

AESCULAPIUS



**Practical training
in Congenital
and acquired
Heart Diseases
treatment**

The background for this project is:

- EHC is a humanitarian foundation established in Europe – France – that deals with a particular complex aspect of cardiovascular diseases: the - so-called – congenital heart disease, affecting neonates with malformations of the heart which are present from birth and even before. These defects need to be recognized (diagnosed) as early as possible since they are curable with either interventional cardiology or cardiac surgery;
- EHC often operates in conjunction with Bambini Cardiopatici nel Mondo, another humanitarian foundation based in Milan, Italy, at San Donato Hospital;
- The “modus operandi” of both foundations, EHC and Bambini Cardiopatici nel Mondo, has traditionally been to educate and train (in person) cardiologists, paediatricians, nurses, surgeons, etc. either by conducting missions in the countries in need or by providing scholarships to be trained in centres of excellence (usually San Donato Hospital) and, eventually, by building dedicated units for paediatric cardiology and helping them for some years until the units become fully independent;
- Both the foundations recognise that this “modus operandi” today is no longer possible, considering the actual legal restrictions in face-to-face training, particularly for cardiac surgery and interventions, the costs of travelling, the lack of professionals dedicating, as volunteers, their time to training. These obstacles are particularly relevant for congenital heart diseases. Cardiac surgery for congenital heart diseases has become extremely complex as the simplest abnormalities (such as closure of ductus or interatrial or intraventricular shunts) nowadays are repaired by percutaneous interventions. Surgery is confined to difficult anatomical abnormalities which require experienced and skilled cardiac surgeons. This makes in vivo training almost impossible for the lack of cases and for the legal restrictions which do not allow trainees to operate. The final result is that trainees need to remain for long periods in a high volume centre before being able to treat cases themselves;
- The above he above mentioned situation is even worse considering the shortcomings in health systems (and particularly so in developing countries) with a generalized lack of human resources i.e. doctors, nurses, and allied professionals who are not available to leave their countries of origin for long periods.

It is this background that has alerted the 2 foundations to find a solution.



The Solution

- Recently, the technology has made a revolution in the classical training. The entire world is becoming more and more digital, and medical training is often performed remotely. In addition, the availability of hearts originated by 3D printers precisely resembling the heart anatomy and abnormalities from which are generated is a new tool, which allows repetitive training for young doctors interested in cardiac surgery for congenital heart diseases.
- **Bambini Cardiopatici nel Mondo** and **European Heart for Children** have started the Aesculapius Project to be conducted at the Practical Training Centre for both invasive cardiology and cardiac surgery at San Donato Hospital in Milan. As it can be seen from the enclosed images, the centre is equipped with: a) a full angiographic room for training on a dummy both interventional adult and paediatric cardiology; b) a cardiac surgery room together with c) a room (wet lab) with several sections to train cardiac surgeons both on hearts from 3D printers and on isolated pigs' hearts; d) a room dedicated to paediatric cardiology with a dummy linked to echocardiography which reproduces the most common pathological abnormalities for diagnoses and a collection of 3-D printed human hearts reproducing the most common complex congenital heart disease for surgical training. The pathological hearts (Figures) are reproduced from the magnetic resonance of real cases in a material which allows to perform the operation with all stitches as many times as needed until the trainees have learnt the technique. This is the only procedure which enables trainees to perform a large number of real-time operations under the guidance of a tutor in a relatively short period of time.
- Finally, the centre is equipped with a professional recording and transmitting room which allows digital courses on pathophysiology, diagnosis, and treatment of congenital heart diseases. Equally, in the centre stations are available for telemedicine which allow continuous interactions with the trainees even when back in their country of origin.



The Project

Aesculapius is an educational project on how to diagnose and treat patients with congenital heart diseases. In practice, EHC and Bambini Cardiopatici nel Mondo will organize a number of courses of the duration of a week in total. The attendees will come to Milan to participate, in person, an intensive course of 5-6 days. The course will have theoretical discussion and practical sessions, taking advantage of the training centre. The practical sessions will be addressed to either diagnosis or treatment for the clinical cardiologists or to cardiac surgery for the surgeons:

- As for diagnosis, the tool is echocardiography (either transthoracic or transeophageal). The technology has developed super realistic dummies on which trainees can be educated as long as necessary. The dummy has very sophisticated algorithms that mimic all the conditions that a doctor could be confronted with during the execution of an echocardiography (both transthoracic and transesophageal).
- As for treatment, experienced interventional cardiologists will run courses on the dummy on how to perform the most common percutaneous interventions using a real angiographer. As for surgery, in the operating theatre the trainees will perform cardiac surgery on the 3D printed anatomical samples. The advantage is that the trainees can practice, under the guidance of the tutor, and perform the operation as many times as they wish.



- **Cost:** a scholarship of € 6.000 all included (travelling, lodging, and training) is provided by the 2 associations to the trainees who will have applied to participate in the programme and have been accepted by the Board of both European Heart for Children and Bambini Cardiopatici nel Mondo. The scholarship can be named after the sponsor.
- **The maximum number of participants to a course is 5.** We envisage running 10 courses a year for a total of 50 participants/year for a total cost of €320,000/year. In this way, in 2 years' time we will be able to train 100 paediatric cardiologists and surgeons who can then return to their country of origin and remain in contact, with our centre, if needed, by the telemedicine programme.

To whom is addressed the project

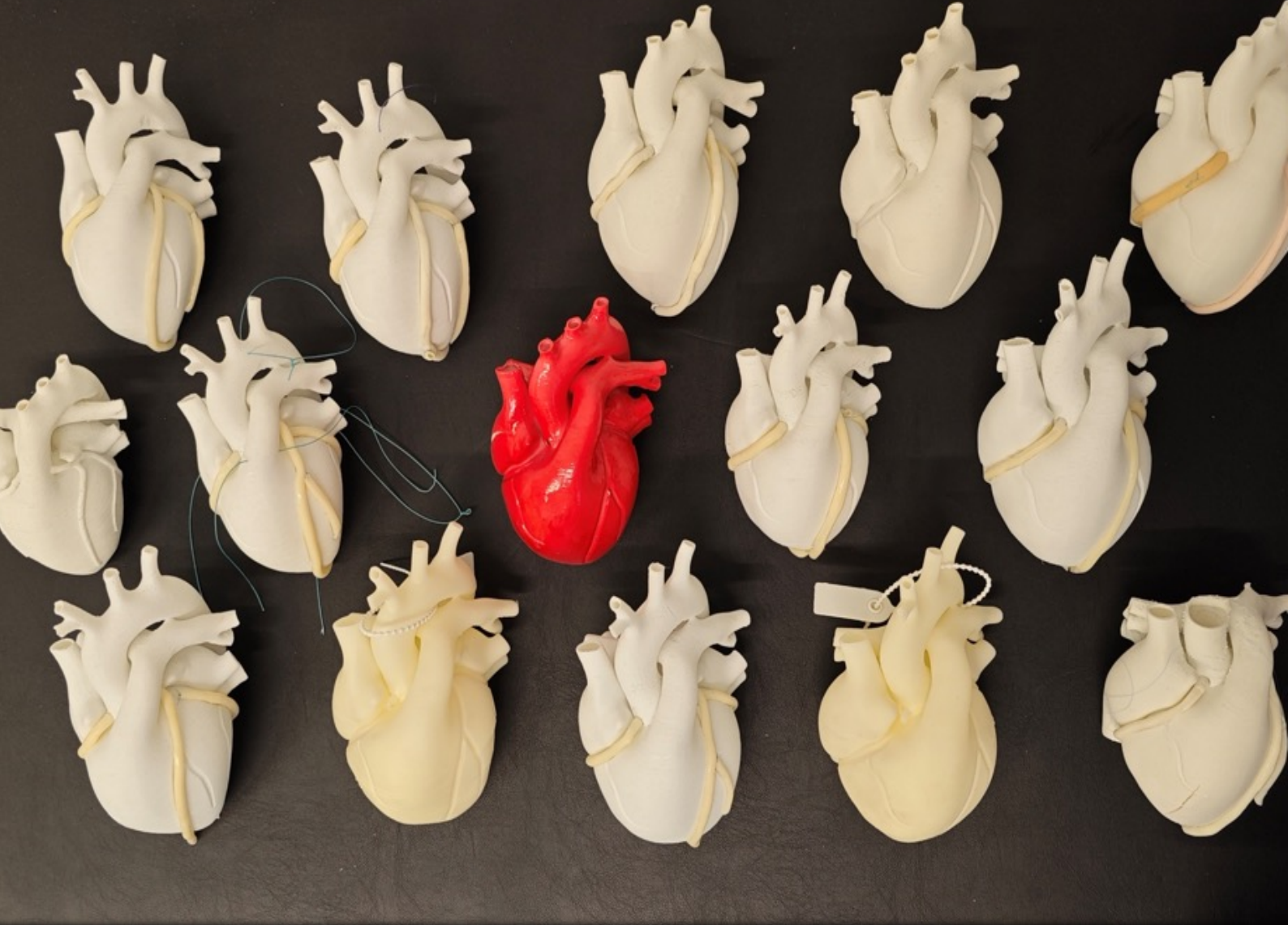
The project is for young cardiologists, paediatricians or cardiac surgeons who have interest and some experience in dealing with congenital heart diseases (either diagnosis or treatment) but find it difficult to be properly trained in their own countries.

The advantages of our project

This modern way of training overcomes the several problems related to teaching how to diagnose and treat congenital heart diseases as:

- it is safe and, importantly, free from medical-legal issues;
- both the diagnostic process (by echocardiography on the dummy) and the surgical or interventional correction of the abnormalities can be repeated as many times as necessary;
- it is not time consuming as the practical courses can be concentrated in a week and the theoretical teaching is via zoom;
- it is cheap as young surgeons do not need to stay away from their country for a long period of time;
- the approach allows to train a large number of paediatric cardiologists/surgeons in a relatively short time: 100 in two years!





The follow up of Aesculapius project

The idea is to create a network among all the participants to the Aesculapius project in order to create the necessary facilities for continuously updating and for engaging the network in the conduction of registries and research on congenital heart diseases.

To this end, they will be contacted by a CRO - Medical Trials Analysis – to fulfil a database and, eventually, a case report form to collect all the necessary information for the establishment of an operative network ready to start, for instance, a survey on the epidemiology and incidence of the most common and the rarest pathologies in their countries.

Once established, the network will be also updated by using the modern digital platforms on how to diagnose and also perform interventions and cardiac surgery.

So, Aesculapius is not just an educational project but also a scientific opportunity and a way to link together doctors interested in solving problems related to congenital heart diseases in their countries.