**Annex A: Inclusion and exclusion criteria**

Inclusion criteria

* Bernstein-Parsonnet score > 7
* Age ≥ 18 years and ≤ 80 years
* Written informed consent to participate to the study
* Severe aortic stenosis (aortic valve area < 0.5 cm2/m2) scheduled for aortic valve replacement or coronary heart disease with poor left ventricular function (systolic function [ejection fraction < 40%], diastolic dysfunction [restrictive pattern, abnormal relaxation]) and/or previous/current heart failure, scheduled for coronary artery bypass grafting

#### Exclusion criteria

* Dementia or inability to understand the study protocol
* Off-pump and emergent cardiac surgery
* Poorly controlled diabetes mellitus (glucose > 12 or < 3 mM/L ≥ 3 episodes/week)
* Atrial fibrillation
* Severe renal insufficiency: creatinine clearance < 20 ml/min
* Abnormal liver function Child-Plugh – C stage
* Associated mitral valve surgery or ascending aortic root replacement
* Body Mass Index < 18 and > 35
* Critical preoperative state (ICU patient, preoperative cardiac massage, preoperative ventilation, preoperative inotropes or intra-aortic balloon pump)

Calculation of the Bernstein-Parsonnet score:

|  |  |
| --- | --- |
| **Risk Factor** | **Assigned weight** |
| Female gender | 1 |
| Morbid obesity | 3 |
| Diabetes | 3 |
| Hypertension | 3 |
| Chronic pulmonary obstructive disease | 5 |
| Peripheral arterial disease | 2 |
| Antiplatelet therapy | 2 |
| Mean pulmonary pressure > 30 mmHg | 10 |
| Ejection fraction |  |
| ≥ 50 | 0 |
| 30–49%  | 2 |
| < 30% | 4 |
| Age |  |
| 70–74 | 7 |
| 75–79 | 12 |
| > 80 | 20 |
| Aortic surgery | 5 |
| Combined surgery | 7 |
| Reoperation | 5 |

**Annex B: Standardized approach for weaning from bypass**

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**Annex C: modified classification system of postoperative complications**[**1**](#_ENREF_1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Cardiovascular** | **Pulmonary** | **Renal** | **Others** |
| **Grade I** Transient, self-limiting AE  | 1. Non-sustained arrhythmias
2. Hypotension associated with anesthesia induction or mild hypovolemia
 | Mild hypoxemia responsive to O2 therapy (< 0.3 FIO2) | < 25% decrease in eGFR |  |
|  |  |  |  |  |
| **Grade II** AE requiring pharmacologic treatment or minor intervention | 1. Arrhythmias requiring pharmacologic treatment
2. Hypotension associated with mild hypovolemia
 | Moderate hypoxemia, atelectasis requiring CPAP support  |  | Superficial surgical site infection (SSI) |
|  |  |  |  |  |
| **Grade IIIa** AE event requiring intervention without sedation/general anesthesia or potentially causing disability | 1. Arrhythmias requiring electrical cardioversion
2. Hypovolemia requiring aggressive fluid management
3. Myocardial ischemia
4. Transient cerebral ischemia
 | 1. Atelectasis requiring bronchoscopy or intense chest therapy
2. Moderate-severe Hypoxemia requiring NIV support
3. Pneumonia
 | 25-50% decrease in eGFR | Deep SSI |
|  |  |  |  |  |
| **Grade IIIb** AE requiring intervention under sedation/general anesthesia or causing disability | 1. Myocardial infarct
2. Stroke
3. New or worsening heart failure, LCOS requiring pharmacological support (1 drug)
 | Severe hypoxemia requiring NIV support (ALI/ARDS, pneumonia, heart failure, muscle failure) | > 50% decrease in eGFR | Mediastinitis |
|  |  |  |  |  |
| **Grade IVa** Admission in ICU for single organ dysfunction  | 1. New or worsening heart failure, LCOS requiring intense pharmacological support (≥ 2 drugs) and/or mechanical assistance
2. Recurrent or sustained arrhythmias
3. Myocardial ischemia/infarct (extensive)
 | Severe hypoxemia requiring intubation and mechanical ventilator support (ALI/ARDS, pneumonia, heart failure, muscle failure) | Renal failure requiring hemodialysis or hemofiltration |  |
|  |  |  |  |  |
| **Grade IVb**  | Cardiac arrest with resuscitation  |  |  | Combined organ dysfunction |

AE: adverse event; eGFR: estimated glomerular filtration rate; CPAP: continuous positive airway pressure; NIV: Non-invasive ventilation; ALI: acute lung injury; ARDS: acute respiratory distress syndrome; LCOS: low cardiac output syndrome

**Secondary outcome definitions in the study (≥ grade II)**

Myocardial infarct: modified myocardial infarct type 5 definition (post coronary artery bypass grafting (CABG))[2](#_ENREF_2) :

1. cTn values >10x99th percentile during the first 48 h following surgery
2. with one or more items:

(i) new pathological ECG changes (Q-waves, new left bundle branch block, ST-segment abnormalities), [10 patients]

 (ii) angiographically documented new graft or new native coronary artery occlusion, [3 patients]

 (iii) imaging evidence of new loss of viable myocardium, new regional wall motion abnormality, or right or left heart dysfunction (TEE or TTE) [21 patients]

(iv) typical chest pain [1 patient]

New or worsening left ventricular failure: radiological evidence of pulmonary congestion and need for sympathomimetic support, and diuretics/vasodilators

Stroke: focal neurological deficit (transient or permanent)

Atrial fibrillation: atrial fibrillation on ECG requiring anti-arrhythmic medications and/or electrical cardioversion during the ICU stay

Atelectasis: Lobar collapse (Chest-X rays) and need for O2 therapy, CPAP/NIV and/or bronchoscopy

Pneumonia: new or progressive radiographic infiltrate (chest X-ray or computed tomography) plus at least two of the following: antibiotic treatment, central temperature > 38°C, leukocytosis or leucopenia (white blood cell count < 4,000cells/mm3 or > 12,000cells/mm3) and/or purulent secretions[3](#_ENREF_3)

**References**

1. Seely AJ, Ivanovic J, Threader J, et al. Systematic classification of morbidity and mortality after thoracic surgery. *Ann Thorac Surg.* 2010;90(3):936-942; discussion 942.

2. Thygesen K, Alpert JS, Jaffe AS, et al. Third universal definition of myocardial infarction. *Circulation.* 2012;126(16):2020-2035.

3. Hemmes SN, de Abreu MG, Pelosi P, Schultz MJ. ESA Clinical Trials Network 2012: LAS VEGAS--Local Assessment of Ventilatory Management during General Anaesthesia for Surgery and its effects on Postoperative Pulmonary Complications: a prospective, observational, international, multicentre cohort study. *European journal of anaesthesiology.* 2013;30(5):205-207.