9.9 vs 80.9±5.3 years, p=0.046), and less frequently females (49.5% vs 62.3%, p=0.018). Significant differences were also observed between groups in terms of prior BAV (20.6% vs 37.8%, p=0.001) and NYHA class IV (1.9% vs 8.5%, p=0.018), which were more frequent in the late discharge group, whereas prior PPM was more frequent among patients in the early discharge group (15.9% vs 7.3%, p=0.007). There were no differences between these two groups in terms of other preoperative variables.

Unadjusted outcomes

Main procedural variables are presented in table 2. Not surprisingly, the LoS after TAVI was significantly shorter in the early discharge group (2.2±0.8 vs 6.5±3.2, p<0.001). In the early discharge group, patients were discharged within 24, 48 and 72 h in 28.9%, 30.5% and 43.8% of cases, respectively. The frequency of early discharge after TAVI over time is depicted in figure 1. No significant differences between groups occurred in terms of device success (83.2% vs 83.8%, p=0.879), bailout valve-in-valve implantation (1.9% vs 2.5%, p=0.517), valve embolisation (0.9% vs 1.7%, p=0.495) and paravalvular regurgitation more than mild (12.1% vs 11.0%, p=0.731) (table 2). The temporary pacemaker was left in place after the procedure in 60 patients (12.9%). Patients in the early discharge group had lower rates of bleeding (6.5% vs 18.5%, p=0.003), particularly life-threatening (0.9% vs 5.3%, p=0.034), major vascular complications (1.9% vs 8.8%, p=0.016) and PPM implantation (9.3% vs 17.9%, p=0.034). There were no statistically significant differences between the two groups in the incidence of in-hospital neurological events (table 3).

After discharge, clinical follow-up was available in all patients. No significant differences were reported between groups in terms of 30-day death, bleeding, PPM implantation or re-hospitalisation (table 4).

Multivariable analysis

The multivariable regression analysis demonstrated that baseline NYHA IV (OR: 0.22, 95% CI 0.05 to 0.96; p=0.045), and any

Table 1 Baseline clinical and echocardiographic characteristics

	Before matching			After matching		
	Early discharge (n=107)	Late discharge (n=358)	p Value	Early discharge (n=89)	Late discharge (n=178)	p Value
Clinical variables						
Age, years	79.5±9.9	80.9±5.3	0.046	81.1±4.9	80.7±5.7	0.567
Female gender	53 (49.5)	223 (62.3)	0.018	50 (56.2)	50 (59.2)	0.598
Diabetes mellitus	26 (24.3)	106 (29.6)	0.285	22 (24.7)	53 (29.8)	0.386
Permanent AF	11 (10.3)	52 (14.6)	0.256	9 (10.1)	29 (16.3)	0.173
Prior myocardial infarction	17 (15.9)	52 (14.5)	0.728	13 (14.6)	29 (16.3)	0.721
Prior stroke	3 (2.8)	22 (6.1)	0.179	3 (3.4)	10 (5.6)	0.317
Prior CABG	11 (10.3)	38 (10.6)	0.921	9 (10.1)	19 (10.7)	0.888
Prior PCI	25 (23.4)	94 (26.3)	0.547	17 (19.1)	43 (24.2)	0.351
Prior BAV	22 (20.6)	135 (37.8)	0.001	21 (23.6)	33 (18.5)	0.332
PVD	9 (8.4)	21 (5.9)	0.347	5 (5.6)	10 (5.6)	1.000
COPD	32 (29.9)	110 (30.7)	0.872	20 (22.5)	56 (31.5)	0.125
CRF*	38 (35.5)	97 (27.1)	0.092	26 (29.2)	53 (29.8)	0.924
Prior PPM	17 (15.9)	26 (7.3)	0.007	9 (10.1)	12 (6.7)	0.335
Prior LBBB	4 (3.8)	26 (7.3)	0.193	4 (4.5)	16 (9.1)	0.188
Prior RBBB	11 (10.6)	27 (7.8)	0.372	8 (9.3)	18 (10.5)	0.770
NYHA IV	2 (1.9)	30 (8.5)	0.019	2 (2.2)	4 (2.2)	1.000
STS score, %	5.7±4.0	6.6±4.7	0.058	6.0±4.2	6.5±4.5	0.420
Propensity score, n	28.4±12.6	21.1±10.4	<0.001	24.6±8.6	24.9±8.6	0.810
Echocardiographic variables						
LV-EF, %	51.2±12.5	51.9±12.5	0.614	51.9±11.5	51.8±12.9	0.935
Mean aortic gradient, mm Hg	50.0±14.9	52.3±15.1	0.169	51.2±15.2	52.5±15.0	0.491

Values are n (%) or mean±SD. Continuous parametric variables were compared using Student's t test. Continuous non-parametric variables were compared using Mann–Whitney U test. Categorical variables were compared using the McNemar's exact test.
*Defined as glomerular filtration rate (GFR) less than 60 mL/min.
AF, atrial Fibrillation; BAV, balloon aortic valvuloplasty; CABG, coronary artery bypass graft; COPD, chronic obstructive pulmonary disease; CRF, chronic renal failure; LBBB, left bundle branch block; NYHA, New York Heart Association; PCI, percutaneous coronary intervention; PPM, permanent pacemaker; PVD, peripheral vascular disease; RBBB, right bundle branch block; STS, Society of Thoracic Surgery.

Table 2 Procedural variables

	Before matching			After matching		
	Early discharge (n=107)	Late discharge (n=358)	p Value	Early discharge (n=89)	Late discharge (n=178)	p Value
Edwards-SAPIEN						
23 mm	17 (15.9)	47 (13.2)	0.474	15 (16.9)	20 (11.2)	0.200
26 mm	15 (14.0)	38 (10.6)	0.336	11 (12.4)	25 (14.0)	0.704
29 mm	2 (1.9)	8 (2.2)	0.586	0 (0.0)	7 (3.9)	0.056
CoreValve						
23 mm	4 (3.7)	12 (3.4)	0.523	4 (4.5)	5 (2.8)	0.348
26 mm	26 (24.3)	137 (38.4)	0.007	25 (28.1)	69 (38.8)	0.085
29 mm	33 (30.8)	98 (27.5)	0.494	27 (30.3)	44 (24.7)	0.327
31 mm	7 (6.5)	14 (3.9)	0.185	4 (4.5)	8 (4.5)	0.633
Lotus						
23 mm	2 (1.9)	0 (0.0)	0.053	1 (1.1)	0 (0.0)	0.333
27 mm	0 (0.0)	1 (0.3)	0.770	0 (0.0)	0 (0.0)	–
Portico						
23 mm	1 (0.9)	0 (0.0)	0.230	2 (2.2)	0 (0.0)	0.110
25 mm	0 (0.0)	1 (0.3)	0.770	0 (0.0)	0 (0.0)	–
TOE guidance	0 (0.0)	5 (1.4)	0.459	0 (0.0)	1 (0.6)	0.667
General anaesthesia	2 (1.9)	6 (1.7)	0.451	1 (1.1)	1 (0.6)	0.556
Device success*	89 (83.2)	300 (83.8)	0.879	75 (84.3)	151 (84.8)	0.904
Bailout THV-in-THV	2 (1.9)	9 (2.5)	0.517	2 (2.2)	5 (2.8)	0.571
THV embolisation	1 (0.9)	6 (1.7)	0.495	1 (1.1)	1 (0.6)	0.556
PVR more than mild	13 (12.1)	39 (11.0)	0.731	10 (11.2)	20 (11.2)	1.000

Values are n (%). Categorical variables were compared using the McNemar's exact test.
*Defined according to Valve Academic Research Consortium-2 (VARC-2) criteria.
PVR, paravalvular regurgitation; THV, transcatheter heart valve; TOE, transoesophageal echocardiogram.

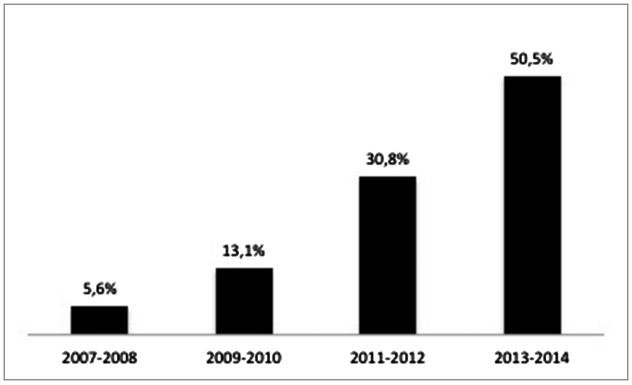

Figure 1 Frequency of early discharge after transcatheter aortic valve implantation (TAVI) over time.

bleeding (OR: 0.31, 95% CI 0.74 to 0.92; p=0.031) were less likely to be associated with early discharge after TAVI. On the other hand, a more recent period of the procedure (OR: 1.66, 95% CI 1.25 to 2.20; p<0.001) and the presence of a PPM before TAVI (OR: 2.80, 95% CI 1.36 to 5.75; p=0.005) were associated with a higher probability of early discharge. Noticeably, the use of CoreValve was not associated with an increased risk of prolonged hospitalisation even at the univariate analysis (OR: 0.70, 95% CI 0.44 to 1.12; p=0.135) (table 5).

Outcomes after matching

After matching using the propensity score method, no significant difference in major baseline clinical, echocardiographic and procedural characteristics were observed between the early discharge group (n=89) and the 2:1 matched late discharge group (n=178) (tables 1 and 2). Results of the propensity-matched analysis were confirmatory of those reported in the unmatched population. In detail, patients in the early discharge group reported lower incidence of in-hospital bleeding, major vascular complications and PPM implantation (table 3), whereas after discharge, at 30-day, no significant differences were reported between groups in the composite safety endpoint and in terms of death, bleeding, PPM implantation or re-hospitalisation (table 4).

DISCUSSION

The main findings of this retrospective study are the following. First, early discharge within 72 h following transfemoral TAVI using either self-expanding or balloon-expandable devices was feasible in selected patients identified by clinical judgement, and was not associated with an increased risk of mortality, bleeding, PPM implantation and re-hospitalisation at 30 days. Second, NYHA functional class IV and bleeding after the procedure were associated with a higher probability to undergo a prolonged postoperative hospitalisation. Conversely, patients treated more recently and patients having a PPM before TAVI were more likely to be discharged early after the procedure.

The motivation to investigate the safety of early discharge after TAVI, and to identify which patients may be suitable or not suitable for this approach stems from a desire to accelerate patient's recovery and mobilisation after the procedure and to minimise unnecessary use of medical resources. As a matter of fact, high costs of TAVI are emerging as one of the main limitation for the diffusion of this technique. Postprocedural LoS is one of the main factors contributing to the increase in peri-procedural costs of TAVI. In the PARTNER trial, postprocedural LoS were 7.4 and 12.4 days for transfemoral and transapical TAVI, respectively.[12] As a consequence, it appears evident that optimisation of the hospitalisation length may have positive effect in containing TAVI costs. However, the objective of saving resources has to be achieved without compromising the safety of the procedure in

Table 3 In-hospital outcomes

	Before matching			After matching		
	Early discharge (n=107)	Late discharge (n=358)	p Value	Early discharge (n=89)	Late discharge (n=178)	p Value
Post-TAVI hospitalisation, days	2.2±0.8	6.5±3.2	<0.001	2.1±0.8	6.5±3.5	<0.001
Day-1 discharge	31 (28.9)	–	–	25 (28.1)	–	–
Day-2 discharge	32 (30.5)	–	–	27 (31.0)	–	–
Day-3 discharge	46 (43.8)	–	–	37 (42.5)		
Post-TAVI CICU, days	1.3±0.4	3.4±2.0	<0.001	1.2±0.4	3.6±1.9	<0.001
Stroke/TIA	2 (1.9)	5 (1.4)	0.505	0 (0.0)	2 (1.1)	0.444
Disabling stroke	0 (0.0)	2 (0.6)	0.592	0 (0.0)	1 (0.6)	0.667
Non-disabling stroke	1 (0.9)	0 (0.0)	0.230	0 (0.0)	0 (0.0)	–
TIA	1 (0.9)	3 (0.8)	0.650	0 (0.0)	1 (0.6)	0.667
Any bleeding	7 (6.5)	65 (18.5)	0.003	7 (7.9)	34 (19.4)	0.014
Life-threatening bleeding	1 (0.9)	19 (5.3)	0.034	1 (1.1)	10 (5.6)	0.071
Major bleeding	3 (2.8)	21(6.4)	0.153	3 (3.4)	11 (6.2)	0.255
Minor bleeding	3 (2.8)	23 (6.4)	0.153	3 (3.4)	13 (7.3)	0.202
New PPM	10 (9.3)	64 (17.9)	0.034	7 (7.9)	33 (18.5)	0.021
Major vascular complications	2 (1.9)	31 (8.8)	0.016	2 (2.3)	16 (9.1)	0.038
Minor vascular complications	9 (8.5)	30 (8.5)	0.996	9 (10.2)	17 (9.7)	0.884
Acute kidney injury			0.286			0.345
Stage 1	12 (11.3)	57 (17.2)		10 (11.2)	33 (18.5)	
Stage 2	2 (1.9)	9 (2.7)		2 (2.2)	4 (2.2)	
Stage 3	1 (0.9)	9 (2.7)		1 (1.1)	5 (2.8)	

Values are n (%) or mean±SD. Continuous parametric variables were compared using Student's t test. Continuous non-parametric variables were compared using Mann–Whitney U test. Categorical variables were compared using the McNemar's exact test.
CICU, cardiac intensive care unit; PPM, permanent pacemaker; TAVI, transcatheter aortic valve implantation; TIA, transient ischaemic attack.

Table 4 Thirty-day outcomes post-discharge

	Before matching			After matching		
	Early discharge (n=107)	Late discharge (n=358)	p Value	Early discharge (n=89)	Late discharge (n=178)	p Value
Death	2 (1.9)*	6 (1.7)	0.583	2 (2.2)*	3 (1.7)	0.540
New PPM	0 (0.0)	2 (0.6)	0.592	0 (0.0)	2 (1.1)	0.444
Any bleeding	1 (0.9)	0 (0.0)	0.230	1 (1.1)	0 (0.0)	0.333
Re-hospitalisation	1 (0.9)	3 (0.8)	0.650	1 (1.1)	2 (1.1)	1.000
Composite safety endpoint†	3 (2.8)	8 (2.2)	0.483	3 (3.4)	5 (2.8)	0.533
Acute kidney injury‡						
Stage 1	5 (4.6)	–	–	4 (4.5)	–	–
Stage 2	1 (0.9)	–	–	1 (1.1)	–	–
Stage 3	0 (0.0)	–	–	0 (0.0)	–	–

Values are n (%). Categorical variables were compared using the McNemar's exact test.
*Patient #1 (CoreValve 29 mm, no conduction disturbances at discharge) died at day 11 due to haemorrhagic stroke. Patient #2 (CoreValve 29 mm and PPM implanted at day 1) died at day 9 due to myocardial infarction.
†Defined as the composite of death, bleeding, PPM implantation, and re-hospitalisation for any cause.
‡Available in patients discharged within 3 days after TAVI. Outcome defined according to blood work prescribed at days 5–7 after discharge.
PPM, permanent pacemaker; TAVI, transcatheter aortic valve implantation.

order for a strategy of early discharge to be termed 'economically attractive'. Therefore, the aim is to intervene on those cases of prolonged hospitalisation without a real clinical reason. In this scenario, an important question is whether mortality and some of TAVI-specific complications rates in the early discharge group could have been reduced by keeping these patients in hospital for longer. Our low mortality and complications rates in the early discharge group and the propensity analysis findings support our conclusion on the putative safety of an early discharge strategy. Our results are well in line with those recently reported by two other studies.[13 14]

This study also demonstrated the incremental use of this approach over time. In the last 18 months, an early discharge strategy has been adopted in almost 40% of patients. This finding is the result of different important factors: first, increasing experience in postprocedural management; second, slight reduction of population's risk profile; third, establishment of teaching programmes for CICU, ICU and ward physicians, nurses and

Table 5 Univariate and multivariate analysis for early discharge post-TAVI

	Univariate			Multivariate		
Variables	OR	95% CI	p Value	OR	95% CI	p Value
Baseline variables						
Prior PPM	2.41	1.25 to 4.64	0.008	2.80	1.36 to 5.75	0.005
NYHA IV	0.21	0.05 to 0.89	0.034	0.22	0.05 to 0.96	0.045
Prior BAV	0.43	0.25 to 0.71	0.001	0.63	0.33 to 1.03	0.063
Female gender	0.59	0.38 to 0.92	0.019	0.65	0.41 to 1.04	0.075
Age	0.97	0.94 to 1.01	0.066	0.98	0.95 to 1.01	0.216
CRF*	1.48	0.94 to 2.35	0.093	1.17	0.70 to 1.96	0.556
Permanent AF	0.67	0.34 to 1.34	0.259			
COPD	0.96	0.60 to 1.54	0.872			
PVD	1.47	0.65 to 3.32	0.350			
Prior LBBB	0.49	0.17 to 0.46	0.202			
Prior RBBB	1.40	0.67 to 2.92	0.374			
Procedural variables						
CoreValve	0.70	0.44 to 1.12	0.135			
Device success	0.96	0.54 to 1.71	0.879			
PVR more than mild	1.12	0.57 to 2.19	0.732			
Major vascular complication	0.20	0.05 to 0.85	0.029			
Minor vascular complications	1.00	0.46 to 2.18	0.996			
In-hospital variables						
Stroke or TIA	1.34	0.26 to 7.03	0.726			
Any bleeding	2.69	1.12 to 6.46	0.027	0.31	0.17 to 0.92	0.031
New PPM	0.47	0.23 to 0.95	0.038	0.65	0.31 to 1.37	0.258
Other						
Year of the procedure†	1.34	0.26 to 7.03	0.726	1.66	1.25 to 2.20	<0.001

*Defined as GFR less than 60 mL/h.†Two-year period.
AF, atrial fibrillation; BAV, balloon aortic valvuloplasty; COPD, chronic obstructive pulmonary disease; CRF, chronic renal failure; NYHA, New York Heart Association; LBBB, left bundle branch block; PPM, permanent pacemaker; PVD, peripheral vascular disease; PVR, paravalvular regurgitation; RBBB, right bundle branch block; TIA, transient ischaemic attack.

physiotherapists focused on the management of patients early after transfemoral TAVI. Whether one or more of these factors have played a predominant role is difficult to discern.

In this study, advanced NYHA class has been strongly associated with a lower probability to discharge patients early after the procedure. As predictable, also when bleeding occurred (generally as a consequence of a major vascular complication), patients were more likely to experience prolonged hospitalisation. On the other hand, the presence of a definitive PPM before TAVI was identified as a variable that may reduce hospitalisation length. In this case, the risk of late high degree conduction disturbances does not exist. In addition, the increasing experience in the postprocedure management has played a key role in increasing the percentage of patients undergoing an 'early discharge' approach, as also demonstrated by the results of the multivariable analysis. Interestingly, the use of CoreValve was not associated with an increase of either prolonged hospitalisation as well as arrhythmic events (ie, symptomatic bradycardia, AV blocks) after discharge. This finding is encouraging considering that self-expanding devices are more prone to develop late conductions disturbances.[15] Putting these results into perspective, it is reasonable to assume that as the indications for TAVI will expand into lower risk populations and the complication rates will reduce, this strategy may be adopted always more frequently in the future. However, this strategy should be adopted with caution in order to not compromise the safety of TAVI.

Study limitations

This study has four main limitations: this is not a randomised trial; accurate assessment of frailty was not available in this study. Exclusion of the 29 patients who died in hospital might generate a selection bias in the study. The vast majority (~98%) of patients included in this study underwent transfemoral TAVI under local anaesthesia; whether this strategy could also be adopted in patients undergoing the procedure under general anaesthesia is unknown.

CONCLUSIONS

Early discharge (within 72 h) after transfemoral TAVI is feasible and does not seem to jeopardise the early safety of the procedure, when performed in a subset of patients selected by clinical judgement. Patients undergoing TAVI in unstable haemodynamic compensation and patients experiencing bleeding after the procedure demonstrated to be poorly suitable to this approach, whereas increasing experience in post-TAVI management was associated with a reduction of LoS.

Key messages

What is already known on this subject?
To date, mean hospitalisation length after transcatheter aortic valve implantation (TAVI) is prolonged (about 6–8 days). In many cases physician keep patients into the hospital after TAVI without a real clinical reason. Feasibility and safety of early discharge after TAVI is still largely debated.

What might this study add?
In this study, we demonstrated that early discharge after transfemoral TAVI is feasible and does not seem to jeopardise the early safety of the procedure, when performed in a subset of patients selected by clinical judgement. We also reported variables which might help to identify patients who are poorly suitable to this approach.

How might this impact on clinical practice?
This strategy has the potential to markedly reduce the costs of TAVI and accelerate functional recovery of patients after the procedure.

Correction notice Since the original publication of this manuscript figure 1 has been replaced and the authors Denise Todaro and Emanuela di Simone have been included in the main author list.

Contributors All authors have full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: MB, SI, CS, MP, CT. Manuscript drafting: MB, PC. Acquisition and analysis of data: SC, CT, PA, VB, DDS, Denise Todaro Emanuela Di Simone and SG. Critical revision of the manuscript: DC, GFA, YO, SG, GG, CT. Administrative, technical, and material support: DG and GC.

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Heart

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