



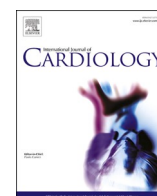
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Contents lists available at ScienceDirect

# International Journal of Cardiology

journal homepage: [www.elsevier.com/locate/ijcard](http://www.elsevier.com/locate/ijcard)

## Editorial

### Stress-testing interventional cardiology organization to streamline procedures during COVID-19 pandemic, and beyond



COVID-19 pandemic is having a tremendous health impact, worldwide. However, while its effects on morbidity and mortality directly linked to pulmonary infection have been promptly recognized [1], only recently the notion is picking up that the effects of COVID-19 pandemic may also extend to negatively impact morbidity and mortality of patients with other diseases, who are not infected by SARS-Cov-2 virus but nonetheless may experience lack of proper care just because much resources are diverted to manage COVID patients, and because overall health organization may have been subverted to cope with the unique demands created by this virus infection. In many places access to outpatient clinics has drastically decreased, or outright abolished, for fear of getting infected and/or because physicians have been called to help in COVID wards. This has left many patients in need of proper diagnosis and therapy for chronic cardiac disease (e. g., atrial fibrillation [2]) without proper management. Similarly, hospitalizations for acute myocardial infarction have substantially declined worldwide, mostly as an effect of paucity of available hospital beds [3], and/or because intensive care units (ICU) at times have been converted into COVID ICUs [4,5]. Overall, these observations have put under focus the issue that proper dealing with the consequences of a pandemic also requires to pay attention to the (even greater) number of patients with other, potentially severe diseases.

Among these, severe aortic stenosis is one of the worst cardiovascular conditions, with a poor mid-term prognosis and an estimated one-year mortality of up to 40% [6]. Recent reports indicate a substantial decrease in the number of patients who were granted treatment of severe aortic stenosis (either by trans-aortic valve implant, TAVI, or by surgical replacement), ranging from 25% to 30% during the pandemic period in comparison to 2019 [7].

The manuscript by Reddavid et al. in this Journal [8], together with other reports from different countries [7,9,10], clearly illustrates how the healthcare system may be readjusted to react to the pandemic adversities. In all cases, efforts were addressed to the following goals: 1) keeping an acceptable waiting period for symptomatic subjects; 2) reducing total hospitalization length; 3) minimizing or even eliminating the need for post-intervention transfer to intensive care unit (ICU), which at times had also been converted into COVID ICUs.

The term resilience has been used up to the excess to describe the ability to face and react to the adversities created by COVID-19, however in this field it is quite clear that the need to optimize the scarce human and logistic resources has provided a great impulse in simplifying and easing TAVI procedures. Procedural flows, teamwork and clear

guidelines play a pivotal role. As already proposed in the FAST TAVI study and in single high volume centre guidelines [11,12], pre-specified algorithm should be used to stratify patients for operative risk and complexity of post-operative course.

Femoral approach with percutaneous sheath insertion under local anaesthesia with minimal sedation is the preferable strategy. Moreover, avoidance of invasive perfusion lines, except one peripheral venous line, adds to the simplification of TAVI. Avoidance of bladder catheterization, central venous line, and radial invasive monitoring minimizes in-hospital complications. Following the procedure, early recovery protocol with quicker mobilization, and reconditioning and discharge within 24 to 48 h should be aimed at, to reduce the risk of post-operative delirium and result in a faster improvement of the patient's quality of life. The operative changes adopted in the COVID-19 period involved the entire process of aortic stenosis treatment, from pre-procedural imaging acquisition, work-out planning, multidisciplinary evaluation, intra-procedural technical details and post procedural management.

In this context, the most interesting finding of the work of Reddavid et al. [7] is that the clinical end-points of what they termed 'simplified TAVI' strategy are comparable to those achieved in the pre-COVID period. This finding stresses the value of experience, organization and team-work collaboration to reduce the burden on hospital resources and increase cost-effectiveness when confronted with the growing population of patients with severe aortic stenosis. In this respect, there is a lesson here, which could extend past and beyond the end of this pandemic, to become a positive legacy. Indeed, more invasive and old fashioned procedures, performed with routine surgical isolation of the femoral artery and with routine permanence in intensive care unit could be progressively phased out. At the same time, though, an accurate multidisciplinary patient evaluation is a mandatory factor to identify those patients with severe aortic stenosis who might require more complex approach and hospital course.

Thus, new standards for 'simplified TAVI' should be adopted also in the future, and dedicated guidelines should be developed to help physicians in patient selection, stratification and in-hospital management. This type of guidelines, developed with the endorsement of scientific societies, would have a huge impact in saving precious resources that instead are too often wasted on "defensive medicine" attitude. At the same time, this should remind us that an orchestrated effort should be put into action to ensure proper organization of health systems to cope with future pandemics [13].

DOI of original article: <https://doi.org/10.1016/j.ijcard.2022.01.038>.

<https://doi.org/10.1016/j.ijcard.2022.02.032>

Received 18 February 2022; Accepted 23 February 2022

Available online 27 February 2022

0167-5273/© 2022 Elsevier B.V. All rights reserved.

## Acknowledgement

This work has been supported by Italian Ministry of Health - Ricerca Corrente to IRCCS MultiMedica.

## References

- [1] S. Achilleos, A. Quattrocchi, J. Gabel, A. Heraclides, O. Kolokotroni, C. Constantinou, et al., On behalf of the C-MOR consortium. Excess all-cause mortality and COVID-19-related mortality: a temporal analysis in 22 countries, from January until August 2020, *Int. J. Epidemiol.* (2021) 1–19, <https://doi.org/10.1093/ije/dyab123>.
- [2] G. Onder, P.P. Olimpieri, S. Celant, A. Di Lenarda, G. Ambrosio, G. Reboldi, et al., AIFA Monitoring Registries, Group, Under-prescription of direct oral anticoagulants for treatment of non-valvular atrial fibrillation and venous thromboembolism in the COVID-19 lockdown period, *Eur. J. Prev. Cardiol.* (2021), <https://doi.org/10.1093/eurjpc/zwab096>. Jun 21:zwab096. Epub ahead of print. PMID: 34151366; PMCID: PMC8344462.
- [3] F. Sofi, M. Dinu, G.P. Reboldi, F. Stracci, Pedretti RFE, S. Valente, G.F. Gensini, C. M. Gibson, G. Ambrosio, Worldwide differences of hospitalization for ST-segment elevation myocardial infarction during COVID-19: a systematic review and meta-analysis, *Int. J. Cardiol.* 347 (2022) 89–96.
- [4] N. Ceserani, E. Motterlini, M. Albergati, F. Barbieri, M. Valcarengi, C. Carbone, et al., Prompt and unavoidable requalification of ordinary hospital wards into a centralized department characterized by high-intensity treatment due to COVID-19 epidemic, *J Comm Hosp Int. Med. Persp.* 11 (2021) 23–26.
- [5] COVIDSurg Collaborative, Projecting COVID-19 disruption to elective surgery, *Lancet.* 399 (2022) 233–234.
- [6] B.A. Carabello, W.J. Paulus, Aortic stenosis, *Lancet* 373 (2009) 956–966.
- [7] E.L. Tay, K. Hayashida, M. Chen, W.H. Yin, D.W. Park, A. Seth, H.L. Kao, M.S. Lin, K.W. Ho, W. Buddhari, M. Chandavimol, F.E. Posas, Q.N. Nguyen, W. Kong, M. A. Rosli, J. Hon, D. Firman, M. Lee, Transcatheter aortic valve implantation during the COVID-19 pandemic: clinical expert opinion and consensus statement for Asia, *J. Card. Surg.* 35 (2020) 2142–2146.
- [8] C. Reddavid, G. Costa, R. Valvo, E. Criscione, O. Strazzieri, S. Motta, V. Frittitta, E. Dipietro, V. Garretto, W. Deste, C. Sgroi, C. Tamburino, M. Barbanti, Transcatheter aortic valve implantation during COVID-19 pandemic: an optimized model to relieve healthcare system overload, *Int. J. Cardiol.* 22 (2022), <https://doi.org/10.1016/j.ijcard.2022.01.038>. S0167-5273(22)00128-0. Epub ahead of print. PMID: 35077726; PMCID: PMC8783646.
- [9] D. Adlam, N. Chan, J. Baron, J. Kovac, Aortic stenosis in the time of COVID-19: Development and outcomes of a rapid turnaround TAVI service, *Catheter. Cardiovasc. Interv.* 98 (2021), <https://doi.org/10.1002/ccd.29550>. E478-E482. Epub 2021 Feb 10. PMID: 33565703; PMCID: PMC8014719.
- [10] M. Valdebenito, E. Massalha, I.M. Barbash, E. Maor, P. Fefer, V. Guetta, A. Segev, Transcatheter aortic valve implantation during the COVID-19 pandemic, *Am. J. Cardiol.* 145 (2021) 97–101.
- [11] M. Barbanti, M.S. van Mourik, M.S. Spence, F. Icovelli, G.L. Martinelli, D.F. Muir, F. Saia, A.S. Bortone, C.G. Densem, F. van der Kley, P. Bramlage, M. Vis, C. Tamburino, Optimising patient discharge management after transfemoral transcatheter aortic valve implantation: the multicentre European FAST-TAVI trial, *EuroIntervention.* 15 (2019) 147–154.
- [12] M. Chopra, N.H.V. Luk, O. De Backer, L. Søndergaard, Simplification and optimization of transcatheter aortic valve implantation - fast-track course without compromising safety and efficacy, *BMC Cardiovasc. Disord.* 18 (2018) 231, <https://doi.org/10.1186/s12872-018-0976-0>. PMID: 30526521; PMCID: PMC6288866.
- [13] E.K. Wei, T. Long, M.H. Katz, Nine lessons learned from the COVID-19 pandemic for improving hospital care and health care delivery, *JAMA Intern. Med.* 181 (2021) 1162–1163.

Flavio Airoldi<sup>a</sup>, Davide Tavano<sup>a</sup>, Giuseppe Ambrosio<sup>b,\*</sup>

<sup>a</sup> Division of Cardiology, IRCCS MultiMedica, Milan, Italy

<sup>b</sup> Division of Cardiology, and Center for Clinical and Translational Research-CERICLET, University of Perugia School of Medicine, Perugia, Italy

\* Corresponding author at: University of Perugia School of Medicine, Ospedale S. Maria della Misericordia, Via S. Andrea delle Fratte, 06156 Perugia, Italy.

E-mail address: [giuseppe.ambrosio@unipg.it](mailto:giuseppe.ambrosio@unipg.it) (G. Ambrosio).