

Integrated Multimodality Cardiovascular Imaging Research Centre

Chair: Prof. Luigi Badano (Coordinators: Dr. Michele Tomaselli [Echocardiography; Valvulopathies]; Dr. Marzia Olivieri [cardiac CT]; Dr. Camilla Torlasco [Cardiac Magnetic Resonance])

Specialised research centre afferent to the cardiology research laboratory

Research Group Members

- Dott.ssa Claudia Baratto
- Prof. Sergio Caravita
- Dott. Andrea Cascella
- Dott.ssa Samantha Fisicaro
- Dott.ssa Mara Gavazzoni
- Dott.ssa Francesca Heilbron
- Prof.ssa Denisa Muraru
- Dott. Giorgio Oliverio
- Dott. Marco Penso
- Dott. Francesco Perelli
- Dott.ssa Valeria Rella
- Dott.ssa Camilla Torlasco

RESEARCH ACTIVITIES

The main research topics of the Integrated Multimodality Cardiovascular Imaging Research Centre are the added diagnostic and prognostic value of the new techniques of noninvasive cardiovascular imaging, application of artificial intelligence to cardiovascular imaging, use of virtual and extended reality techniques to improve the diagnostic capability of cardiovascular imaging, definition of the natural history and prognostic markers in patients with heart valve diseases, definition of predictors of sudden cardiac death in patients with structural heart diseases, assessment of right ventricular function, assessment and prognostic value of the atrial function.

The Integrated Multimodality Cardiovascular Imaging Research Centre runs an echocardiography core-lab activity to analyze echocardiography studies that are part of the scientific projects developed in Auxologico, and also as part of scientific project developed from the industry (multicenter international trials) and other scientific institutions.

The Integrated Multimodality Cardiovascular Imaging Research Centre has an active partnership with the industry and has active research contracts with GE Healthcare (Horten, Norway), Philips Medical Systems (Andover, MA, USA), EsaOte SpA (Genova Italy), TomTec Imaging Systems (Unterschleissen, Germany)

The Integrated Multimodality Cardiovascular Imaging Research Centre has established research collaborations with the National Institute of Health (USA), l'University of Chicago Medical Center (USA), Semmelweiss University in Budapest (Ungheria), Carol Davila University in Bucharest (Romania)

The activities of the Integrated Multimodality Cardiovascular Imaging Research are supported by 2 Ph.D. students, 1 Bioscientist and several research fellows who joined us from other Italian and foreign universities (Romania, Japan, Montenegro).

CARDIAC CONDITIONS THAT ARE CURRENTLY UNDER INVESTIGATION

Ischemic heart disease, Tricuspid regurgitation, Mitral regurgitation, Aortic stenosis, Atrial fibrillation, Hypertrophic cardiomyopathy, Cardiac amyloidosis, Heart failure with preserved ejection fraction, Athlete heart, Hypertensive heart disease, Pulmonary hypertension

MAIN ACHIEVEMENTS (list of publications reachable from the website with a hyperlink, approved projects, awards - to be updated annually)

Publications (last 2 years)

2022

1. Fratianni G, Malfatto G, Perger E, Facchetti L, Pini L, Bosco M, Cernigliaro F, Perego GB, Facchini M, Badano LP, Parati G. Lung Ultrasound in Patients with SARS-COV-2 Pneumonia: Correlations with Chest CT, Respiratory impairment and Inflammatory Cascade. *J Cardiovasc Ultrasound* 2022;41:1465-73 [doi: 10.1002/jum.15831](https://doi.org/10.1002/jum.15831). PMID: 34533859.
2. Russo G, Taramasso M, Pedicino D, Gennari M, Gavazzoni M, Pozzoli A, Murrau D, Badano LP, Metra M, Maisano F. Challenges and future perspectives of transcatheter tricuspid valve interventions: adopt old strategies or adapt to the new chances? *Eur J Heart Fail* 2022; 24: 442-54 [doi: 10.1002/ehf.2398](https://doi.org/10.1002/ehf.2398). PMID: 34894039
3. Florescu DR, Muraru D, Florescu C, Volpato V, Caravita S, Perger E, Bălșeanu TA, Parati G, Badano LP. Right heart chambers geometry and function in patients with the atrial and the ventricular phenotypes of functional tricuspid regurgitation. *Eur Heart J Cardiovasc Imaging*. 2022;23:930-940. [doi: 10.1093/ehjci/jeab211](https://doi.org/10.1093/ehjci/jeab211). PMID: 34747460.
4. Killekar A, Grodecki K, Lin A, Cadet S, McElhinney P, Razipour A, Chan C, Pressman BD, Julien P, Chen P, Simon J, Maurovich-Horvat P, Gaibazzi N, Thakur U, Mancini E, Agalbato C, Munechika J, Matsumoto H, Menè R, Parati G, Cernigliaro F, Nerlekar N, Torlasco C, Pontone G, Dey D, Slomka P. Rapid quantification of COVID-19 pneumonia burden from computed tomography with convolutional long short-term memory networks. *J Med Imaging (Bellingham)*. 2022;9:054001. [doi: 10.1117/1.JMI.9.5.054001](https://doi.org/10.1117/1.JMI.9.5.054001). PMID: 36090960
5. Merlo M, Porcari A, Pagura L, Cameli M, Vergaro G, Musumeci B, Biagini E, Canepa M, Crotti L, Imazio M, Forleo C, Cappelli F, Favale S, Di Bella G, Dore F, Lombardi CM, Pavasini R, Rella V, Palmiero G, Caiazza M, Albanese M, Guaricci AI, Branzi G, Caponetti AG, Satri G, La Malfa G, Merlo AC, Andreis A, Bruno F, Longo F, Sfriso E, Di Lenno L, De Carli G, Giacomini E, Spini V, Milidoni A, Limongelli G, Autore C, Olivetto I, Badano L, Parati G, Perlini S, Metra M, Emdin M, Rapezzi C, Sinagra G. A national survey on prevalence of possible echocardiographic red flags of amyloid cardiomyopathy in consecutive patients undergoing routine echocardiography: study design and patients characterization - the first insight from the AC-TIVE Study. *Eur J Prev Cardiol*. 2022;29:e173-e177. [doi: 10.1093/eurjpc/zwab127](https://doi.org/10.1093/eurjpc/zwab127). PMID: 34499711.
6. Ricci F, Bufano G, Galusko V, Sekar VB, Benedetto U, Awad WI, Kennon S, di Mauro M, Gallina S, Ionescu A, Badano L, Khanji MY. Tricuspid regurgitation management: a systematic review of clinical practice guidelines and recommendations. *Eur Heart J*

Qual care Clin Outcomes 2022; 8: 238-48 [DOI: 10.1093/ehjqcco/qcab081](https://doi.org/10.1093/ehjqcco/qcab081) PMID: 34878111

7. Scorsin M, Andreas M, Corona S, Guta AC, Aruta P, Badano LP. Novel transcatheter mitral prosthesis designed to preserve physiological ventricular flow dynamics. *Ann Thorac Surg.* 2022; 113(2): 593-9 Apr 7:S0003-4975(21)00646-9. [doi: 10.1016/j.athoracsur.2021.03.067](https://doi.org/10.1016/j.athoracsur.2021.03.067). PMID: 33838122.
8. Florescu DR, Muraru D, Volpato V, Gavazzoni M, Caravita S, Tomaselli M, Ciampi P, Florescu C, Bălșeanu TA, Parati G, Badano LP. Atrial Functional Tricuspid Regurgitation as a Distinct Pathophysiological and Clinical Entity: No Idiopathic Tricuspid Regurgitation Anymore. *J Clin Med.* 2022;11:382. [doi: 10.3390/jcm11020382](https://doi.org/10.3390/jcm11020382). PMID: 35054074
9. Torlasco C, Castelletti S, Soranna D; Volpato V, Figliozzi S, Menacho K, Cernigliaro F, Zambon A, Kellman P, Moon JC, Badano LP, Parati G. The EFFECTIVE study: development and application of a question-driven, time-effective cardiac magnetic resonance scanning protocol. *JAHA* 2022; 11: e022605 [doi: 10.1161/JAHA.121.022605](https://doi.org/10.1161/JAHA.121.022605). PMID: 34970923
10. Senage T, Paul A, Le Torneau T, Fella-Hebia I, Vadori M, Bashir S, Galiñanes M, Bottio T, Gerosa G, Evangelista A, Badano LP, Nassi A, Costa C, Galli C, Manji RA, Cuffe de Monchy C, Piriou N, Capoulade R, Serfati J-M, Guimbretière G, Dantan E, Ruiz-Majoral A, Coste du Fou G, Leviatan Ben-Aryes S, Govani L, Yehuda S, Bachar S, Ron Amon A, YU H, Iop L, Casos K, Kuguel SG, Blasco-Lucas A, Permanyer E, Sbraga F, Llatjos R, Moreno-Gonzales G, Sánchez-Martínez M, breimer ME, Holgersson J, Teneberg S, Pascual-Gilabert M, Nonell-Canals A, Takeuchi Y, Chen X, Mañez R, Roussel J-C, Soullou J-P, Cozzi E, Padler-Karavani V. Early antibody responses against glycans of bioprosthetic heart valves support their eventual calcification. *Nature Medicine* 2022 28: 283-294 [doi: 10.1038/s41591-022-01682-w](https://doi.org/10.1038/s41591-022-01682-w). PMID: 35177855
11. Lancellotti P, Pibarot P, Chambers J, La Canna G, Pepi M, Dulgheru R, Dweck M, Delgado V, Garbi M, Vannan M, Montaigne D, Badano L, Maurovitch Horvat P, Pontone G, Vahanian A, Donal E, Cosyns B. Multi-modality imaging assessment of native valvular regurgitation: an EACVI and ESC council of valvular heart disease position paper. *Eur Heart J Cardiovasc Imaging* 2022; 23: e171-e232 [doi: 10.1093/ehjci/jeab253](https://doi.org/10.1093/ehjci/jeab253). PMID: 35292799
12. Hahn RT, Donal E, Muraru D, et al. Functional tricuspid regurgitation: recent advances in the pathophysiology, severity grading and outcome. *Eur Heart J Cardiovasc Imaging* 2022;23:913-29 [doi: 10.1093/ehjci/jeac009](https://doi.org/10.1093/ehjci/jeac009). PMID: 35157070
13. Addetia K, Miyoshi T, Amuthan V, Citro R, Daimon M, Gutierrez Fajardo P, Kasliwal RR, Kirkpatrick JN, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Ronderos RE, Sadeghpour A, Scalia GM, Takeuchi M, Tsang W, Tucay ES, Tude Rodrigues AC, Zhang Y, Hitschrich N, Blankenhagen M, Degel M, Schreckenber M, Mor-Avi V, Asch FM, Lang RM; WASE Investigators. Normal Values of Left Ventricular Size and Function on Three-Dimensional Echocardiography: Results of the World Alliance Societies of Echocardiography Study. *J Am Soc Echocardiogr.* 2022;35:449-59 [doi: 10.1016/j.echo.2021.12.004](https://doi.org/10.1016/j.echo.2021.12.004)
14. Merlo M, Pagura L, Porcari A, Cameli M, Vergaro G, Musumeci B, Biagini E, Canepa M, Crotti L, Imazio M, Forleo C, Cappelli F, Perfetto F, Favale S, Di Bella G, Dore F, Girardi F, Tomasoni D, Pavasini R, Rella V, Palmiero G, Caiazza M, Carella MC, Igoen Guaricci A, Branzi G, Caponetti AG, Satrio G, La Malfa G, Merlo AC, Andreis A, Bruno F, Longo F, Rossi M, Varrà GG, Saro R, Di Lenno L, De Carli G, Giacomini E, Arzilli C, Limongelli G, Autore C, Olivetto I, Badano L, Parati G, Perlini S, Metra M, Emdin M, Rapezzi C, Sinagra G. Unmasking the prevalence of amyloid

cardiomyopathy in the real world: results from Phase 2 of the AC-TIVE study, an Italian nationwide survey. *Eur J Heart Fail.* 2022;24:1377-1386. doi: [10.1002/ehf.2504](https://doi.org/10.1002/ehf.2504). PMID: 35417089.

15. Badano LP, Tomaselli M, Muraru D. Shedding light on the pathophysiology of non-valvular atrial fibrillation as a primary cause of the regurgitation of atrio-ventricular valves. *Eur Heart J Cardiovasc Imaging* 2022;23:956-7 DOI: 0.1093/ehjci/jeac080. PMID: 35511578
16. Muraru D, Badano LP. Shedding new light on the right heart. *Eur Heart J Cardiovasc Imaging* 2022;23:863-6 doi: [10.1093/ehjci/jeac085](https://doi.org/10.1093/ehjci/jeac085). PMID: 35613037
17. Kong WKF, Salsano A, Giacobbe DR, Popescu BA, Duval X, Schueler R, Moreo A, Colonna P, Piper C, Iglesias FC, Badano L, Srdanovic I, Boutoille D, Huttin O, Stoehr E, Timoteo AT, Vaskelyte J, Sadeghpour A, Habbal R, Abid L, Poh KK, Habib G, Lancellotti P. Outcomes of culture-negative versus culture-positive infective endocarditis: the ESC EORP EURO-ENDO registry. *Eur Heart J* 2022;43:2770-80 DOI: [10.1093/eurheartj/ehac307](https://doi.org/10.1093/eurheartj/ehac307)
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Research grants

1. Bando Ricerca Finalizzata 2021 (fondi 2020-2021) Progetto# RF-2021-12374122.di tipo ...Theory-enhancing dal titolo **“In-depth characterization of atriogenic secondary tricuspid regurgitation due to atrial fibrillation. Prevalence, mechanisms, advanced quantification of regurgitation severity, and relative impact of sinus rhythm restoration on the 3D remodeling of right heart chambers and tricuspid valve apparatus “**
https://www.salute.gov.it/portale/ministro/p4_10_1_1_atti_1_1.jsp?lingua=italiano&id=283
2. Bando PNRR 2022. Progetto codice .PNRR-MAD-2022-12375700.nella sezione Malattie Croniche non Trasmissibili (MCnT) ad alto impatto sui sistemi sanitari e socio-assistenziali dal titolo **“ Use of intepREtable artificial intelligence techniques for a PErsonalized risk prediCTION of sudden cardiac death in patients with ischemic and non-ischemic left ventricular dysfunction.The RESPECT project”**
https://www.salute.gov.it/portale/ministro/p4_10_1_1_atti_1_1.jsp?lingua=italiano&id=283
3. Research project funded by the Italian Ministry of Health CC-2019-2366577_001 - Cat. II (EX C)-Aggr. IRCCS- **INTEGRATION OF 3D CARDIOVASCULAR IMAGING AND EXTENDED REALITY APPLICATIONS (AUGMENTED REALITY AND VIRTUAL REALITY) FOR THE CREATION OF VIRTUAL HEART TEAMS BETWEEN PROFESSIONALS FROM DIFFERENT INSTITUTIONS, TO SUPPORT PATINT SELECTION AND PLANNING OF CARDIAC SURGERY OR STRUCTURAL INTERVENTIONS**-Procedura DGRIC n. 1944 del 25/05/2020 - IRCCS CC 2019-20
4. Research project funded by Fondazione Vollaro (ID= 2021-NOECO-0008) **CARDIAC STRUCTURE REMODELING IN ATRIAL FIBRILLATION AND EFFECTS OF SINUS RHYTHM RESTORATION**

Awards

Prof Muraru is vice-President and chair of the echocardiography session of the European Association of Cardiovascular Imaging

Prof Badano è the chair of the working group on heart valve disease of the Italian Society of Cardiology

3 members of the echocardiography laboratory staff had their competence by the European Association of Cardiovascular Imaging

MAIN COLLABORATIONS IN NATIONAL AND INTERNATIONAL RESEARCH NETWORKS

Gruppo di studio su cardiopatie valvolari della Società Italiana di Cardiologia
Gruppo di studio su risonanza magnetica cardiaca della Società Italiana di Cardiologia
World Alliance Societies of Echocardiography Normal Values Study
European Society of Cardiology EORP EURO-ENDO registry
Gruppo di studio AC-TIVE per la diagnosi ecocardiografica dell'amiloidosi cardiaca

