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COMPREHENSIVE ASSESSMENT OF FRAILITY SCORE AS A TOOL TO ASSESS POTENTIAL RECOVERY IN CARDIAC SURGERY

To the Editor:

We read with great interest the recent article by Yanagawa and colleagues.¹ The authors conclude that routine frailty assessments should be implemented in cardiac surgery, and that we need to develop better tools with long-term outcome measures to assess potential recovery.

To do that, we used the comprehensive assessment of frailty (CAF) score that was implemented by Sündermann and colleagues in the past in cardiac surgery and was found to be an effective predictor of 30-day and 1-year mortality.^{2,3} We applied this tool to assess recovery after surgery in 65 patients using hospitalization length as a surrogate marker.

The CAF score is composed of the following factors:

- Body mass index;
- Laboratory tests, including albumin and creatinine;
- Forced expiratory volume in 1 second;
- Exhaustion phenotype, which is estimated using questions and calculation of the weekly energy used by a patient in physical activities;
- Weakness, which is measured by assessing grip strength;
- Slowness of gait speed, which is measured in meters per second by assessing the time to walk 4 m at usual gait speed; and
- Physical performance test, which is assessed by testing standing balance, chair rise, putting on and removing a jacket, picking up a pen from the floor, and turning 360°.

All the different scores are added in a specific manner into a single number and the final score is then stratified into 3 groups: not frail (1-10 points), moderately frail (11-25 points), and severely frail (26-35 points).^{2,3}

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TABLE 1. Patient characteristics segregated by comprehensive assessment of frailty (CAF) score

	Low CAF	High CAF	P value
n	43	22	
Age	66.67 ± 8.74	65.45 ± 10.04	.614
Female sex (%)	1 (2.3)	4 (18.2)	.075
BMI	27.06 ± 3.81	26.85 ± 4.74	.862
Prior angina (%)	36 (85.7)	16 (76.2)	.557
History of myocardial infarction (%)	5 (11.6)	1 (4.5)	.631
History of congestive heart failure (%)	18 (41.9)	11 (50.0)	.718
History of CVA or TIA (%)	6 (14.0)	1 (4.5)	.462
Prior PCI (%)	14 (32.6)	6 (27.3)	.878
Prox LAD (%)	8 (42.1)	1 (7.7)	.084
Mid to distal LAD (%)	2 (15.4)	1 (7.7)	1.000
Prox CX (%)	2 (14.3)	2 (14.3)	1.000
Mid CX or OM (%)	1 (8.3)	0 (0.0)	.967
Prox RCA (%)	4 (28.6)	2 (14.3)	.645
Mid RCA/PDA (%)	0 (0.0)	0 (0.0)	NaN
LM (%)	0 (0.0)	0 (0.0)	NaN
History of atrial fibrillation or flutter (%)	2 (4.8)	4 (19.0)	.172
Implantable cardioverter defibrillator/cardiac resynchronization therapy (%)	0 (0.0)	0 (0.0)	NaN
History of PVD (%)	8 (19.0)	3 (13.6)	.844
History of hypertension (%)	32 (74.4)	19 (86.4)	.430
History of hyperlipidemia (%)	28 (65.1)	14 (63.6)	1.000
Family history of CAD (%)	5 (23.8)	0 (0.0)	.245
History of diabetes mellitus (%)	19 (44.2)	13 (59.1)	.381
Former smoker (%)	23 (53.5)	10 (45.5)	.726
History of renal impairment (%)	6 (14.0)	3 (13.6)	1.000
History of malignancy (%)	2 (4.7)	6 (28.6)	.021
History of COPD (%)	1 (2.3)	3 (14.3)	.192
History of CABG (%)	3 (7.0)	1 (4.8)	1.000
History of valve surgery (%)	0 (0.0)	3 (14.3)	.056
History of heart surgery (%)	2 (6.1)	3 (17.6)	.426
Active depression (%)	2 (4.9)	1 (4.8)	1.000
CABG, no valve (%)	32 (74.4)	10 (45.5)	.042
Valve, no CABG (%)	5 (11.6)	6 (27.3)	.214
CABG and valve (%)	6 (14.0)	6 (27.3)	.331

Values are presented as n, mean ± standard deviation, or n (%). CAF, Comprehensive assessment of frailty; BMI, body mass index; CVA, cardiovascular accident; TIA, transient ischemic attack; PCI, percutaneous coronary intervention; Prox LAD, left anterior descending; Prox CX, circumflex; OM, obtuse marginal; Prox RCA, right coronary artery; Mid RCA/PDA, right coronary artery/posterior descending artery; NaN, not a number; LM, left main; PVD, peripheral vascular disease; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; CABG, coronary artery bypass graft.

FIGURE 1. Postprocedure hospitalization days segregated by comprehensive assessment of frailty (CAF) score.

We divided the groups into high (>10) and low (<10) CAF scores and evaluated differences in demographic parameters and hospitalization length; although no demographic parameter differences were found between the groups (Table 1), a statistically significant difference was found in hospitalization length (5 days on average for the low CAF score group and 7 days on average for the high CAF score group) (Figure 1).

The CAF score is a complicated score to use on a daily basis in cardiac surgery, yet the score's ability to predict both 30-day and 1-year mortality as well as hospitalization length as a marker for postoperative recovery suggests its importance. We suggest that future, larger randomized studies should reduce the CAF score to the minimal variables needed to achieve the same added value while making it more user friendly.

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 DECISION ALGORITHM:
 IF IT'S TOO
 COMPLICATED, WE
 WON'T REMEMBER IT,
 IF IT'S TOO HARD, WE
 WON'T USE IT**

Reply to the Editor:

We thank Barac and colleagues¹ for their interest in our work and for sharing their experiences with use of the comprehensive assessment of frailty (CAF) tool to predict duration of hospitalization as a measure of recovery after cardiac surgery. We agree that the development of clinical prediction scores that incorporate frailty measures are urgently needed.² Rapid advances in medical informatics will make available patient data from larger and larger databases to develop such scores for vulnerable subpopulations. But this is just the first step. We also need external validation of existing scores, as attempted by Riley and colleagues.³ External validation tests the performance—specifically discrimination and calibration—in a patient cohort external to that used for model development to examine the reliability of a model's prediction. Comparative studies of clinical prediction scores will help to identify the model with the best predictive performance across diverse clinical settings and populations. Barac and colleagues¹ correctly state that we can experiment with existing clinical prediction scores by the addition or subtraction of predictors to improve usability and predictive power. We need champions to implement clinical prediction scores to improve decision making. Finally, we need studies that demonstrate improvement in clinical outcomes when using a clinical prediction score.

Any clinical prediction score needs to be fast, simple, and powerful. Most of us use the Framingham Risk Score, but we do not know many surgeons who routinely calculate the SYNTAX score!

As for the CAF, it is a complicated score for daily use. The CAF combines body mass index measurements, a patient survey, routine blood tests, and specialized tests such as pulmonary function testing as well as physical performance tests. A reasonable estimate to complete this patient evaluation would likely exceed 30 minutes to an hour per patient, which is not feasible outside of research contexts. Further, one needs to obtain formal pulmonary function tests, which are not routinely obtained for most patients.