### 1. Fellowship Information

<table>
<thead>
<tr>
<th>Basic Fellowship in Cardiothoracic and Vascular Anaesthesia</th>
<th>Advanced Fellowship in Cardiothoracic and Vascular Anaesthesia</th>
</tr>
</thead>
</table>

### 2. Institution Name

- **Address**: Vita-Salute San Raffaele University, Milan, Italy
  - **Website**: [https://www.unisr.it/en/](https://www.unisr.it/en/)
  - **Country**: Italy
  - **City**: Milano

### 3. Chair Name

- **First name**: Alberto
- **Last name**: Zangrillo
- **Email**: zangrillo.alberto@hsr.it
- **Phone**: +39 02 264321

### 4. Programme Director

- **First name**: Giovanni
- **Last name**: Landoni
- **MD 1996, Anesthesiologist and Intensive Care Specialist 2000**
- **Board Certification**
  - EACTA membership: Yes
  - ESA membership: Yes
  - Societies membership: Yes
- **Email**: landoni.giovanni@hsr.it

### Mailing Address

- **Street**: Via Olgettina 60
- **City**: Milano
- **Country**: Italy
- **Zip code**: 20132

### 5. Candidate’s requirements

- **Language requirements**: The fellow must be proficient in Italian language (B2 LEVEL is required). If the candidate is proficient in English or in Spanish (B2 LEVEL is required) he will be asked to study and learn Italian within the first 8 weeks after the beginning of the fellowship.

### 6. General Programme Information

- **Aims, goals and objectives of the Fellowship Programme**

  The aim of the Fellowship Programme is to train anaesthesiologists of any country of origin, religion or gender who have finished their residency training to become proficient in cardiothoracic and vascular anaesthesia. The fellow will have the opportunity to gain extensive experience in the fields of cardiac, thoracic and vascular anaesthesia and intensive care medicine. After completion of the programme, they will be able to work independently as consultants in cardiac, thoracic and vascular anaesthesia.

### Preferred Duration

- **Of note**: The training period should not be interrupted by frequent and/or prolonged periods of attendance to other divisions/departments.

- **Preferred Programme Training**
  - **Type of fellowship training available**: Clinical / Clinical Research
  - **Start**: Month / Day
  - **End**: Month / Day
  - **Comments**: Yes / No

### Offered Advanced Training

- **Type of fellowship training available**: Advanced Training
  - **Comments**: Yes / No

### 7. Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>EACTA member</th>
<th>Certification in Cardiothoracic and Vascular Anaesthesia</th>
<th>Additional Qualifications</th>
<th>Email address</th>
<th>Contact address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberto Zangrillo</td>
<td>Yes</td>
<td>Prof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giovanni Landoni</td>
<td>Yes</td>
<td>Prof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabrizio Monaco</td>
<td>Yes</td>
<td>Prof</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martina Crivellari</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Publications

- Landoni G = 412 publications in PUBMED
- Zangrillo A = 380 publications in PUBMED
2. Resources

Check if each of the following is available at the host centre.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Yes/No</th>
<th>Number / Number per week</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Health insurance and out-of-pocket costs</em></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><em>Number of ICU beds dedicated to CTV patients</em></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><em>Is there an emergency department in which cardiovascular patients are managed 24 hours a day?</em></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><em>Is there a post anaesthesia care unit in the anaesthesia unit that provides additional care to CTV patients?</em></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td><em>Is there monitoring and advanced life support equipment representative of current levels of technology?</em></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><em>Anesthesia Operating Rooms</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Thoracic Operating Rooms</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Cardiac Operating Rooms</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Interventional Labs</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Electrophysiology Labs</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Radiology Labs</em></td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td><em>Interventional Vascular Labs</em></td>
<td>Yes</td>
<td>4</td>
</tr>
</tbody>
</table>

Landoni G = 417 publications in PUBMED
Zangrillo A = 380 publications in PUBMED

9. Clinical Skills and Responsibilities

Will your Programme offer a 12-24 months of fellowship education in fundamental clinical skills of medicine relevant to the practice of CTV? Yes

If yes, for each rotation or experience below, specify the duration (in months, four weeks = one month) during the 12-24 months of education in fundamental clinical skills.

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Number of performed procedures/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute and Chronic Pain Management for CTV patients</td>
<td>100 cases / 7 month for basic / 4-6 month for advanced</td>
</tr>
<tr>
<td>Interventional Cardiac Catheterisation</td>
<td>50 cases / 3 month / 6 month for advanced</td>
</tr>
<tr>
<td>Electrophysiology Lab (e.g. mapping, ablation, pacemakers, ICDs)</td>
<td>1250 cases / 7 month for basic / 4-6 month for advanced</td>
</tr>
<tr>
<td>Electrophysiology Lab</td>
<td>350 cases / 0.5 month</td>
</tr>
<tr>
<td>Interventional Cardiac Catheterisation Lab (e.g. hemodynamics, contrast)</td>
<td>2000 cases / 7 month for basic / 4-6 month for advanced</td>
</tr>
<tr>
<td>VAD Procedures</td>
<td>200 cases / 0.5 month</td>
</tr>
<tr>
<td>Thoracic Surgery</td>
<td>500 cases / 1 month</td>
</tr>
<tr>
<td>Thoracic Surgery</td>
<td>125 cases / 0.5 month</td>
</tr>
<tr>
<td>Thoracic Surgery</td>
<td>250 cases / 2 month</td>
</tr>
<tr>
<td>Thoracic Surgery</td>
<td>300 cases / 3 month</td>
</tr>
<tr>
<td>Electrophysiology Lab (e.g. mapping, ablation, pacemakers, ICDs)</td>
<td>300 cases / 4 month</td>
</tr>
<tr>
<td>Electrophysiology Lab</td>
<td>100 cases / 0.5 month</td>
</tr>
<tr>
<td>Electrophysiology Lab (e.g. mapping, ablation, pacemakers, ICDs)</td>
<td>500 cases / 2 month</td>
</tr>
<tr>
<td>Electrophysiology Lab (e.g. mapping, ablation, pacemakers, ICDs)</td>
<td>300 cases / 3 month</td>
</tr>
</tbody>
</table>

30. Financial Statement

An employment contract will be signed with the candidate

<table>
<thead>
<tr>
<th>Accommodation options are provided</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation/travel options are provided</td>
<td>Yes</td>
</tr>
<tr>
<td>Currency</td>
<td>US dollar</td>
</tr>
</tbody>
</table>

Maximum Time In Non-Clinical Activities

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
</tr>
</thead>
</table>

Will advanced subspecialty rotations reflect increased responsibility and learning opportunities? Yes

Maximum Time In Non-Clinical Activities

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
</tr>
</thead>
</table>

Clinical Responsibilities

List any other rotations (along with their duration, in months) offered in the Programme to augment fellows’ learning.

Will all fellows entering the CTVA Programme complete each of the fundamental clinical skills of requirements?

*Yes, if yes, explain*

In the clinical anaesthesia setting, including nights and weekends, will faculty members at any time direct perioperative CTVA care, involving fellows, for more than two anaesthetizing locations simultaneously?

*Yes, if yes, describe*
11. Educational and Academic Programme

Diagnostic Services

1. II. Anesthesia management − cardiac surgery

1. I. General patient assessment and risk estimation

- Basic Training
  - Competency Area / Skills
    - Grand rounds
    - Board review (e.g., oral exams, written exams)
    - Quality improvement (M&M, QA)
    - Critical care appraisal of the participant
    - The Opportunity for Exchange with other training facilities
    - Dedicated Research Time
      - Abstracts
      - Formal Course Work Available in
        - EACTA, SMART, INTELLIG, EUROELSO meeting will be considered (not granted)

2. III. Perioperative management of cardiac surgery

- Assessment of patient's status based on physical examination and history with use of appropriate laboratory tests and examinations, level C
- Score evaluation, e.g., physical status in accordance with American Society of Anesthesiologists (ASA), level B
- Arterial evaluation, level C
- Interpretation and limitations of perioperative monitoring, including invasive and non-invasive cardiac function tests, pulmonary function tests, blood gas analysis, oxygen saturation monitoring, coagulation tests, liver and renal function tests, endocrine function tests, and drug dosage adjustments, level D
- Cardiac and non-cardiac drugs and nursing; level C
- Evaluation and planning of the individual anesthetic technique, level C
- Assessment of status prior to surgery and decision making, level D
- Participation in multi-disciplinary (morbidity) conferences, level B
- Reoperative cardiac surgery, level C
- Reoperative cardiac surgery, level B
- Reoperative cardiac surgery, level A

3. IV. Basic Training

- Cardiopulmonary bypass, level C
- Cardiac arrest, level C
- Cardiac surgery, level C

Weekly | Biweekly | Monthly | Quarterly | Semi-annually | Annually
--------|----------|---------|-----------|---------------|-------------
No | No | No | Yes | No | No

Annual topics will be reviewed and discussed by the fellow side by side with a faculty member, after the intervention the topic will be reviewed and discussed by the fellow and the faculty member.

4. V. Assessment management − cardiac surgery

- Workup preparation following environmental safety measures and checklists, level C
- Use of advanced medical equipment, inclusive advanced hemodynamic monitoring, echocardiography, and basic perioperative TEE, level C
- Assessment of preoperative, perioperative, and emergent post anesthesia care, level C
- Defibrillation, cardioversion, level D
- Transesophageal echocardiogram insertion and modes of action; use of temporary pacemaker, level C
- Central and peripheral venous (ultrasound-guided) access, laser engagement, artery versus pulmonary artery catheterization, arterial and venous lines insertion, level C
- Bradycardia and tachycardia, level C
- Organ system and organ function maintenance throughout cardiac surgery procedures, level C
- Interpretation of post-operative coagulation monitoring such as rotational thromboelastometry (ROTEM) and thromboelastography (TEG), level C
- Management of patients on cardiopulmonary bypass, level C

Weekly | Biweekly | Monthly | Quarterly | Semi-annually | Annually
--------|----------|---------|-----------|---------------|-------------
No | No | Yes | No | No | No

Other topics will be reviewed and discussed by the fellow side by side with a faculty member, after the intervention the topic will be reviewed and discussed by the fellow and the faculty member.

5. VI. Administration − cardiac surgery

- Source of financial support for the candidate: scholarship, own center

Others (specifically) Click here to enter text.
Management of patient transport to and from the intensive care unit (ICU) level C
The fellow will intervene in the transport of every patient managed during his training. During this activity, the fellow will learn how to deliver and manage the patient under this special situation.
Faculty members.

Consideration of ethical and medicolegal aspects. Level C
The fellow will learn ethical considerations in the management of critical care patients.
Faculty members.

S. 6. Anesthesia management - Thoracic surgery

Bronchoscopist trainee to verify the position of a long-intubation device and to verify the disappearance of the bronchus to be stapled and the positioning of the other branch, level C
Following and discussing hospital guidelines.
Faculty members.

Provision of safe induction, maintenance, and emergence from anesthesia in patients undergoing thoracic surgery of varying complexity, including airway management, the decision of which drug to use, one-lung ventilation technique, and management of intraoperative adverse events, level C
Following and discussing hospital guidelines.
Faculty members.

Management of adult cardiac percutaneous intervention models and complications, including level C:
- hypoxemia
- hypotension
- hypothermia

Performing ventilation with a double-lumen tube, level C
Following and discussing hospital guidelines.
Faculty members.

Performing ventilation with other techniques (e.g., Arndt blocker, GI blocker), level B
Following and discussing hospital guidelines.
Faculty members.

Reoperative pain management, including epidural and perivisceral analgesia, level C
Following and discussing hospital guidelines.
Faculty members.

Additional techniques in pain management (e.g., epidural analgesia, transvers blocks, multimodal analgesic techniques), level C
Following and discussing hospital guidelines.
Faculty members.

S. 7. Anesthesia management - Vascular surgery

Preoperative assessment, risk stratification, and standard management of vascular patients, level C
Every day assessment of each patient.
Faculty members.

Provision of safe induction, maintenance, and emergence from anesthesia in patients undergoing vascular surgery of varying complexity, including arterial management, the decision of which drug to use, hemodynamic management, and management of intraoperative adverse events, level C
The fellow will be supervised during all the procedure, the fellow will be in charge of performing the induction plan.
Faculty members.

Management of the most common perioperative critical incidents and complications including level C:
- acute kidney injury
- neuromuscular blockade
- paraplegia

The management and diagnosis of intraoperative complications, will be addressed during this lecture, by the fellow side by side with a faculty member, after intervention the topic will be reviewed and discussed by the fellow and the faculty member. The fellow will be responsible for CCP drainage and AMR.
Faculty members.

Endovascular repair of acute and emergent open abdominal aortic aneurysms (AAA) and AAA repair, level D
The fellow will learn the basics of AAA anesthetic management and hemodynamic monitoring.
Faculty members.

Management of carotid endarterectomy, angioplasty, or stenting, level D
The fellow will be in charge of the anesthetic plan for carotid endarterectomy and angioplasty, and how to perform intraoperative neuro monitoring.
Faculty members.

S. 8. Multi-organ system (thoracic care

Physical examination and patient assessment (e.g., respiratory and pulsatile sounds, temperature gradient capillary refill), level B
The fellow will be part of the critical care team, to assess patients and learn: monitoring, mechanical ventilation, weaning, shock management.
Faculty members.

Applying sedation, general anesthetics, multimodal analgesia, level D
The fellow will learn the sedation protocol and how to utilize the CMI evaluation assessment score.
Faculty members.

Management of the airway, relative of emergency resuscitation, level D
The fellow will be part of the emergency and resuscitation team to become proficient in difficult and rapid sequence induction.
Faculty members.

Bronchoscopy, peripheral venous, arterial, and central line insertion, level C
The fellow will learn how to perform invasive procedures under aseptic conditions.
Faculty members.

Airway management during election of endotracheal intubation, ventilation, and chest X-rays (portable), bronchoscopy, and sampling, level D
The fellow will learn how to perform invasive procedures under aseptic conditions.
Faculty members.

Invasive ventilation including prone position ventilation and weaning strategies, level D
The fellow will learn in the ICU and PACU how to apply weaning strategies.
Faculty members.

Delivery of continuous positive pressure ventilation and non-invasive ventilation, level D
The fellow will learn how and when to perform a non invasive ventilation.
Faculty members.

Hemodynamic monitoring and management: invasive and non-invasive. level B
The fellow will learn to manage PA catheter and the vasosupportive therapy during different situations.
Faculty members.

Urine management and fluid administration, level D
The fellow will learn how to manage fluids.
Faculty members.

Management of blood product transfusion and coagulopathy correction, level D
The fellow will learn how to administer blood products and interpret blood coagulation analysis.
Faculty members.

Renal replacement therapy and acute renal failure, level D
The fellow will learn how to manage patients with acute/chronic renal failure.
Faculty members.

Identification of relevant pre-existing conditions, level D
The fellow will learn how to identify comorbidities and manage the patient accordingly.
Faculty members.

Responding to trends in physiologic variables, level D
The fellow will learn to apply cardiovascular physiological knowledge.
Faculty members.

Neurointensive care unit and intra-hospital level B
The fellow will intervene in the transport plan of every patient managed during his training, during this activity, the fellow will learn how to perform a safe induction, ensuring the correctness of the bronchus to be stapled and the patency of the other bronchi. The fellow will be in charge of performing the induction plan.
Faculty members.

Anticoagulant and antiplatelet use cancellation (antiplatelet guideline), level D
The fellow will be taught how to be proficient in the insertion of different vascular accesses, under the use of USG.
Faculty members.

Perioperative management, paraplegia, hypothermia, level D
The fellow will learn concepts and therapy management.
Faculty members.

Assessment of intracranial vascular status, level C
The fellow will be taught how to decide which therapy is best for each patient, and discuss other options.
Faculty members.

Recognition of intraoperative hemorrhage and platelet effects, level B
The fellow will be proficient in the diagnosis of pericardial and pleural effusions.
Faculty members.

S. 9. Multi-organ system (vascular care

Basic levels of peri-operative TEE and lung and vessel ultrasonography as performed in the operating room level C
The fellow will be part of the cross-functional team, how will learn how to perform a safe induction, monitoring and manage complications.
Faculty members.

Advanced echocardiography techniques, management of airways and management of intraoperative adverse events, level C
The fellow will be part of the cross-functional team, how will learn how to perform a safe induction, monitoring and manage complications.
Faculty members.
1. Basic Training

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Basic Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. General patient assessment and risk estimation</strong></td>
<td>The fellow will be part of various research projects.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>2. Basic statistical approach</strong></td>
<td>The fellow will be part of the field team.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>3. Ability to write and present scientific papers</strong></td>
<td>The fellow will be part of the statistical analysis department.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

2. Clinical Training

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. Cardiac surgery</strong></td>
<td>The fellow will be part of the cath lab team, they will learn how to perform safe inductions, monitoring and manage complications.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>2. Cardiovascular perfusion</strong></td>
<td>The fellow will review all the basic principles of extracorporeal perfusion, apply them during the perioperative management of patients.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>3. Extracorporeal circulatory support</strong></td>
<td>The fellow will be involved in more specific aspects of extracorporeal circulatory support, and the specific patients and procedures. Level C</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>4. Vascular surgery</strong></td>
<td>The fellow will be involved in more specific aspects of vascular surgery. Level D</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>5. Organ transplantation</strong></td>
<td>The fellow will be involved in more specific aspects of organ transplantation. Level D</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>6. Anesthesiology</strong></td>
<td>The fellow will be involved in more specific aspects of anesthesiology. Level D</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

3. Research Training

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. Extracorporeal perfusion</strong></td>
<td>The fellow will be involved in more specific aspects of extracorporeal perfusion, and apply them during the perioperative management of patients.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>2. Anticoagulation monitoring and management</strong></td>
<td>The fellow will learn the basics of anticoagulation monitoring and management.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>3. Anesthesia management</strong></td>
<td>The fellow will learn the basics of anesthesia management.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. Coronary angiography</strong></td>
<td>The fellow will learn the basics of coronary angiography.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>2. Cardiac magnetic resonance imaging (cMRI)</strong></td>
<td>The fellow will learn the basics of cardiac magnetic resonance imaging.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>3. Computer tomography (CT)</strong></td>
<td>The fellow will learn the basics of computer tomography.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

4. Organizational Training

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Organizational training</strong></td>
<td>The fellow will learn the basics of organizational training.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>The fellow will be involved in more specific aspects of communication.</td>
<td>Faculty members.</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>The fellow will be involved in more specific aspects of leadership.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

5. Orals, written, and oral examinations

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Orals, written, and oral examinations</strong></td>
<td>The fellow will be involved in more specific aspects of orals, written, and oral examinations.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>

6. Medical Knowledge

<table>
<thead>
<tr>
<th>Area of Knowledge</th>
<th>Setting/Activities</th>
<th>Assessment Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medical Knowledge</strong></td>
<td>The fellow will be involved in more specific aspects of medical knowledge.</td>
<td>Faculty members.</td>
</tr>
</tbody>
</table>
I. V. Anesthesia management – cardiac surgery (Level A)

- Principles of pulmonary evaluation is described previously, and basic knowledge in the interpretation of results from pulmonary function tests, lung perfusion testing and CT.
- Knowledge of the bronchial anatomy.
- Knowledge about relevant anesthetic agents and their effects in patients with lung diseases.
- Principles of intraoperative pharmacology and relevant medication, including bronchodilators and steroids.
- Principles of conventional cardiopulmonary bypass techniques. Principles of myocardial protection.

2. III. Anesthesia management – thoracic surgery (Level A)

- Basic principles of common procedures in cardiac surgery, such as coronary artery bypass grafting (CABG).
- Principles of preoperative management for cardiac patients undergoing vascular interventions, including pulmonary, peripherally inserted central venous catheters, and cardiac catheterization.
- Basic principles of per-operative management of tumour drainage for early interventional procedures.
- Basic principles of oesophageal protection during vascular and interventional surgical procedures.
- Basic principles of interventional surgery.

3. IV. Post-operative care/ Critical care (Level A)

- Basic principles of neuromonitoring.
- Basic principles of spinal cord protection during surgical and interventional aortic procedures.
- Basic principles of the peri-operative management of lumbar drainage for aortic interventional procedures.

4. V. Oral discussion and writing evaluations
Knowledge of primary graft dysfunction and indications for mechanical circulatory support.

Principles of perioperative management of neurosurgical surgery for aneurysms, metastatic, skull, brain tumor, craniotomy, and cranial vault procedures.

Excellent knowledge of peri-operative management of lumbar drainage for aortic interposition, foreign body, stricture, and tracheoesophageal fistula.

2. X. Anesthesia management – Thoracic surgery (Level A)

Principles of use of inhaled pulmonary vasodilators (nitric oxide (NO), prostaglandins).

Principles and state of the art of mechanical support including intra aortic balloon pumps, and extracorporeal membrane oxygenation.

Current state chemotherapy and long-term mechanical circulatory support (ventricular assist devices, total artificial heart).

Principles of postoperative care following cardiopulmonary bypass, and thoracotomy, lung resections, lobectomies, lung volume reduction surgery, lung transplantation.

Principles of fast-track surgery.

Principles of donor pool.

Knowledge of current limitations of organ transplantation and efforts to increase the suitable donor pool.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

2. VIII. Heart and/or lung transplantation (Level A)

Knowledge of heart transplantation and clinical management of affected patients.

Knowledge of the principles of heart transplantation and clinical management of affected patients.

Knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Excellent knowledge of the principles of cerebral function monitoring.

Knowledge of the physiology of the denervated organs.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.

Understanding of the surgical context of heart transplantation and knowledge of intra-operative and immediate postoperative care, including stability of induction, ventilation, oxygenation, hemodynamic support, and anti-coagulant organ protection.

Understanding of primary graft dysfunction and indications for mechanical circulatory support.
Knowledge of the principles of primary lung dysfunction and conservative and extracorporeal treatment options, including indicators for and techniques of ECMO.

Understanding of anesthesia on registries and the role of participation in feedback and education.

2. Research evaluative (level 3)

- Principles of research ethics, including design, ethics, inclusion / exclusion criteria, reporting requirements.
- Understanding of research techniques for quality improvement.
- Understanding of European and specific national ethics frameworks, including research ethics applications, clinical regulatory frameworks and hospital site-specific assessment.
- Principles of patient and data confidentiality agreements.
- Understanding of data collection, analysis, and reporting.
- Principles of international basic science practices and the field of cardiac studies.
- Ethics and patient selection, storage and biobanking.
- Principles and ethics of scientific publishing.
- Ethics and practicalities of biological sample collection, storage and biobanking.
- Principles of patient and data confidentiality agreements.
- Understanding of data collection, analysis, and reporting.
- Principles of international basic science practices and the field of cardiac studies.
- Ethics and patient selection, storage and biobanking.

12. Assessment

The Programme Director will assess each fellow every 3 months.

<table>
<thead>
<tr>
<th>Assessment tools</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>360-degree evaluations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal reports from the faculty</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Learning goals for the next three months</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>A logbook will be available</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

The Programme Director will give an appraisal for each fellow every 3 months.

- Training programmes should encourage fellows to provide self-assessment feedback on their training.
- The centre will be able to maintain a register of those fellows who have entered and successfully completed a training programme in order to continue their accreditation as a training centre.
- There will be a regular opportunity for fellows to provide confidential written evaluations of the faculty and programme to the ACTA Education Chair.
- Periodic evaluation of patient care quality assurance is mandatory. Subspeciality trainees in cardiac, thoracic, and vascular anesthesia will be involved in continuing quality improvement and risk management.
- Trainees in cardiac, thoracic, and vascular anesthesia will actively participate in the periodic evaluation and reassessment of the fellowship training goals and objectives.

At the end of the training period, the centre will acknowledge in writing successful completion of a fellowship.

1. Briefly describe one planned learning activity in which fellows engage to identify strengths, deficiencies, and limits in their knowledge and expertise (self-reflection and self-assessment); set learning and improvement goals; and identify and participate in appropriate learning activities to achieve self-defined goals (life-long learning).

2. Briefly describe one planned quality improvement activity or project that will allow fellows to demonstrate an ability to analyze, improve, and change practice in patient care. Describe planning, implementation, evaluation, and evaluation of faculty support and supervision that will guide this process.

3. Briefly describe one learning activity that fellows will participate in the education of patients, families, students, fellows, and fellow health professionals.

4. Briefly describe how fellows will receive and incorporate evaluation feedback into daily practice.

5. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

6. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

7. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

8. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

9. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

10. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

11. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

12. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

13. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

14. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

15. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

16. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

17. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

18. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

19. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

20. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

21. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

22. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

23. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

24. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

25. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

26. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

27. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

28. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

29. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

30. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

31. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

32. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

33. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

34. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

35. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

36. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

37. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

38. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

39. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

40. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

41. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

42. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

43. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

44. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

45. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

46. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

47. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

48. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

49. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.

50. Briefly describe how fellows will participate in the education of patients, families, students, fellows, and other health professionals.
14. Interpersonal and Communication Skills

1. Briefly describe one learning activity in which fellows demonstrate competence in communicating effectively with patients and families across a broad range of socioeconomic and cultural backgrounds, and with physicians, other health professionals, and health-related agencies.

The fellow will participate in the preoperative / preanaesthesia clinic and will be involved in the information process toward patients and families. Also, the fellow will be encouraged to use his second or third language to help foreign patients.

2. Briefly describe one learning activity in which fellows demonstrate their skills and habits to work effectively as members or leaders of a health care team or other professional group. In the example, identify the members of the team, responsibilities of the team members, and how team members communicate to accomplish responsibilities.

The fellow will be asked to participate in the daily OR coordinating meeting. This meeting is held by the head of OR, head of cardiac anesthesia, and head of cardiac surgery. The fellow will be related to plan according to department priorities and structure availability. Selecting the cases for morning and afternoon shifts, having in mind any possible emergency case.

3. Briefly describe how fellows will be provided with opportunities to act in a consultative role to other physicians and health professionals related to clinical information systems.

During the ICU rotations, the fellow will be part of a multidisciplinary team (cardiologist and anesthesiologist, nurse assistants, perfusionists, and cardiac surgeons), also during the management of every patient the fellow will need to interact with other consultants, to address patient-specific issues.

4. Briefly describe how fellows will be provided with opportunities to maintain comprehensive, timely, and legible medical records, if applicable.

The fellow will have full access / credentials to the preop clinic and inpatients electronic records. During OR rotations, the fellow will be asked to fill in the written operating summary and hardcopy for cardiac cases. During ICU rotations the fellow will be asked to fill in the daily observations and to maintain a comprehensive written medical file. In addition, the fellow will be responsible for the quality of the medical letters and mailings for general practitioners, surgeons, and cardiologists.

5. Briefly describe how fellows will maintain a comprehensive anesthesia record for each patient, including evidence of pre- and post-operative anesthesia assessment, an ongoing reflection of the drugs administered, the monitoring employed, the techniques used, the physiologic variations observed, the therapy provided as required, and the fluids administered.

The fellow will be asked to follow the routine procedure for the quality and completeness of anesthesia records. In our institution, we utilize the GALILEO, which is a software that records every aspect of the management of the patient, from initial signs to fluid administration and urine output.

6. Briefly describe how fellows will create and sustain a therapeutic relationship with patients, engage in active listening, provide information using appropriate language, ask clear questions, provide an opportunity for comments and questions, and demonstrate sensitivity and responsiveness to cultural differences, including awareness of their own and their patients' cultural perspectives.

The anesthesia team of our institution is routinely and deeply involved in all stages of the patient's operating path from preop evaluation, OR care, ICU care, ward care to discharge. This involvement offers daily opportunities to engage in patient-physician interaction. In addition we routinely care for patients with different cultural/cultural differences; we also routinely care for non-Italian national patients.

15. Professionalism

Briefly describe the learning activity(ies), other than lecture, by which fellows demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles, including: compassion, integrity, and respect for others; responsiveness to patient needs that supersedes self-interest; respect for patient privacy and autonomy; accountability to patients, society, and the profession; and sensitivity and responsiveness to a diverse patient population, including to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation.

As described above, professionalism is based on the involvement of the anesthesia team, including the fellow, in all stages of the perioperative care. Also, the fellow will be invited to a bioethics program, held for two months one day a week. During this course, the fellow will learn or refresh ideas about the management of the patient as a human being and topics as and holistic management of death.

15. Systems-based Practice

1. Describe the learning activity(ies) through which fellows achieve competence in the elements of systems-based practice: working effectively in various health care delivery settings and systems, coordinating patient care within the health care system; incorporating considerations of cost-containment and risk-benefit analysis in patient care; advocating for quality patient care and optimal patient care systems; and working in inter-professional teams to enhance patient safety and care quality.

The fellow, as a member of the anesthesia team, should show competencies in working with the various health care delivery settings and systems, coordinating patient care within the health care system with paying attention to the cost-containment and risk-benefit analysis in patient care.

2. Describe an activity that fulfills the requirement for experiential learning in identifying system errors and implementing potential systems solutions.

The fellow will be asked to attend SMART meeting, in which discussions about safety, mortality and systematic errors are discussed. Also attending the anesthesiologists-surgery epidemiology meetings.

16. EACTA Site Visit (for 1-day)

Date(s) proposed for the visit (at least 3) 06/09/2020 or 09/06/2020 or 10/06/2020

I hereby accept the regulations of the hospital regarding expenses to be charged the travel costs and hotel accommodation. The two reviewers are the most reasonable base.

Other comments

To be completed by the head of department or the authorized deputy.

Please fill in all required fields and send to eacta@aimgroup.eu

Yes
San Raffaele Scientific Institute Cardiothoracic and Vascular Anaesthesia and Intensive Care Fellowship

Period and Aims of the Fellowship

The Cardiothoracic Anaesthesia Fellowship at the San Raffaele Scientific Institute in Milan is offered in two complementary levels of training: one year of cardiothoracic and vascular (CTVA) anesthesia, and an optional second year of CTVA advanced training. The fellow who aims both levels of training, has the opportunity for 24 continuous months of training.

Aim of the Fellowship Programme is to train anesthesiologists who have finished their residency training to become proficient in cardiothoracic and vascular anaesthesia.

The candidates must be board certified or board eligible according to European residency programme standards, and must be proficient in Italian language (B2 LEVEL is required). If the candidate is proficient in English or in Spanish (B2 LEVEL is required) he will be asked to study and learn Italian within the first 8 weeks after the beginning of the fellowship.

The fellows will have the opportunity to gain extensive experience in the fields of cardiac, thoracic and vascular anaesthesia and intensive care medicine. After completion of the programme, they will be able to work independently as consultants in cardiac, thoracic and vascular anaesthesia.

The fellowship programme in Milan is organized and directed by the local head of cardiothoracic anaesthesia and intensive care (Prof. Dr. Alberto Zangrillo), by the Head of Research (Prof. Giovanni Landoni), the leader of the ECMO team and in charge of the intensive care (Dr Federico Pappalardo) and the head of cardiac anaesthesia (Dr. Fabrizio Monaco) as programme directors. Completion of the programme will be acknowledged by the Department of Anaesthesia and Intensive Care at the San Raffaele Scientific Institute in conjunction with European Association of Cardiothoracic Anaesthesia (EACTA). In particular, criteria for EACTA certification will be determined and communicated before the start of the Fellowship and their fulfillment will be mandatory in order to receive the joint certification (San Raffaele Scientific Institute and EACTA). A logbook for all clinical activities and a final examination are planned.

Obligation of the Fellow

The fellow has to: 1. gain knowledge in anatomy and pathophysiology of cardiac diseases, 2. to plan a perioperative anesthesia plan and to safely execute it, 3. to manage and interpret correctly diagnostic tools and take advantage of them in the care of patients, 4. to understand intra operative neurophysiology monitoring, be familiar with cardiopulmonary bypass and mechanical support systems and 5. to perform a
complete trans esophageal echo cardiogram examination. The program includes pre-, intra- and postoperative care of patients undergoing cardiac, vascular, thoracic operation, transcatheter ablation of ventricular or supraventricular arrhythmias, percutaneous or transapical treatment of structural heart disease. Also, the program expects from the fellow to be proficient in non-technical skills, communication collaboration, managerial and leadership skills.

The Fellow takes part in the clinical routine as well as in clinical conferences with the Departments of Anesthesiology and Intensive Care, of Cardiology, of Cardiac Surgery of Vascular Surgery, of Thoracic surgery and of Arrhythmology. The fellow is trained in trans esophageal echo cardiography by formal courses and teaching in the operating room and intensive care unit: the fellow is expected to perform at least 120 TEE examination per year. The fellow takes part in preparation and presentation of case conferences. The didactic curriculum is provided through lectures and conferences and allows the fellow to acquire the knowledge to care for the patients. In addition, academic projects including preparation and publication of review articles, book chapters, manuals for teaching or clinical practice, clinical research or other academic activities are offered and strongly encouraged. The fellow is responsible for the documentation of the cases and TEE examinations done during his fellowship.

Logbook

The fellows are required to record all the activities performed during their training, in the form of a logbook. This should include: anonymous record of patients managed during the fellowship, record of TEE examinations performed, summaries of three-monthly feedback.

Evaluation

The fellow’s progress will be evaluated and discussed with the fellow every 3 months by the programme director and the division heads, using a standardized form. The fellow’s professional attitude, fund of knowledge, and clinical judgment will be assessed as well as his/her practical skills, social competence and efficiency for patient management and critical analysis of any relevant clinical situation. Feedback will be given. The fellow will be involved in programmes of quality assurance and risk management. At the end of the training period, the fellow will receive a testimonial. We will motivate the fellow to attain EACVI/EACTA TEE certification following him/her during the all process.

Faculty

The division heads and the programme directors have a large experience in cardiothoracic and vascular anaesthesia, for details please see the attached CVs. Dr Landoni is responsible for the fellowship programme
and will direct it in accord with the following co-directors: the local head of cardiothoracic anaesthesia and intensive care (Prof. Dr. Alberto Zangrillo); the leader of the ECMO team (Prof Federico Pappalardo); the in charge of the intensive care (Dr Mara Scandroglio), the head of cardiac anaesthesia (Dr. Fabrizo Monaco); a senior anesthesiologist with extensive expertise in TEE (Dr Martina Crivellari). They will devote sufficient time to provide substantial leadership to the programme and supervision for the trainees. In addition to the primary coaches of the fellow, further senior members of the cardiothoracic and vascular anaesthesia and ICU team serve as faculty, clinical teachers and coaches for the fellows in daily clinical practice (Calabrò MG, De Luca M, Di Tomasso N, Di Prima AL, Fano G, Fominskii E, Franco A, Frau G, Gerli C, Melisurgo G, Mucchetti M, Pieri M, Oriani A, Licheri M, Ajello S. The Division of Cardiothoracic and Vascular anaesthesia consists of over 20 consultants who are specially trained in cardiothoracic and vascular anaesthesia and intensive care and some of them in perioperative transesophageal echocardiography.

**Resources**

The San Raffaele Scientific Institute is one of the leading private scientific research institutes in Italy, recognized by the Italian Ministry of Health as a Research Hospital. At the same time, with almost 30,000 surgical procedures per year it is an high volume surgical center. It comprises both clinical and research activities, conducted by a highly specialized and qualified staff with 1,357 beds and a research institute with around 1,600 basic, clinical and translational scientists. San Raffaele integrates its research with the education and training activities conducted within the Vita-Salute San Raffaele University which comprises the faculties of medicine, psychology and philosophy and provides specialized post graduate courses, residency programs in various medical specialties, and international PhD programs. The San Raffaele Scientific Institute is located in Milan and is one of the most important cardiac, vascular and thoracic vascular surgical centre in Italy. It has a high level of medical care with a twenty--four--seven emergency department, operating rooms which are all adequately designed and equipped for the management of cardiothoracic and vascular surgery patients and three intensive care units for neurosurgical patients (6 beds), cardiac surgical patients (14 beds) and medical/general surgical patients (8 beds). Staff physicians are all board certified in their medical specialty and have extensive experience in cardiovascular and pulmonary diseases, echocardiography including transesophageal echo, clinical cardiac electrophysiology, cardiac, thoracic and major vascular surgery such as in the management of patients undergoing heart structural disease correction with transapical or percutaneous approach . The monitoring and advanced life support equipment is representative of current levels of technology. There are facilities which are readily available at all times to provide prompt laboratory measurement pertinent to the care of cardiothoracic and vascular surgical patients as well as prompt non-invasive and invasive diagnostic and therapeutic cardiothoracic procedures. These include but are not limited to echocardiography, cardiac stress testing, cardiac catheterization, electrophysiological testing and therapeutic intervention, cardiopulmonary scanning procedures and pulmonary function testing.
Overall, the fellow will have the opportunity to work in the 3 cardiac surgery theatres, 3 hybrid rooms for invasive cardiological procedures, 2 rooms for vascular and thoracic surgery, 14 ICU beds.

Cardiac Surgery

The Department of Cardiovascular and Thoracic Department at the San Raffaele Scientific Institute performs over 1300 adult cardiac procedures per year including TAVI and Mitralclip. The Chief surgeons are Prof Alfieri Ottavio, Prof Michele De Bonis and Prof Alessandro Castiglioni.

Recent activities per year included 1496 hospitalization, 1360 cardiac surgery procedures including:
- Mitral Valve Repair 420
- Tricuspid Valve repair 92
- Aortic Valve repair 12
- Aortic Valve replacement 327
- Mitral Valve replacement 197
- Revascularization-Bypass 226
- Mitraclip 55
- Transapical/Transaortic/Transaxillary Tavi 15
- Tranfemoral Tavi 65
- Ventricular assistance device 9
- Ascending aorta 120.

(REDO surgery 175)

| General Brief description of the of the Cardiac Surgery Unit | The Cardiac Surgery Unit of the San Raffaele University Hospital represents a high quality centre for the treatment of cardiac diseases. About 1300 open heart procedures are performed every year, involving the most wide range of cardiac pathologies. The Unit is a national and international reference centre for the mitral valve repair, for surgical treatment of atrial fibrillation and congestive heart failure. Team work with other specialities in the Cardio-Thoracic-Vascular Department. New treatments, devices and alternative routes. Participation in national and international clinical trials. Preclinical trials validation and cooperation with University research centres and animal facilities. Cost/benefits approach orientation with local and national institutions. |
| Key competence | Adult Cardiac surgery. Mitral valve repair. Minimally invasive technique (Heart port). Surgical ablation of atrial fibrillation. Mechanical assistance for congestive heart failure. Team work with other specialities in the Cardio-Thoracic-Vascular Department. New treatments, devices and alternative routes. Participation in national and international clinical trials. Preclinical trials validation and cooperation with University research centres and animal facilities. Cost/benefits approach orientation with local and national institutions. |
| Facilities | • Engineering laboratories for preclinical studies and bench testing, in vitro and ex vivo study validation  
• Laboratory of Echocardiography, equipped with modern equipment (three-dimensional echocardiography, post-elaboration data center)  
• 38 beds in hospital, including 18 fully monitored for semi-intensive therapy  
• Support of post-operative intensive care unit (Prof. Alberto Zangrillo) with 14 beds equipped with the latest cardio-circulatory and respiratory technological assistance  
• Outpatient’s clinic for pre and post-operative evaluation, for heart failure, for... |
Interventional Cardiology
The Division of Cardiovascular and Thoracic Department at the San Raffaele Scientific Institute also covers the interventional cardiology theatre. Last year a total of 3427 procedures were performed, including 333 cardiac structural interventions with the presence of anesthesiologists (205 TAVI, 31 MitraClip, 66 ASD/PFO closure and 31 LAA closure). The fellow will be involved and trained in the management of these procedures.

Thoracic Surgery
Part of the fellowship programme is the anaesthetic management of adult patients undergoing thoracic surgery. In the Hospital, over 900 thoracic operations per year are performed which includes video-assisted thoracoscopic surgery (n=300), open procedures (n=300), oesophageal surgery (n=200), trachea-bronchial surgery (n=20) and about 100 interventional bronchoscopy procedures under general anesthesia.

Electrophysiology Unit
The Electrophysiology Unit treats patients with all types of arrhythmia and is a centre of excellence for the treatment of ventricular arrhythmias in patients with and without structural heart disease. These procedures (n=160 in 2018) are often targeted at patients with hemodynamic instability and in 2018 a total of 24 periprocedural extracorporeal supports were provided for these patients (2 IABP, 1 IMPELLA, 18 ECMO, 22 VAD).

Vascular Surgery
The Department of Vascular Surgery covers all major vascular procedures. In 2018 more than 2500 procedures, including open surgery and endovascular treatment of thoracic and abdominal aortic disease, carotid stenosis, peripheral arterial disease, renal and visceral vessel occlusion, thoracic outlet syndrome, deep venous thrombosis and superficial venous insufficiency. The leading activity of the Department is the treatment of thoracoabdominal aortic aneurysms, with about 100 cases of open repair and 25 cases of endovascular repair performed every year. The research is mainly focused on the evaluation of organ protection protocols during thoracoabdominal aortic surgery, the application of new endovascular strategies for the treatment of acute type B aortic dissection, and the development of new endovascular devices (fenestrated and branched stent-graft) for the thoracoabdominal aorta and the aortic arch.

Anaesthesia
Cardiac Anaesthesia

Fellows are trained to provide perioperative anaesthetic management for patients with severe cardiopulmonary pathology. The cardiac surgeries are the following: coronary artery bypass surgery (CABG) both on cardiopulmonary bypass as well as on a beating heart, heart valve surgery (especially mitral surgery), aortic reconstruction requiring deep hypothermic arrest, thoracic aortic aneurysm repair and aortic dissection repair.

Adequate exposure and experience are provided in the management of adult patients for cardiac pacemaker and automatic implantable cardiac defibrillator placement and surgical treatment of cardiac arrhythmias. There is exposure also to techniques such as percutaneous aortic valve replacement and mitral valve intervention.

Fellows also gain experience in perioperative medical (anaesthetic) management of the cardiac patient, including management of intra-aortic balloon pumps (IABP) and ventricular assist devices (VAD), post-operative ICU care, point-of-care coagulation testing, blood transfusion medicine, electrophysiology, and transthoracic echocardiography.

As for transfusion policy at our institutions, allogenic blood products are administered according to a specific protocol Rotem guided. Packed red cells (PRC) are transfused to maintain haemoglobin value >8 g/dL in the overall population and >10 g/dL in patients with hemodynamic instability or severe cardiac or pulmonary complications. Fresh frozen plasma (FFP) are used for the treatment of active bleeding. Platelet concentrates are used in case of active bleeding and platelet count < 50x10^9/L. The transfusion rate in our center is low as documented by several international multicentre randomized trials performed over the years. Point of care coagulation test are currently being implemented.

In addition, fellows will be involved in the management of patients treated with VV- and VA-ECMO. All the activities in the Cardiothoracic Intensive Care Unit will be supervised by Dr Federico Pappalardo, Dr Calabrò Maria Grazia, Dr Scandroglio Anna Mara, Dr Evgeny Forminsky.

Fellows will receive proper theoretical and practical training both for basic and advanced TEE. Each patient undergoing cardiac surgery is receiving pre- and postsurgical transesophageal examination. The fellow will perform and document the TEE examinations with increasing independence and review each examination with a senior echocardiographer. We’ll motivate him to attend the EACTA Echo and follow the EACTA accreditation process. The local referee for accreditation are: Dr. Eustachio Agricola, Dr. Fabrizio Monaco and Dra Martina Crivelari. The TEE training will be therefore based on the understanding of the basic principles of ultrasound and learning of basic skills of TEE (physics, standard views for examination, Doppler principles and quantification etc). As soon as the fellows master the basic skills, TEE training will continue with advanced applications of intraoperative TEE including assessment of valvular function, 3D, AQ for assessment of ventricular function, Stress and Strain, Tissue Doppler).
Clinical work of fellows includes anaesthetic management of adult patients undergoing thoracic and vascular surgery. Fellows are trained to manage different types of thoracic surgeries, including video-assisted thoracoscopic surgery (VATS), open thoracotomy, and robotic surgery. Fellows achieve expertise in different techniques of lung isolation and ventilation, including the use of double-lumen endotracheal tubes, bronchial blockers, fiberoptic bronchoscopy, and jet ventilation.

**Advanced Monitoring and Invasive Techniques**

The complex nature of cardiothoracic surgery necessitates extra training to acquire the skills needed to be a cardiothoracic and vascular anaesthesia consultant. Fellows are trained to achieve expertise in the advanced monitoring techniques including invasive blood pressure measurement, arterial blood gas analysis, cardiac output monitoring and central venous oxygen saturation.

Finally, invasive procedures completed by the cardiothoracic anaesthesiology fellows include arterial line placement (femoral, axillary, brachial, radial), central venous cannulation (internal jugular, subclavian, femoral), pulmonary artery catheter placement, transvenous pacemaker placement, thoracic epidural catheter positioning, intrathecal lumbar catheter positioning for cerebrospinal fluid drainage fiberoptic endotracheal tube placement, 2D/3D transesophageal echocardiography and ultrasound guidance of vascular access.

**Intensive Care**

The Hospital has three intensive care units for neurosurgical patients (6 beds), cardiac surgical patients (14 beds) and medical/general surgical patients (8 beds). The “cardiac” and the “general” ICU manage the:

- cardiac-thoracic-vascular patients
- VV-ECMO patients for refractory hypoxia in ARDS patients and VA-ECMO patients for severe cardiac dysfunction (either admitted from the emergency department or referred from other centres or in-hospital emergencies). Over 100 patients receive ECMO every year in our Institute.
- patients with mechanical devices (IABP, IMPELLA, VAD, total artificial heart)

Fellows will follow all the activities of the ICUs under the supervision of senior specialists.

Overall, the team, the environment and the skills are similar to those described above for the anesthesiological part.

**Structure of the Fellowship Programme**

The Fellowship
First year (Basic CTVA training)
During the first year of the Fellowship, the Fellow is directly supervised and gets a 1:1 supervision with a senior cardiac consultant.

Arrival and first week
- Welcome and introduction,
- Institutional orientation and health insurance compilation
- Completing Basic course about safety and health condition on the job

First week to 4th week
During this time period there will be a basic assessment of communication capacities and clinical knowledge, an will be a final decision for the fellow to continue or go back home.

1st Month to 7th Month
- Cardiac anesthesia
  - Familiarization in cardiothoracic and vascular anaesthesia, coached mainly by the programme directors or division heads
  - Clinical duties as a member of the cardiac team for standard cardiac procedures (isolated CABG, aortic and mitral valve replacement), under supervision. Minimum of 100 cases CPB in which 30% cases different from CABG
  - Daily participation in ward rounds and preop anaesthesia clinic-acquisition of basic and advanced echocardiographic knowledge (books, media, course, teaching in the operating theatre)
  - On – call duties, under supervision
  - Research activities
  - Acquisition of basic TEE skills. The fellow learns to obtain the 20 standard views

8th -9th Month
- Thoracic anesthesia
  - Clinical duties as a member of the thoracic team for standard thoracic procedures under supervision. Minimum of 25 cases.
  - Planning of participation in a national or international cardiac and thoracic conference. Participation in the Annual Meeting of EACTA in one of the two fellowship years.

10th Month
- Vascular anesthesia
- Clinical duties as a member of the vascular team for standard thoracic procedures under supervision. Minimum of 25 cases.
- Planning and presentation of clinical case conference
- On – call duties, under supervision

**11th Month**

- **Intensive care medicine**
  - Clinical duties as a member of the ICU-PACU team for standard management and care of post operative cardiac, vascular and thoracic patients.
  - Daily participation to intensive care ward rounds and preop anaesthesia clinic
  - Self consistent TEE examination (Pre - and postoperatively) under bedside supervision
  - On – call duties, under supervision

**12th Month**

- **Final approach**
  - Clinical duties as a member of the cardiac team for standard and advanced cardiac procedures, including transcatheter aortic valve implantation (transapical / transfemoral), aortic valve bypass and anterolateral mitral valve repairs / replacements), under supervision
  - Extracorporal perfusion training
  - Self-consistent clinical duties as junior anaesthesia consultant in elective cardiac, thoracic and vascular surgical patients
  - Self consistent TEE examination
  - On – call duties as a junior consultant, together with a backup senior consultant
  - Continuous medical education in the field of cardiac, thoracic and vascular anaesthesia
  - Presentation of a case at the clinical case conference once every 6 months

**Second year of the fellowship (Advanced CTVA training program)**

The Fellow will focus on the activity of the cardiac surgery ICU (14 beds) and the general ICU (8 beds) and to the management of VV-ECMO, VA-ECMO patients, and those with mechanical devices (IABP, IMPELLA, VAD, total artificial heart). Fellows will follow all the activities of the ICUs under the supervision of senior specialists.

The second year of training is given in a modular fashion, being cardiac surgery the main topic of training, also includes thoracic advanced training and vascular advanced training. There are optional modules, which are 3-6 months length duration as: intensive care of adult cardiothoracic and vascular patients and the research module.
To obtain the advanced training certificate, the fellow must complete the practical part logbook and obtain the TEE certification from EACVI.

**Cardiac advanced training**
- Learning in advanced haemodynamic monitoring, mechanical circulatory support as management of VV-ECMO, VA-ECMO patients, and those with mechanical devices (IABP, IMPELLA, VAD, total artificial heart), pulmonary hypertension and fast track heart surgery.

**Thoracic advanced training**
- Protective one-lung ventilation, bronchial blockers, ultrasound-guided blocks and regional techniques.

**Vascular advanced training**
- Perioperative risk stratification and management, emergency open aortic surgery and TEVAR and EVAR procedures.

**Prof. Giovanni Landoni**
Fellowship Programme Director and Head of Research  
Anaesthesia Department of Anaesthesia and Intensive Care Medicine  
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy  
e-mail: landoni.giovanni@hsr.it

**Prof. Alberto Zangrillo**
Head of Cardiothoracic Anaesthesia Department of Anaesthesia and Intensive Care Medicine  
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy

**Prof Federico Pappalardo**
Leader of the ECMO team  
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy

**Dr. Fabrizio Monaco**
Head of Cardiac Anesthesia  
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy

**Dr. Anna Mara Scandroglio**
Head of Cardiac Intensive Care
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy

Dr. Martina Crivellari
EACTA TEE Certified
San Raffaele Scientific Institute, via Olgettina 60, Milan, Italy