

Title<sup>1</sup>

Predictors of postoperative physical functional decline at hospital discharge in elderly patients with prolonged intensive care unit stay after cardiac surgery

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### **Highlights**

- 28.0% of patients who spent  $\geq 72$  h in the ICU following cardiac surgery had postoperative physical functional decline.
- MRC-SS and mechanical ventilation days were independently associated with physical functional decline at hospital discharge.
- MRC-SS at ICU discharge was a useful in predicting postoperative physical functional decline.

### **Conflict of Interest**

The authors have no interest conflicts.

### **Abbreviations:**

ICU, intensive care unit; ICU-AW, ICU-acquired weakness; IQR, interquartile range;

FSS, functional status score; MMSE, Mini-Mental State Examination; MRC-SS,

Medical Research Council sum score; ROC, receiver operating characteristic; SPPB,

Short Physical Performance Battery

## **Abstract**

**Background:** A prolonged stay in the intensive care (ICU) is associated with physical function decline following cardiac surgery. To predict physical function decline after cardiac surgery, it may be important to evaluate physical function in the ICU.

**Objectives:** This study aimed to determine that physical function examination at ICU discharge was independently associated with physical functional decline at hospital discharge in elderly patients who had undergone cardiac surgery and prolonged the ICU stay.

**Methods:** We assessed physical function before and after cardiac surgery in elderly patients who had spent  $\geq 72$  h in the ICU in this retrospective cohort study using the short physical performance battery (SPPB). At hospital discharge, a decrease of at least 1 point on the SPPB was considered a postoperative physical functional decline.

Postoperative physical functional decline at hospital discharge was predicted using multiple logistic regression.

**Results:** We revealed postoperative physical functional deterioration in 28.0% of patients who spent  $\geq 72$  h in the ICU following cardiac surgery. The Medical Research Council sum score (MRC-SS) (OR: 0.96, 95% CI: 0.82–0.99) and mechanical ventilation days (OR: 1.27, 95% CI: 1.01–1.64) were independently associated with physical functional decline at hospital discharge.

**Conclusions:** Physical function at ICU discharge and mechanical ventilation days were predictors of postoperative physical functional decline at hospital discharge in patients. MRC-SS was more accurate in predicting postoperative physical functional decline at hospital discharge when performed at the time of ICU discharge.

**Keywords**

elderly

cardiac rehabilitaion

cardiac surgery

intensive care unit

ICU-AW

physical functional decline

## Introduction

With advancements in surgical technology and perioperative cardiac surgery management, it is now possible to perform cardiac surgery on the elderly over 65 years old and those with comorbidities. Due to the rising prevalence of cardiovascular disease with aging, there are a growing number of elderly patients having cardiac surgery. According to previous research, 20%–30% of elderly patients undergoing cardiac surgery experience postoperative physical functional decline.<sup>1-4</sup> In elderly individuals, physical functional decline is a predictor of long-term impairment or mortality.<sup>2,3,5</sup> Despite the improvement in surgical technology and perioperative management after cardiac surgery, prolonged intensive care unit (ICU) stay is related to poor outcomes.<sup>6</sup> A prolonged stay in the ICU is associated with an elderly patient's risk of physical functional decline following cardiac surgery.<sup>6</sup> According to previous research, the ICU-acquired weakness (ICU-AW) syndrome developed in 40% of critically ill patients who were in the ICU.<sup>7</sup> Physical function and health-related quality of life are significantly impaired over a long period due to ICU-AW syndrome.<sup>8,9</sup> To predict physical function after cardiac surgery, it may therefore be crucial to evaluate postoperative physical function in the ICU.

Age, preoperative gait speed and cognitive function, and postoperative rehabilitation have all been linked to physical function at hospital release following cardiac surgery according to some studies.<sup>4,10</sup> It is unknown how postoperative physical performance in the ICU related to physical function at hospital discharge. The methods for evaluating physical function in the ICU have not yet been standardized, although a number of them have been documented.<sup>11</sup> Our study sought to determine that physical function examination at ICU discharge was independently associated with physical functional

decline at hospital discharge in elderly patients who had been in the ICU for an extended period following cardiac surgery.

## **Methods**

### **Study design and participants**

The patients were recruited from a single retrospective cohort study evaluating predictors of postoperative physical functional decline in older (>65 years) patients having scheduled cardiac surgery. Patients at Hyogo Medical University Hospital in Hyogo, Japan, who had elective cardiac surgery, coronary artery bypass grafting, and/or cardiac valve replacement between April 2017 and March 2021 and spent  $\geq 72$  h in the ICU, were included in the study. Hospital death, postoperative cerebral infarction, severe complications, and missing data were all exclusion criteria. All details were gathered from medical documents. The Hyogo Medical University Research Ethics Committee approved this study, which followed the principles of the Helsinki Declaration for human research, and it was assigned the protocol number 202212-043. To acquire informed consent, we used the opt-out form, which was posted at the hospital or on their website.

### **Definition of Physical functional decline at hospital discharge**

Postoperative physical functional decline was defined as a decrease of at least 1 point on the Short Physical Performance Battery (SPPB) on 1 day before hospital discharge compared to the score on 1 day before cardiac surgery. The SPPB value was generated and computed in accordance with the recommendations. The three tasks that comprise a summary score of 0 to 12 (a higher score indicating better function)<sup>12</sup> are gait speed,

chair rise, and three standing positions. The SPPB is highly standardized geriatric physical functioning test, and it is the highest recommended index in terms of validity, reliability, and responsiveness among the various physical function assessments used clinically in elderly<sup>13</sup>. The SPPB value was generated and computed in accordance with the recommendations. The three tasks that comprise a summary score of 0 to 12 (a higher score indicating better function)<sup>12</sup> are standing balance, gait speed and chair rise. The SPPB was assessed using the SPPB manual<sup>14</sup>. The SPPB was performed by three physiotherapists specialized in cardiac rehabilitation with at least 5 years' clinical experience. These physiotherapists received well in-hospital training on SPPB assessment. A significant change in the SPPB score was defined as one point.<sup>15</sup>

#### Clinical parameters and evaluations

Preoperative and postoperative factors were created using the clinical traits listed below that were gathered from the patients' medical records: age, sex, body mass index (BMI), left ventricular ejection fraction (LVEF), percent predicted vital capacity (%VC), percent predicted forced expiratory volume in 1 second (FEV1%), hemoglobin, creatinine, charlson comorbidity index<sup>16</sup>, type of operation, operation time, volume of blood loss, total fluid balance, postoperative days on mechanical ventilation, length of ICU stay, initiation of postoperative walking, postoperative length of hospital stay, and the incidence of postoperative heart failure, new onset of arrhythmia, major bleeding, and postoperative delirium.<sup>17</sup>

#### Preoperative physical and cognitive function measurement

Handgrip strength and knee extension strength test, and MMSE were measured on 1 day before cardiac surgery by three physiotherapists specialized in cardiac rehabilitation with at least 5 years' clinical experience. Handgrip strength for each hand was measured two times using a hand grip dynamometer (Takei Scientific Instruments Co, Ltd, Tokyo, Japan). Handgrip strength test was performed with participants in the standing position with their arms extended beside their body. The highest value of two attempts of either handgrip strength in each hand was recorded. Handgrip strength value were the average of the highest handgrip strength reading recorded from each hand. Isometric knee extension strength was measured two times using hand-held dynamometer (Anima Corp, Tokyo, Japan). Participants sat in a chair with their hips and knees flexed to 90. The hand-held dynamometer sensor was secured to fixed to the front of the leg using a traction belt placed between the ankle level of the lower leg and the chair. The highest value of two attempts of either knee extension strength in each leg was recorded. Knee extension strength value were the average of the highest knee extension strength reading recorded from each leg and divided by body weight. The Mini-Mental State Examination (MMSE) was used to assess preoperative cognitive performance. MMSE is one of the most popular tools used for cognitive impairment diagnosis.<sup>18</sup>

Functional status score for the ICU and Medical Research Council sum score



Functional status score for the ICU (FSS-ICU)<sup>11,19</sup> evaluates five functional tasks that are appropriate and practicable in the ICU setting, such as rolling, supine to sit transfer, unsupported sitting, sit to stand transfer, and ambulation. The five activities are evaluated using a seven-point scoring system in the functional independence measure. The total score ranged from 0 to 35, with higher scores indicating greater function. In MRC-SS,<sup>20,21</sup> the strength of each muscle group in the upper and lower limbs is rated using a total score range of 0 to 60. Each muscle group was assigned a score ranging from 0 to 5, with higher scores indicating stronger muscles. MRC-SS and FSS-ICU were evaluated on the day of ICU discharge. FSS-ICU and MRC-ss were performed by three physiotherapists specialized in cardiac rehabilitation with at least 5 years' clinical experience. These physiotherapists received well in-hospital training on FSS-ICU and MRC-ss assessment.

#### Cardiac rehabilitation

The recommendations of the Japanese Circulation Society served as the foundation for the postoperative functional rehabilitation program and the exercise intensity standards.<sup>22</sup> Patients participated in active or inactive extremity exercise while lying in bed, sitting on the edge of the bed, standing by the bed, or simply walking around the bed in the hospital's postoperative cardiac rehabilitation program. Patients continued to walk for up to 300 meters and engage in endurance exercises on a stationary cycle or treadmill in the rehabilitation center until they were discharged. According to the standards for assessing the outcomes of exercise stress tests, postoperative cardiac rehabilitation progress was conducted.<sup>22</sup>

## Statistical analysis

When SPPB was compared before and after cardiac surgery, two groups of subjects were identified: “postoperative physical functional decline,” defined as a decrease of at least one point on SPPB at hospital discharge compared to the score before the cardiac surgery, and “nonpostoperative physical functional decline,” defined as maintenance or improvement on SPPB at hospital discharge compared to the score before the cardiac surgery.<sup>15</sup>

Mean and standard deviation were used to show the results of parametric data. Nonparametric data were analyzed using the median and interquartile range (IQR). For categorical factors, the proportion was used. In the univariate analysis, the Mann–Whitney U-test, or the chi-squared test for categorical covariates were used to analyze the two groups. Comparing sex, operation type, and postoperative complications was performed using the chi-squared test. The Mann–Whitney U-test was used to compare the SPPB, standing balance test, 4 meter walk, 5 chair stands, MMSE, MRC-SS, FSS-ICU, charlson comorbidity index, mechanical ventilation days, duration of ICU stay, initiation of postoperative walking, and length of hospital stay. The student t-test was used to compare age, LVEF, %VC, FEV1%, hemoglobin, creatinine, BMI, handgrip strength, knee extension strength, operation time, blood loss volume, and overall fluid balance.

Standardized effect size was used to assess the index responsiveness’s magnitude. Minor, medium, and large degrees of responsiveness correspond to 0.2, 0.5, and 0.8, respectively, according to the definition of Cohen’s d.<sup>23,24</sup> According to the definitions of the Phi coefficient and Pearson’s correlation coefficient, 0.2, 0.3, and 0.5 represent small, intermediate, and large degrees of responsiveness, respectively.<sup>23,24</sup>

In the multivariate analysis, multiple logistic regression, coded as 0 for nonpostoperative physical functional decline and 1 for postoperative physical functional decline, was used to predict postoperative physical functional decline at hospital discharge. FFS-ICU and MRC-SS were included, along with any factors with a p value of  $<0.05$  in the univariate analysis. Multiple logistic regression excluded the factors treated as multicollinear. To ascertain the AUC of factors extracted by multiple logistic regression, ROC curve analysis was performed. Using Youden-index quantification, the optimal cutoff values for predicting postoperative physical functional decline at hospital discharge were discovered. Throughout, a p value of 0.05 or lower was regarded as statistically significant. Statistical Package for Social Sciences version 21.0 was used for all statistical studies.

## **Results**

As shown in Figure 1, 180 prospective patients who have required an ICU stay of  $\geq 72$  h were selected for the study, but 69 had to be excluded because of missing data ( $n=62$ ), severe postoperative complications ( $n=4$ ) and death in hospital ( $n=3$ ). 111 individuals were analyzed as a result. In total, 33 (28.0%) were classified as having physical functional decline at hospital discharge, while 78 (72.0%) were classified as having nonpostoperative physical functional decline.

The SPPB scores are shown in Table 1. The discharge SPPB score of the postoperative physical functional decline group was significantly lower than that of the

nonpostoperative physical functional decline group (12, IQR; 11–12 vs. 10, IQR; 7.75–11,  $p = 0.01$ ).

Table 2 displays the preoperative features and postoperative data of the patients.

Preoperative MMSE ( $p = 0.01$ ,  $r = 0.23$ ), creatinine ( $p = 0.03$ ,  $d = 0.53$ ), and %VC ( $p < 0.01$ ,  $d = 0.65$ ) in the postoperative physical functional decline group were all considerably lower. The types of operations did not vary significantly.

In those patients whose physical function declined postoperatively, on the other hand, had significantly delayed postoperative walking ( $p < 0.01$ ,  $r = 0.29$ ), longer operation time ( $p < 0.01$ ,  $d = 0.85$ ), mechanical ventilation days ( $p < 0.01$ ,  $r = 0.33$ ), ICU stay ( $p < 0.01$ ,  $r = 0.35$ ), and postoperative length of hospital stay ( $p < 0.01$ ,  $r = 0.29$ ). Total fluid balance was also higher ( $p < 0.01$ ,  $d = 0.67$ ), and MRC-SS ( $p < 0.01$ ,  $r = 0.43$ ) and FSS-ICU ( $p < 0.01$ ,  $d = 0.33$ ) were lower. The postoperative physical functional decline group also experienced a substantially higher incidence of postoperative delirium ( $p = 0.04$ ,  $\phi = 0.19$ ).

The patients' preoperative characteristics and postoperative data included the start of postoperative walking, postoperative delirium, the MMSE, %VC, creatinine, MRC-SS, FSS-ICU, operation time, total fluid balance, mechanical ventilation days, length of ICU stay, and five chair stands before surgery. Because of the anticipated multicollinearity with mechanical ventilation days, the multivariate analysis omitted the length of the ICU stay (variance inflation factor;  $VIF = 5.37$ ) and the start of postoperative walking ( $VIF = 4.37$ ). Five chair stands before surgery, the MMSE, %VC, creatinine, MRC-SS, FSS-ICU, mechanical ventilation days, delirium, operation length, and overall fluid balance were therefore included in the multivariate analysis. Table 3 displays the outcomes of multiple logistic regression for postoperative physical

functional decline at hospital release. As a result, postoperative physical functional decline was independently associated with MRC-SS (OR: 0.90, 95% CI: 0.82–0.99) and mechanical ventilation days (OR: 1.27, 95% CI: 1.00–1.61) at hospital discharge. ROC curve analysis was used to establish that an MRC-SS of 47/48 points was the cutoff value for postoperative physical functional decline at discharge, with a sensitivity of 88.5%, specificity of 75.8%, and an AUC of 0.80 (Figure 2A). With a sensitivity of 39.4%, specificity of 92.3%, and AUC of 0.71, the cutoff number for mechanical ventilation day was 3.0/4.0 days (Figure 2B).

## **Discussion**

The aim of this retrospective study to identify predictors of postoperative physical functional decline at hospital discharge in elderly patients who required an ICU stay of  $\geq 72$  h after cardiac surgery. According to our knowledge, this study was the first to investigate the link between physical function at ICU discharge and physical functional decline at hospital discharge. We found that MRC-SS during ICU discharge and mechanical ventilation days was independently correlated with postoperative physical functional decline at hospital discharge. Our research indicates that physical function assessment at ICU discharge can help forecast physical function decline at discharge. We discovered that 28.0% of elderly patients who needed an ICU stay of  $\geq 72$  h following cardiac surgery had diminished physical function when they were released from the hospital. Our study was consistent with a previous study reported that the prevalence of hospital-acquired disability in elderly patients was 30%.<sup>25</sup> In this study, we used FSS-ICU and MRC-SS, which have been widely used, as indices for the evaluation of physical function in the ICU. At hospital release, physical

functional decline was strongly predicted by the MRC-SS. In this research, the MRC-SS cutoff of 47/48 points was used, just like for ICU-AW<sup>26</sup>. Our findings indicate that physical functional decline at hospital discharge following cardiac surgery was associated with ICU-AW. Long-term mortality and increased morbidity after hospital release have been linked to prolonged ICU stays.<sup>27</sup> It was estimated that 40% of critically ill patients developed ICU-AW.<sup>7</sup> Among the conditions covered by ICU-AW are polyneuropathy, myopathy, and muscular atrophy, all of which can worsen long-term physical performance and quality of life in terms of health.<sup>28</sup> For patients in the ICU, early mobilization is linked to improved physical function.<sup>29</sup> In addition, the Japanese Circulation Society guidelines recommend promoting patients to begin walking after cardiac surgery as soon as feasible.<sup>22</sup> Benefits of early mobilization include decreased mechanical ventilation days, decreased hospital duration of stay, and functional outcomes, according to several studies.<sup>30-32</sup> The start of walking around the bed and a significant delay in mechanical ventilation days were observed in the postoperative physical functional decline group. During the acute period, delayed mechanical ventilation days and ambulation encourage immobility and restrict the recovery of physical function. In light of this, it is possible that the marked decline in physical function at ICU discharge hindered the success of subsequent rehabilitation and halted the return to physical function. ICU-AW in elderly patients with extended ICU stay after cardiac surgery may worsen their long-term functional outcome and impair their physical function when at hospital discharge. To prevent a decline in physical function at hospital discharge after cardiac surgery, physical function assessment at ICU discharge is appropriate for reconstructing rehabilitation after ICU discharge. In the univariate analysis, the FSS-ICU was found to be a relevant factor, but

in the multivariate analysis, it was not. Five functional activities of daily living were evaluated using the FSS-ICU in an ICU setting.<sup>11,12,15,19</sup> Drainage after cardiac surgery is frequently long-term, limiting the postoperatively patient's independent physical activity and ambulation.<sup>33</sup> As a result, FSS-ICU was less associated with physical function at hospital discharge. Therefore, we hypothesized that MRC-SS would be a more useful technique for predicting functional decline in elderly patients with long ICU stays after cardiac surgery.

In the current research, mechanical ventilation days were also linked to physical functional decline at hospital discharge. The period of ventilation and ICU stay were significantly longer in the group with postoperative physical functional decline. To ensure patient survival, the ICU frequently focuses on circulatory, respiratory, and renal function therapy. Therefore, most patients on ventilators are given sedative and analgesics. However, prolonged periods of inactivity and restricted physical exercise can result in ICU-AW, which seriously impairs physical function.<sup>34,35</sup>

#### Study limitations

First, the generalizability of our results may be limited because they were based on data from a singular tertiary care facility. Second, the sample size was also limited, with only 111 cases. This was inadequate for evaluating predictors of postoperative functional decline by multivariate analysis, as were the 33 patients with postoperative functional decline at hospital discharge. Third, it is not suitable for all patients because severe cases necessitated a minimum 72-hour stay in the ICU following cardiac surgery.

However, patients who have a prolonged stay in the ICU should use prevention techniques to avoid postoperative functional decline. Fourth, patients with serious complications and hospital deaths were not included. Therefore, patients with severe complications were not considered. Fifth, there were variations in each patient's duration of hospital stay. The postoperative cardiac rehabilitation intervention time was longer with longer hospital stays. As a result, physical function recovery at hospital discharge varied depending on the length of the hospital stay. Finally, since this study is a retrospective study, the intra- and inter- rater reliability of each measurement were not examined.

## **Conclusion**

Physical function during ICU discharge and mechanical ventilation days were predictors of postoperative physical functional decline at hospital discharge in elderly patients with prolonged ICU stays following cardiac surgery. It was discovered that MRC-SS at ICU discharge was more useful in predicting postoperative physical functional decline.

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### **Availability of the data**

The data is available by e-mail on request from the corresponding author.

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## Figure Legends

Figure 1. Flow chart of program enrollment.

Figure 2. Receiver operating characteristic (ROC) curve analysis. (A) ROC curve shows MRC-SS cutoff at 47/48 points with sensitivity 75.7%, specificity 88.4%, and AUC 0.79. (B) ROC curve shows mechanical ventilation days cutoff at 2/3 days with sensitivity 54.5%, specificity 82.1%, and AUC 0.71. AUC, area under the curve; MRC-SS, Medical Research Council sum score.

## Tables

Table 1. SPPB score

	Before surgery				At hospital discharge			
	Nonpostoperative physical functional decline group (n = 78)	Postoperative physical functional decline group (n = 33)	P value	Effect size	Nonpostoperative physical functional decline group (n = 78)	Postoperative physical functional decline group (n = 33)	P value	Effect size
SPPB total score, points	12 (10–12)	11 (9.5–12)	0.15	r = 0.13	12 (11–12)	10 (7.75–11)	<0.01	r = 0.57
Standing balance test, points	4 (3.75–4)	4 (3–4)	0.38	r = 0.08	4 (4–4)	3 (3–4)	<0.01	r = 0.36
4m walk, sec	4.15 (1.70)	4.75 (2.17)	0.16	d = 0.32	3.95 (1.04)	5.68 (2.38)	<0.01	d = 1.11
4m walk, points	4 (4–4)	4 (3–4)	0.14	r = 0.14	4 (4–4)	3 (2.5–4)	<0.01	r = 0.43
5 chair stands, sec	9.73 (2.86)	10.38 (3.26)	0.01	d = 0.22	9.85 (3.10)	15.8 (6.44)	<0.01	d = 1.37
5 chair stands, points	4 (4–4)	4 (3–4)	0.25	r = 0.18	4 (4–4)	2 (1–3)	<0.01	r = 0.56

SPPB, Short Physical Performance Battery.



Table 2. Study participants' preoperative characteristics and postoperative data.

	Nonpostoperative physical functional decline group (n = 78)	Postoperative physical functional decline group (n = 33)	P value	Effect size
Age, years	73.9 (5.5)	75.1 (5.1)	0.26	d = 0.22
Sex, women, n (%)	26 (33%)	12 (36%)	0.75	φ = 0.02
MMSE, points	29 (27–30)	27.5 (26–30)	0.01	r = 0.23
LVEF, %	58.9 (12.3)	58.2 (15.0)	0.83	d = 0.05
%VC, %	95.2 (15.5)	84.8 (16.8)	<0.01	d = 0.65
FEV1%, %	76.3 (10.9)	73.7 (10.4)	0.11	d = 0.24
BMI, kg/m <sup>2</sup>	23.1 (4.3)	22.1 (3.7)	0.23	d = 0.24
Handgrip strength, kg	25.2 (8.0)	22.4 (7.7)	0.08	d = 0.35
Knee extension strength, kgf/kg	0.45 (0.14)	0.40 (0.13)	0.08	d = 0.36
Charlson comorbidity index, points	4 (3-5)	5 (3.5-6.5)	0.19	r = 0.12
Hemoglobin, g/dl	12.6 (2.0)	11.6 (2.6)	0.05	d = 0.46
Creatinine, mg/dl	1.49 (1.84)	2.63 (2.80)	0.03	d = 0.53
CABG, n (%)	32 (41%)	12 (36%)	0.64	φ = 0.04
Valve surgery, n (%)	22 (27%)	7 (21%)	0.74	φ = 0.03
Multiple valve surgery, n (%)	10 (12%)	7 (21%)	0.26	φ = 0.10
CABG + valve surgery, n (%)	14 (17%)	7 (21%)	0.68	φ = 0.03
Operation time, min	324.0 (74.8)	390.6(85.0)	0.01	d = 0.85
Blood loss volume, ml	537.8 (684.3)	620.8(771.2)	0.60	d = 0.12
Total fluid balance, ml	4080.9 (1857.0)	5793.0(3712.6)	0.01	d = 0.67

Postoperative heart failure, n (%)	7 (8%)	6 (18%)	0.16	$\phi = 0.13$
Postoperative arrhythmia, n (%)	28 (35%)	12 (36%)	0.96	$\phi = 0.01$
Major bleeding, n (%)	5 (6%)	5 (15%)	0.14	$\phi = 0.14$
Postoperative delirium, n (%)	2 (2%)	4 (12%)	0.04	$\phi = 0.19$
Mechanical ventilation days, days	1 (0–1)	2 (1–6)	<0.01	$r = 0.33$
Length of ICU stay, days	5 (4–6)	6 (5–9.5)	<0.01	$r = 0.35$
Initiation of postoperative walking, days	4 (3–5)	5 (4–9.5)	<0.01	$r = 0.29$
FSS-ICU, points	27 (25–29)	21.5 (21–26)	<0.01	$r = 0.33$
MRC-SS, points	52 (48.75–56)	44.5 (38.5–47.5)	<0.01	$r = 0.43$
Length of hospital stay, days	21 (16–28)	28 (20.5–39.5)	<0.01	$r = 0.29$

MMSE, Mini-Mental State Examination; BMI, body mass index; LVEF, left ventricular ejection fraction; %VC, percentage vital capacity; FEV1%, forced expiratory volume 1 second percent; ICU, intensive care unit; CABG, coronary artery bypass grafting; MRC-SS, Medical Research Council sum score; FSS-ICU, functional status score for the intensive care unit.

Table 3. Results of multiple logistic regression of physical functional decline at hospital discharge.

Variable	OR	95% CI	P value
5 chair stands before surgery	1.13	0.93–1.36	1.20
MMSE	0.94	0.75–1.17	0.59
%VC	0.96	0.75–1.00	0.07
creatinine	1.24	0.97–1.58	0.08
MRC-SS	0.90	0.82–0.99	0.04
FSS-ICU	0.98	0.85–1.14	0.85
Mechanical ventilation days	1.27	1.01–1.61	0.03
Delirium	1.05	0.08–13.9	0.96
Operation time	1.00	0.99–1.01	0.19
Total fluid balance	1.00	1.00–1.00	0.73

MMSE, Mini-Mental State Examination; MRC-SS, Medical Research Council sum score; %VC, percent vital capacity; FSS-ICU, functional status score for the intensive care unit.

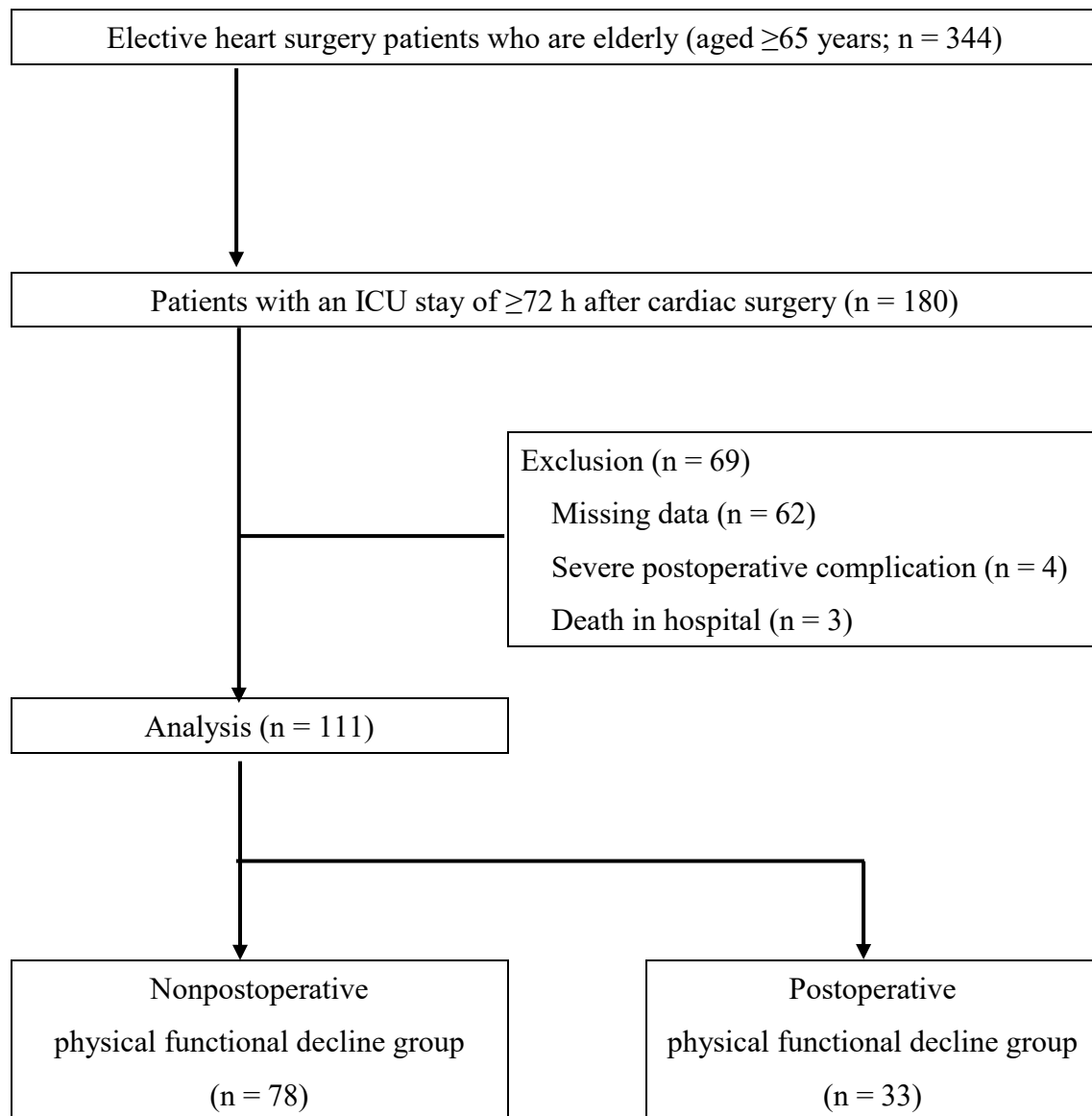
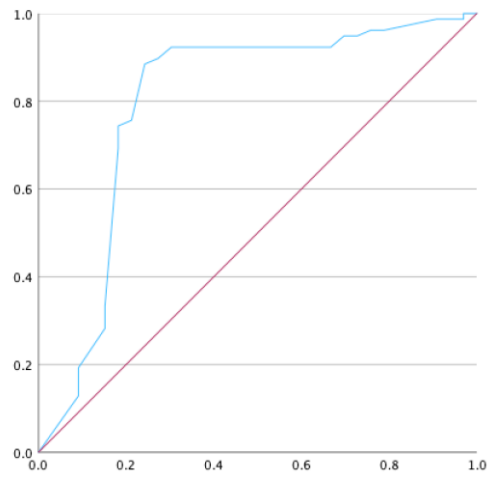


Figure 1

A. MRC-SS



B. Mechanical ventilation days

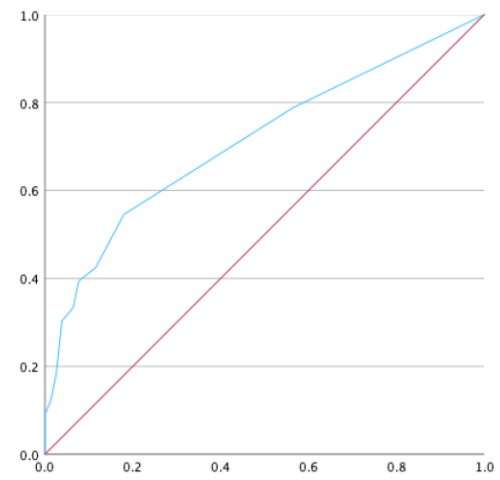


Figure 2