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The extended heart: cardiac surgery serving more hospitals

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The Heart Team is becoming ever more central in delivering cardiovascular care, embodying a modern aspect of medical practice, designed to place the patient at the 'center' of a team with different specialists, all contributing to the definition of the most appropriate therapeutic actions. We prospectively analyzed 200 consecutive patients (2015–2017). Patients were evaluated independently by a cardiologist and a cardiac surgeon, each deciding the most appropriate therapeutic action. At a later time, the same patient, was evaluated by the Heart Team. For the first 100 patients the rate of concurrence between cardiologist and cardiac surgeon as well as among each specialist and the Heart Team, was relatively low (51 and 42% respectively). For the following 100 patients the concurrence rate was significantly higher (75 and 70% respectively). The systematic and collegial discussion of the patients in the contest of the Heart Team, steered toward an evolution of each specialist in the group settings. The Electronic Heart Team (e-Heart Team) employing video conference support, applied to the first 65 patients with promising results, represent a further advancement in the delivery of care, by reducing the *distance* from the 'Hub' center, and the specialist in the 'Spoke' facility, who from simple *source* of the patient, now becomes an essential part of the therapeutic decision process. The Heart Team environment can deeply affect patients management and improve treatment results, by sharing the expertise and overcoming the limitations of the individual disciplines, thus reaching the common goal of the patient's best available treatment.

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We prospectively analysed 200 consecutive patients (2015–17). Patients were evaluated independently by a cardiologist and a cardiac surgeon, each deciding the most appropriate therapeutic action. At a later time, the same patient was evaluated by the Heart Team. For the first 100 patients, the rate of concurrence between cardiologist and cardiac surgeon as well as among each specialist and the Heart Team was relatively low (51% and 42%, respectively). For the following 100 patients, the concurrence rate was significantly higher (75% and 70%, respectively). The systematic and collegial discussion of the patients in the contest of the Heart Team, steered towards an evolution of each specialist in the group settings.

The Electronic Heart Team (e-Heart Team) employing video conference support, applied to the first 65 patients with promising results, represent a further advancement in the delivery of care, by reducing the *distance* from the 'Hub' centre, and the specialist in the 'Spoke' facility, who from simple *source* of patients, now becomes an essential part of the therapeutic decision process. The Heart Team environment can deeply affect patients management and improve treatment results, by sharing the expertise and overcoming the limitations of the individual disciplines,

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The concept of the 'Heart Team' has become the subject of growing interest in clinical practice regarding the treatment of cardiovascular diseases.

This multidisciplinary approach consists of a regular meeting between different specialists to discuss complex cases and identify the best individualized diagnostic and therapeutic approach for each patient.

The concept of 'Heart Team' is to optimize the management of complex pathologies in patient care, a task made ever more difficult by the development of new technologies and innovations aimed at greater effectiveness and lower invasiveness, from the growing amount of scientific information on new therapeutic strategies, and the increasing incidence of higher risk groups due to advanced age, frailty, and associated comorbidities.

The introduction into clinical practice of a systematic interdisciplinary discussion for patients with cardiovascular disease occurred later than in other disciplines such as oncology or the management of transplant-candidate patients. A push in this direction was given by the introduction of coronary catheterization procedures with angioplasty and stent implantation (percutaneous coronary intervention), and recently with the introduction of transcatheter aortic valve prosthesis implantation. Therefore, interventional cardiologists and cardiac surgeons increasingly turned to the same patient population.

The Heart Team is a multidisciplinary team composed mainly of clinical cardiologists, interventional cardiologists, and cardiac surgeons which is described, in the literature, in recent large multicentre studies such as the SYNTAX trial[1] and the PARTNER trial.[2,3]

However, in both studies, the Heart Team is simply a tool used to select the appropriate patients who can be enrolled in the randomized trial.

Considering the value of the aforementioned studies and the influence they have exercised on the management of coronary heart disease and patients with valvular heart disease in European and American guidelines, the Heart Team was introduced as a protagonist in the decision-making process of patients with possible indication for surgery or percutaneous treatment.[4-8]

As recent studies had revealed a non-compliance with the guidelines concerning revascularization procedures, the scientific community realized that further efforts were needed to improve patient management.

In 2010, Hannan *et al.*[9] observed that there is often a non-compliance with the guidelines, which results in an inadequate indication of the appropriate revascularization strategy. In other studies, the propensity towards angioplasty or bypass varies considerably depending on the country or even in different regions of the same nation. In the literature, many studies show that cardiac surgeons tend to be more likely to favour surgical approaches, whereas interventional cardiologists are more likely to direct patients towards a percutaneous approaches.[10,11]

It seems intuitive that multidisciplinary management can become an essential tool to overcome these obstacles.

However, due to the scarcity of randomized studies and despite the American and European guidelines assigned Heart Team directed patient management 'Class—I' level of recommendation, the level of evidence available to support this indication is only 'Level—C'.

Because of this low level of evidence, there has been much criticism of the Heart Team by various members of the scientific community.

In some contexts, the introduction of this concept in the guidelines is criticized, arguing that this involves crossing the boundaries imposed by evidence-based medicine, since there are still no randomized studies able to validate this model. Furthermore, it is argued that it is not obvious that multidisciplinary management could lead to a real improvement in the decision-making process, in which 'cognitive bias' may occur.

Others complained about the greater importance of the opinion of significant personalities within the group, a sort of prejudice already advanced for the multidisciplinary decision in oncology.

Moreover, some point out that this type of management would lead to an increase in costs and unnecessary delays, as well as organizational and logistical problems that prevented the spread of this clinical practice.[13]

For these reasons, the need to investigate the effective functioning of the Heart Team in the practical sense emerged in the scientific community. The reproducibility of the collective decision, the adequacy of the results and a greater compliance with the Guidelines was therefore demonstrated.

Other studies have shown that a multidisciplinary approach is able to optimize the results of patients with severe aortic stenosis and coronary artery disease.[14,15]

Most of the Heart Team studies, however, focus only on one type of patient (patients with coronary heart disease or valvular disease), while there are no authoritative studies aimed at validating the Heart Team as a better decision-making tool for all patients with cardiovascular diseases.

Our Heart Team

Since January 2014, a clinical and therapeutic decision-making process based on an interdisciplinary collegial meeting, called the Heart Team, has been officially introduced in our institution. The following figures are mandatory: clinical cardiologist, cardiac surgeon, interventional cardiologist, electrophysiologist, vascular surgeon, and cardiac anaesthesiologist.

Furthermore, radiologists, geriatricians, gynaecologists, infectious disease specialists, and other specialists may be present, whose opinion is necessary to clarify the patient's clinical conditions globally.

The clinical cases are then presented to the staff by the attending physician, who illustrates the patient's characteristics, clinical history, cardiovascular risk factors, comorbidities, and surgical risk indexes (STS and EuroSCORE II).

Echocardiography, computed tomography, coronary angiography, and other diagnostic tests are also displayed and evaluated collegially.

After a multidisciplinary discussion, the final official decision will be clear and shared.

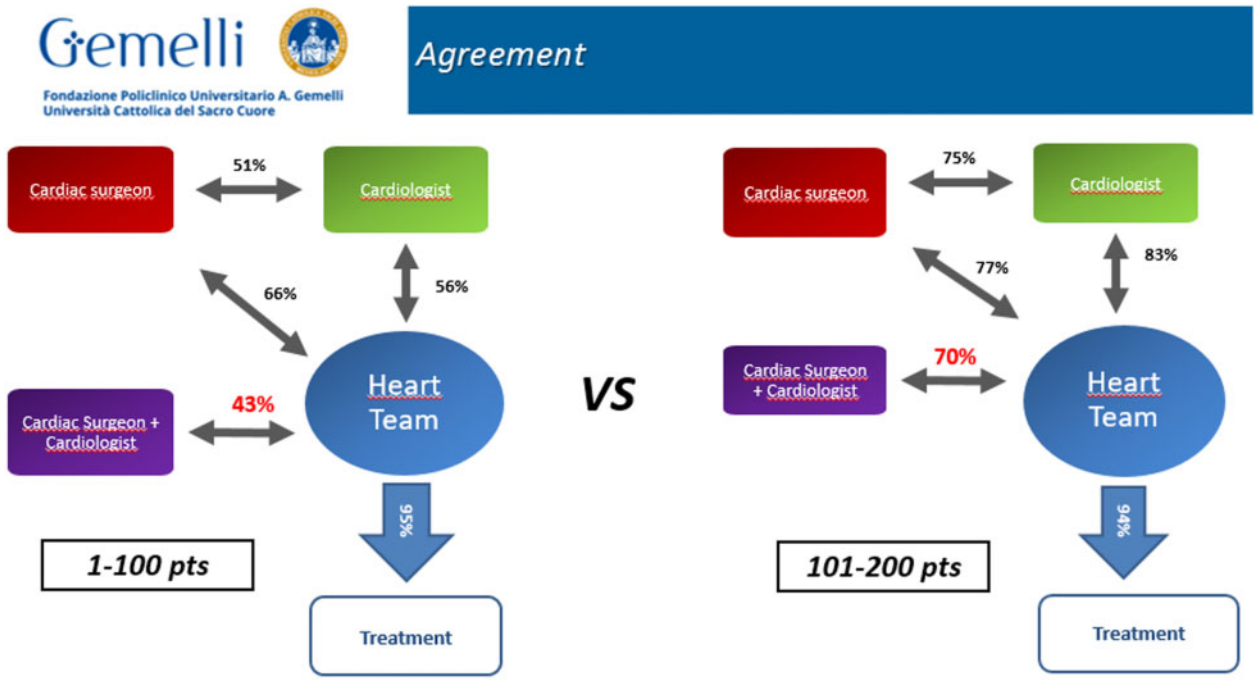

Figure 1 Difference in the percentage of agreement between the first group (100 patients) and the second group (100 patients).

From May 2017 to March 2018, a new Heart Team model was introduced, an evolution compared to the previous model: 'The Electronic Heart Team' (e-Heart Team).

The e-Heart Team is based on the practical collaboration between two remote centres, namely a 'Hub' centre including a Cardiac Surgery Unit (Policlinico Agostino Gemelli of Rome) and a 'Spoke' centre (Sacred Heart Hospital of Jesus-Fatebenefratelli of Benevento).

The specialists of both centres meet regularly in the multimedia classrooms of the respective centres and discuss the clinical, diagnostic, and therapeutic aspects of the patient in video-conference, and an indication is given by mutual agreement.

Preliminary study by Heart Team

Our first preliminary study was to evaluate the change in the treatment recommendation by comparing the initial assessment of a single doctor and a re-evaluation by the Heart Team.

From September 2015 to September 2017, 200 patients were enrolled prospectively (146 males and 54 females, age 73 ± 10.3 years, body mass index 26.4 ± 4.4) who were discussed at the Heart Team of Agostino Gemelli Polyclinic of Rome.

Ninety-eight (49%) patients had coronary artery disease, 60 (30%) had valvular disease with the involvement of one or more heart valves, and 32 (16%) had coronary artery disease associated with a valve disease. Six (3%) patients had valvular heart disease associated with an ascending aortic aneurysm and 4 (2%) had valvular heart disease associated with an ascending aortic aneurysm with severe coronary artery disease.

Table 1 Mortality and morbidity at follow-up

	All patients ($n = 200$)	Patients 1-100	Patients 101-200
Death	2 (1%)	0 (0%)	2 (2%)
Stroke	3 (1.5%)	1 (1%)	2 (2%)
TIA	1 (0.5%)	1 (1%)	0 (0%)
STEMI	2 (1%)	2 (2%)	0 (0%)
NSTEMI	1 (0.5%)	1 (1%)	0 (%)

For the evaluation of the surgical risk of the study population, we used the STS score and the EuroSCORE II score.

The patient was previously evaluated individually by a cardiac surgeon and a cardiologist who independently placed an indication. Subsequently, the same patient was discussed collegially in the Heart Team.

After a multidisciplinary discussion during the Heart Team, 46% of patients underwent cardiac surgery and 33% of patients underwent percutaneous treatment. Only 3% and 10% of patients were subjected to hybrid and medical therapy, respectively. For 8% of patients an indication was given to perform further diagnostic tests.

If we analyse the concordance between the decision of the Heart Team and the final treatment performed, we see that the concordance between the first group (patients 1-100) and the second group (101-200) differs considerably.

In the first 100 patients, the concordance of the therapeutic decision between cardiac surgeon and cardiologist is 51%, the concordance between the decision of the cardiac surgeon, the cardiologist, and the final decision of the Heart Team was found to be 43%.

In the next 100 patients, we observe a concordance rate between cardiologist and cardiac surgeon of up to 75%, and an agreement between the decision of the two specialists and the decision of the Heart Team reached 70%.

Analysing the concordance rate between cardiac surgeon, cardiologist, and cardiac team in the first 100 and second 100 patients, we noticed how in the second group there is a significant increase in the percentage of agreement (43% vs. 70%) (*Figure 1*). Follow-up was completed in 100% of patients. The outcome of the patients was favourable (*Table 1*).

E-Heart Team

As for the experience of e-Heart Team among the specialists of the cardiovascular area of the Gemelli Hospital in Rome and the Fatebenefratelli Hospital in Benevento respectively, between May 2017 and March 2018, 65 patients were enrolled (68 $\pm$ 12 years, 54% females). The conditions diagnosed were: mitral insufficiency (35%), mitral stenosis (15%), aortic stenosis (20%), aortic insufficiency (12%), prosthetic dysfunction (15%), and coronary artery disease (3%). Forty-four percent of patients were symptomatic with dyspnoea (New York Heart Association III) and the ejection fraction was 53 $\pm$ 11%. In 30% of the cases, the patients had previously undergone cardiac surgery. The STS score was 6.75 $\pm$ 8.56%. The outcome of the patients was favourable, with no mortality and no major complications at 9 months of follow-up.

Comments

As often reported in the literature, the main limitation of the Heart Team is the low level of evidence. It is difficult to update the Class IC recommendation in the current guidelines. Due to the lack of randomized data, it is essential to perform observational studies to produce data for the purpose of improving the level of evidence. In this context, our prospective study analyses the clinical impact of the multidisciplinary decision. To assess the clinical impact, we analysed how the individual opinions of cardiologists and cardiac surgeons, members of the same team, often differ in terms of final decision.

Analysing the first 100 and the next 100 patients under examination during the preliminary study, the change in concordance rate between cardiologist and heart surgeon and between the two specialists and the Heart Team was evident. From this information, we deduce that the Heart Team offers a reflection tool that indicates a process of maturation between the various professional figures, a greater convergence of opinions and sharing of skills, and a better progressive adherence to the Heart Team, with greater mental openness in establishing the most appropriate diagnostic-therapeutic procedure of the patient.

The high initial discrepancy therefore underlines the importance of the multidisciplinary discussion for the choice of the therapeutic approach: in a significant number of cases, the therapy proposed by the specialist was different than the final indication of the team.

Furthermore, the results obtained in all enrolled and treated patients were favourable in relation to the calculated risk index.

The e-Heart Team represents an evolution of the previous Heart Team standard. In this configuration, the patient assumes a fully central role, with specialists from various branches belonging to two different structures that revolve around him. Within the framework of this model, the cardiologist of the 'Spoke' centre is not only the 'sender' of the patient to the referring doctor of the 'Hub' centre, but he becomes an integral and fundamental part of the decision-making process, being effectively the doctor who is treating the patient, and with whom the patient has a direct relationship.

Another link between the various specialists is the hybrid room. The hybrid room is a surgical operating room equipped with all the technological tools of a catheterization laboratory and electrophysiology room, as well as advanced imaging devices. This allows treating patients who are in the grey zone between surgery and percutaneous therapies, and to offer in this context a 'hybrid' therapy performed 'four-handed' by the interventional cardiologist and the heart surgeon. If the multidisciplinary decision represents the 'cognitive' phase, the treatment in the hybrid room is the 'theater of action', the paradigm, the 'final procedural step' of the Heart Team.

The Heart Team is the natural consequence of the continuous innovation in the therapeutic and diagnostic field that has characterized the cardiovascular disciplines in recent decades, not simply representing a meeting between doctors of different specialties but an 'indicator of evolution' of cardiovascular therapy, which opens the way to the medicine of the future.

Conflict of interest: none declared.

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