



Best Paper of the Year 2024

Rupak Mukherjee¹ · Enrique Lara-Pezzi^{2,3}

Published online: 29 January 2025

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2025

Every year [1, 2], we highlight the best papers of the previous year in JCTR. Among several exciting manuscripts published in 2024, the associate editors felt the following papers stood out based on their relevance, novelty, scientific rigor, and translational impact. We believe that they showcase the quality and diversity of the papers published in JCTR.

Best Paper of the Year

Gut Microbiota as Predictive Biomarker for Chronic Heart Failure in Patients with Different Nutritional Risk, by Chen Yang and colleagues [3].

There is accumulating evidence that the population(s) of microbes inhabiting our digestive tract, collectively called “gut microbiota”, contribute to our health as well as diseases. By ablating and then replacing gut microbiota in animals, several seminal studies have demonstrated a causative role that gut microbiota play in our wellbeing. However, there have been very few studies that have explored whether alterations in nutritional status can affect the composition of gut microbiota and whether there are functional consequences for such alterations.

Our “Paper of the Year” characterized the composition of microbes in the stools of subjects with heart failure (HF) and age- and sex-matched controls. Through a questionnaire, HF patients were segregated into nutritional “risk” and “non-risk” cohorts. NT-proBNP levels and the number

of post-diagnosis complications were markedly higher in the group with a lower nutritional status. The authors found differences in the composition of the gut microbiota between the control and HF subjects, with differential alteration of several organisms in HF subjects with nutritional risk compared to those without nutritional risk, including *Enterobacter* and *Escherichia shigella*. Microbiome signatures were predictive of HF in patients with nutritional risk. Enrichment analyses revealed that the differentially expressed microbes may impact metabolic pathways involving lysin and albumin synthesis.

The study was conducted in a single center and results may not apply globally. Similar studies from other centers could reveal unique microbiome signatures with predictive value in populations that these centers serve. It would be intriguing to determine whether improvement of nutritional intake may change the gut microbiome and move individuals to lower levels of disease acuity.

Highly Commended Papers in JCTR in 2024

Chitinase-3-like protein 1 Reduces the Stability of Atherosclerotic Plaque via Impairing Macrophagic Efferocytosis, by Yandong Liu and colleagues [4].

This paper reported that CHI3L1, a glycoprotein associated with inflammation, was highly expressed in the human unstable carotid plaque. CHI3L1 decreased macrophages’ efferocytosis capacity through down-regulation of MFGE8 induced by ATF2. Administration of CHI3L1 led to plaque destabilization, while a neutralizing antibody had the opposite effect. This paper unveils CHI3L1 as a potential biomarker and therapeutic target for unstable atherosclerotic plaque.

Force analysis using self-expandable valve fluoroscopic imaging: a way through artificial intelligence by Yiming Qi and colleagues [5].

✉ Rupak Mukherjee
mukherr@musc.edu

Enrique Lara-Pezzi
elarapezzi.jctr@outlook.com

¹ Medical University of South Carolina, Charleston, SC, USA

² Centro Nacional de Investigaciones Cardiovasculares (CNIC), Madrid, Spain

³ Centro de Investigación Biomédica en Red Cardiovascular (CIBERCV), Madrid, Spain

Qi et al. developed an AI model to reconstruct and analyze the stress distribution in a self-expandable valve during/after TAVR based on force assessment by fluoroscopy. Such an approach is not only pioneering from a technological standpoint but might have a strong prediction power on the success of the valve replacement, as well as forecasting potential complications, and allowing more efficient treatment planning.

Efficient Edge-AI Models for Robust ECG Abnormality Detection on Resource-Constrained Hardware by Zhaojing Huang and colleagues [6].

This study developed two AI models to enhance the identification of abnormalities in ECGs. Two models, ConvLSTM2D-liquid time-constant network (CLTC) and ConvLSTM2D-closed-form continuous-time neural network (CCfC), offer advantages over conventional deep models, such as higher computational capabilities, better tolerance to noise, and lower memory usage, making them ideal for real-world healthcare applications.

Mild Therapeutic Hypothermia Alleviated Myocardial Ischemia/Reperfusion Injury via Targeting SLC25A10 to Suppress Mitochondrial Apoptosis by Senlin Ma and colleagues [7].

This paper demonstrates that mild hypothermia reduces reperfusion injury and pathological remodelling following myocardial infarction. The mechanism involves upregulation of SLC25A10, which encodes the mitochondrial dicarboxylate carrier. The paper improves our understanding of ischemia/reperfusion injury and unveils SLC25A10 as a promising therapeutic target.

Vaccarin Ameliorates Doxorubicin-Induced Cardiotoxicity via Inhibition of p38 MAPK Mediated Mitochondrial Dysfunction by Xin Shi and colleagues [8].

In this paper the authors provide clear evidence that a chemotherapeutic agent's (Doxorubicin) toxic effects are reduced by applying vaccarin, an active flavonoid glycoside extracted from a traditional Chinese herbal agent. Vaccarin exerts its beneficial effects by suppressing oxidative stress-induced cell apoptosis via inhibition of p38 MAPK pathways.

Percutaneous Alginate Hydrogel Endomyocardial Injection with a Novel Dedicated Catheter Delivery System: An Animal Feasibility Study by Bo Wang and colleagues [9].

This study proved the feasibility and safety of alginate hydrogel delivered through a transcatheter endocardial injection in a pig model. The system allowed wide alginate

distribution in the mid-left ventricular wall and the product remained within cardiac tissue. No adverse impact on cardiac function and structure was detected, thereby providing a promising translational tool for the delivery of alginate hydrogel in future therapies.

Declarations

Conflict of Interest The authors do not have any issues, financial or otherwise, that may be perceived to be conflict(s) of interest with any of the publications highlighted here.

References

1. Stolen C, Lara-Pezzi E. Best Paper of the Year 2023. *J Cardiovasc Transl Res.* 2024;17(1):1–2. <https://doi.org/10.1007/s12265-024-10490-1>.
2. Stolen C, Lara-Pezzi E. Best Paper of the Year 2022. *J Cardiovasc Transl Res.* 2023;16(1):1–2. <https://doi.org/10.1007/s12265-023-10359-9>.
3. Yang C, Li X, Hu M, Li T, Jiang L, Zhang Y. Gut Microbiota as Predictive Biomarker for Chronic Heart Failure in Patients with Different Nutritional Risk. *J Cardiovasc Transl Res.* 2024;17(6):1240–57. <https://doi.org/10.1007/s12265-024-10529-3>.
4. Liu Y, Hu W, Yang F, Zou S, Ren H, Zuo Y, Qu L. Chitinase-3-like Protein 1 Reduces the Stability of Atherosclerotic Plaque via Impairing Macrophagic Efferocytosis. *J Cardiovasc Transl Res.* 2025. <https://doi.org/10.1007/s12265-024-10576-w>.
5. Qi Y, Zhang X, Shen Z, Liang Y, Chen S, Pan W, Ge J. Force Analysis Using Self-Expandable Valve Fluoroscopic Imaging: a way Through Artificial Intelligence. *J Cardiovasc Transl Res.* 2024;17(6):1328–37. <https://doi.org/10.1007/s12265-024-10550-6>.
6. Huang Z, Herbozo Contreras LF, Leung WH, Yu L, Truong ND, Nikpour A, Kavehei O. Efficient Edge-AI Models for Robust ECG Abnormality Detection on Resource-Constrained Hardware. *J Cardiovasc Transl Res.* 2024;17(4):879–92. <https://doi.org/10.1007/s12265-024-10504-y>.
7. Ma S, Song Y, Xu Y, Wang C, Yang Y, Zheng Y, Chen M. Mild Therapeutic Hypothermia Alleviated Myocardial Ischemia/Reperfusion Injury via Targeting SLC25A10 to Suppress Mitochondrial Apoptosis. *J Cardiovasc Transl Res.* 2024;17(4):946–58. <https://doi.org/10.1007/s12265-024-10503-z>.
8. Shi X, Cao Y, Wang H, Zhao Q, Yan C, Li S, Jing L. Vaccarin Ameliorates Doxorubicin-Induced Cardiotoxicity via Inhibition of p38 MAPK Mediated Mitochondrial Dysfunction. *J Cardiovasc Transl Res.* 2024;17(5):1155–71. <https://doi.org/10.1007/s12265-024-10525-7>.
9. Wang B, Gao C, Lim S, Wang R, Zhu C, Onuma Y, Tao L. Percutaneous Alginate Hydrogel Endomyocardial Injection with a Novel Dedicated Catheter Delivery System: An Animal Feasibility Study. *J Cardiovasc Transl Res.* 2024;17(4):842–50. <https://doi.org/10.1007/s12265-024-10497-8>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.