

The Year in Hungarian Cardiology 2023: Heart failure

Roland Gál¹, Róbert Halmosi¹, Tamás Alexy²,
Tamás Habon^{1,3}



Szerzői video-összefoglaló

¹1st Department of Medicine, Division of Cardiology, University of Pécs,
Medical School, Pécs, Hungary

²Department of Medicine, Division of Cardiology, University of Minnesota, Minneapolis, MN 55455, USA

³1st Department of Medicine, Division of Clinical Pharmacology, University of Pécs, Medical School, Pécs,
Hungary

Address for correspondence:

Tamás Habon, MD, PhD, First department of Medicine, Division of Cardiology, University of Pécs, Medical School,
Ifjúság u. 13., 7624 Pécs, Hungary, e-mail: habon.tamas@pte.hu

The year 2023 proved to be a productive period with many remarkable scientific papers published from Hungary in the field of heart failure (HF). Our aim with this brief review is to highlight the results of the most prominent landmark randomized clinical trials as well as other relevant influential publications with significant contribution from Hungarian authors. Several clinical trials were published in 2023 with the primary focus on optimizing medical management. Papers described the use of sodium-glucose cotransporter-2 inhibitors (SGLT2i) in HF in association with renal dysfunction, COVID-19 infection, and evaluating their economic impact. A comprehensive manuscript analysed the geographic differences in patient characteristics, treatments, and outcomes in the PARADISE-MI trial population. With regards to glucagon-like peptide-1 (GLP-1) receptor agonists, the STEP-HFpEF landmark clinical trial reported a favourable effect for semaglutide in patients with HFpEF and obesity. The intermittent administration of levosimendan did not improve post-hospitalization clinical stability in a population with advanced HF. In the field of cardiac resynchronization therapy (CRT), results of the BUDAPEST-CRT Upgrade trial was published in the European Heart Journal. This was the first prospective, randomized controlled trial to demonstrate that CRT upgrade in patients with intermittent or permanent RV pacing and HFpEF reduces morbidity and mortality.

Several papers focused on the greater field of cardiomyopathies, including medical therapies, diuretic use, and cardiotoxicity. Finally, it is important to mention that an issue of *Cardiologia Hungarica* was published that was entirely dedicated to HF.

Keywords: heart failure, randomized clinical trials, cardiac resynchronization therapy, cardiomyopathy, SGLT2 inhibition, GLP-1 receptor agonist

Introduction

Valuable scientific contributions to the field of HF continued from Hungary in 2023. In this paper, we aimed to provide a brief overview of those manuscripts that were published in an international, peer-reviewed journal with high impact factor and at least one contributing author from Hungary or the work was at least partially performed at a Hungarian research site. Original research papers are

primarily included, but reviews with special impact are also presented. Due to their outstanding scientific importance and major impact on the daily clinical practice, we highlight the results of major phase III randomized controlled clinical trials with Hungarian contribution also. The vast collaboration network between Hungarian HF specialists and other institutions across the world is depicted in *Figure 1*. The importance of fostering international partnerships can clearly be appreciated.

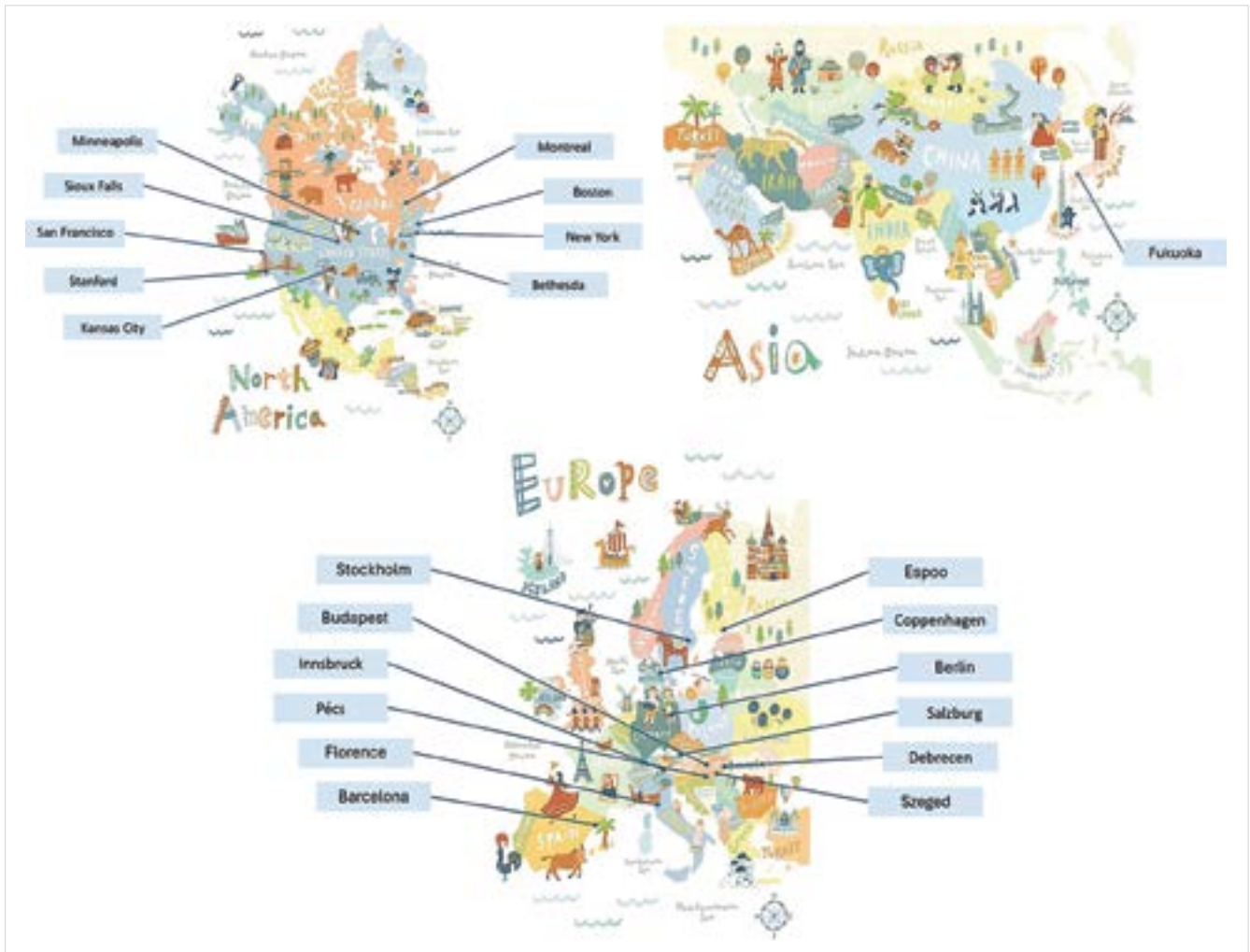


FIGURE 1. Collaboration between Hungarian heart failure specialists and other Universities/Centres throughout the world (based on first authors of the selected publications).

Randomized controlled clinical trials

SGLT2 inhibitors

Although the 2023 focused update of the ESC guidelines for the diagnosis and treatment of HF expanded the class I recommendation for the use of SGLT2i to patients across the entire HF spectrum, limited data exist regarding the continued use of SGLT2i agents when the estimated glomerular filtration rate (eGFR) falls below the thresholds approved for drug initiation (1). In a participant-level pooled analysis of the DAPA-HF and DELIVER trials, *Chatur S et al.* (*Merkely B* was a co-author) aimed to assess the incidence and prognostic implications of worsening renal function defined as an eGFR value of 25 mL/min/1.73 m² or less. The association between the decline in kidney function, treatment with dapagliflozin, and clinical outcomes in HF were also evaluated. When compared to placebo, the beneficial effects of dapagliflozin on cardiovascular (CV) outcomes appeared to be preserved, independent of a decline in renal function, and without an excess in safety endpoints. These findings suggest that the

benefit-to-risk ratio may favour dapagliflozin continuation in patients with HF and worsening renal function, even if the eGFR drops below 25 mL/min/1.73 m². Nevertheless, further randomized clinical trials are needed in a population with advanced chronic kidney disease (CKD) (2). Patients with established CV disease, including HF, are at increased risk for COVID-19 infection-related complications. DELIVER was a prospective, multi-centre, double-blind, event-driven clinical trial that assessed the safety and efficacy of dapagliflozin in HF (EF >40%). The trial was initiated before and was conducted throughout the COVID-19 pandemic. In an interesting analysis, *Bhatt AS et al.* (*Merkely B* contributed as co-author) sought to evaluate the association between COVID-19 infection and clinical outcomes among DELIVER participants. Those diagnosed with COVID-19 infection had higher rates of all-cause mortality and the risk remained elevated for at least 3-6 months. Fifteen percent of all deaths (N=155) were adjudicated as definitely/possibly related to COVID-19. Based on the results, the therapeutic benefits (reduced CV death/

worsening HF events) of dapagliflozin persisted when excluding COVID-19 related immediately fatal events reported by investigators (3).

Taffazoli A et al. (*Rakonczai P* was a co-author) evaluated in a separate paper the potential economic advantages of SGLT2i use in a European population (based on the EMPEROR-Reduced trial data). When compared to standard of care (SoC) alone, the addition of empagliflozin generated incremental health benefits and was found to be a cost-effective use of healthcare resources for managing patients with HF with reduced ejection fraction (HFrEF) (4). *Tsutsui H and co-workers* (*Rakonczai P* contributed as co-author) found similar results in Japan (5).

Angiotensin receptor–neprilysin inhibition (ARNI)

The PARADISE-MI trial published in 2021 found that, compared to ramipril, sacubitril/valsartan did not reduce the primary endpoint of death from CV causes or incident HF in a contemporary cohort enriched for acute myocardial infarction (AMI) (6). *Butt JH et al.* (*Merkely B* was a co-author) used the PARADISE-MI trial population to analyse differences in patient characteristics, treatments, and outcomes in relation to geography. Overall, 23.0% of participants were randomized in Eastern Europe/Russia, 17.5% in Western Europe, 12.2% in Southern Europe, 10.1% in Northern Europe, 12.0% in Latin America, 9.3% in North America, 10.0% in East/South-East Asia, and 5.8% in South Asia. Rates of the primary composite outcome of CV death or incident HF varied two-fold among regions while the rates of incident HF alone varied almost six-fold between the regions. There were also differences in patient characteristics, their comorbidities, and the perceived SoC therapy. These findings underscore the importance of considering both inter-regional and intra-regional differences when designing global clinical studies (7).

GLP-1 receptor agonist

HF with preserved ejection fraction (HFpEF) accounts for more than 50% of all HF cases and continues to grow in prevalence. There is increasing evidence that obesity and excess adiposity are not simply coexisting conditions but these may play a role in the development and progression of HFpEF. The STEP-HFpEF randomized, double-blind, placebo-controlled trial was performed at 96 sites in 13 countries (*Merkely B* was one of the authors). Investigators enrolled 529 patients with HFpEF and obesity (BMI ≥ 30 kg/m²) who were randomized to receive once weekly semaglutide (2.4 mg) or placebo for 1 year. The dual primary endpoints were the change from baseline Kansas City Cardiomyopathy Questionnaire (KCCQ) clinical summary score (KCCQ-CSS) and the change in body weight. Secondary endpoints were defined as the change in 6-minute walking distance, shift in C-reactive protein (CRP) levels, and

a hierarchical composite endpoint that included death, HF events, as well as differential change in KCCQ-CSS and 6-minute walk distance. Overall, the administration of semaglutide (2.4 mg) to patients with HFpEF and obesity prompted a larger reduction in symptom burden and physical limitations than placebo, led to greater improvement in exercise capacity, and a significant weight loss. In addition, the use of semaglutide was associated with an increase in 6-minute walking distance, reduced CRP levels, and resulted in more wins in the evaluation of the hierarchical composite end point. However, larger studies are needed in patients with HFpEF and obesity to definitively prove that this approach indeed improves clinical outcomes significantly (8).

Positive inotrope therapy

Patients with advanced HF frequently experience episodes of acute HF exacerbations. Clinical trials evaluating the repetitive intravenous (iv) use of the calcium sensitizer and potassium channel activator levosimendan suggested that it may benefit patients with advanced HF by reducing the risks of repeat rehospitalizations as well as mortality (9–11). The prospective, multicentre, double-blind clinical trial (LeoDOR trial, *Zima E* and *Papp Z* co-authors) explored the efficacy and safety of intermittent levosimendan administration for 12 weeks on the clinical stability of patients with chronic advanced HF (LVEF $\leq 30\%$). Levosimendan was given in the highly vulnerable period immediately following an acute HF hospitalization. The primary endpoint was death, urgent heart transplantation, need for left ventricular assist device (LVAD) implantation, as well as non-fatal acute HF events. Intermittent levosimendan administration had no significant impact on the primary endpoint when compared to placebo suggesting that the intervention did not improve post-hospitalization clinical stability (12). In a remarkable editorial, *Papp Z* discussed the potential role of inotrope therapy in patients with HF, based on several trials and meta-analyses published over the past years. As the manuscript highlighted, the biggest future challenge for clinical researchers will be to identify the appropriate patient subgroups that may benefit most from inotrope therapy (13).

Novelties in cardiac resynchronization therapy (CRT)

Current European guidelines recommend upgrade to a CRT device in patients with high RV (right ventricular) pacing burden (Class IIa). However, the potential benefits of such device upgrade on hard outcomes have not been published in a population with HFrEF and a pacemaker (PM) or implanted cardioverter defibrillator (ICD) *in situ*. The BUDAPEST-CRT Upgrade trial was the first prospective, phase III, multicentre, randomized controlled trial where *Merkely B et al.* investigated the efficacy and safety of CRT-D upgrade in HFrEF patients on appropriate guideline-directed medical ther-

apy (GDMT) but with an RV pacing burden of 20% or more and a paced QRS complex duration ≥ 150 ms. Three hundred sixty symptomatic (NYHA II–IVa) patients with a PM or ICD were randomly assigned to undergo CRT-D upgrade (N=215) or have an ICD (N=145) in a 3:2 ratio. The composite of all-cause mortality, HF hospitalizations, or $<15\%$ reduction of left ventricular (LV) end-systolic volume at 1 year was the primary outcome. The secondary endpoint was defined as the reduction in the composite of all-cause mortality and HF hospitalizations. Over a median follow-up time of 12.4 months, CRT-D upgrade was associated with significantly fewer HF hospitalizations and reduced all-cause mortality. In addition, CRT-D upgrade proved to be a safe procedure that improved LV reverse remodelling significantly when compared to ICD alone. In summary, the findings of this landmark trial support performing a CRT upgrade to reduce morbidity and mortality in a select group of patients with HFrEF (14). In another study, *Goldenberg et al.* (*Merkely B* was a co-author) sought to analyse whether QRS morphology (LBBB or non-LBBB pattern) is associated with an increase in the risk of life-threatening ventricular tachyarrhythmias in patients with HF and implanted CRT-D. Those with LBBB in the CRT-D arm experienced a significant reduction in the primary endpoint (fast ventricular tachycardia [VT]/ventricular fibrillation [VF]) compared to the ICD-only cohort. In contrast, among patients with a non-LBBB pattern QRS complex, the presence of CRT-D was not associated with a reduction in the incidence of fast VT/VF. In addition, fast VT/VF event burden was significantly higher in the CRT-D group compared to those with ICD-only. These findings suggest a potential pro-arrhythmogenic effect associated with CRTs in those without an underlying LBBB and emphasize the importance of appropriate patient selection (15). In addition to these studies, several other trials (16–18) and meta-analyses (19) were published in 2023 in the field of cardiac resynchronization therapy where Hungarian authors were involved.

Cardiomyopathy

The ESC (European Society of Cardiology) published new “Guidelines for the management of cardiomyopathies” in 2023. The ESC National Cardiac Societies, including *Prof. Robert Sepp* from Hungary, were actively involved in the review process (20). In addition, several high impact papers were published in 2023 on the topic of cardiomyopathies. The role of genetic testing in the diagnosis of hypertrophic cardiomyopathy (HCM) is unquestionable and cardiologists play a central role alongside geneticists. In a review by *Girolami F et al.* (*Pálinkás ED* served as co-author), authors discussed the most frequent questions they received throughout their 20-years genetic counselling experience from pa-

tients suffering from HCM (21). In a retrospective analysis *Zampieri M et al.* (*Pálinkás ED* was involved) aimed to identify the modes of death in a consecutive cohort of patients with HCM based on presenting clinical features and stage of their disease. The most common causes of death were related to complications of their underlying HCM, primarily in the context of HF. Sudden cardiac death (SCD) ranked third, after non-CV death, and mostly occurred in young individuals. Modes of death varied with the disease stage; SCD became less prevalent in more advanced phases when the competitive risk of HF became overwhelming (22).

Other relevant publications

Bánfi-Bacsárdi F and co-workers performed a retrospective analysis to evaluate the application of GDMT, including RAASi (ACEI/ARB/ARNI), beta receptor blockers, MRA, and SGLT2i in a consecutive real-world patient population with HFrEF admitted with HF exacerbation to a tertiary cardiac centre in Hungary between 2019 and 2021. Their results suggest that a high rate of disease-modifying drug use is achievable in this population despite their severe clinical condition. Therefore, further efforts are needed to encourage the routine initiation of these agents in the clinical practice (23).

Symptomatic congestion is the most common cause for hospital admission in the setting of HF exacerbation and requires iv diuretic administration. However, hospitalization for decongestion has a negative impact on the patient's as well as their caregiver's quality of life and also increases healthcare expenditures dramatically. In a critical review, *Khan WJ et al.* (*Tóth K, Halmosi R* and *Alexy T* were involved as co-authors) provided an overview of the pharmacodynamic and pharmacokinetic profile of the novel, pH-neutral subcutaneous furosemide (Furoscix®). In addition, authors reviewed relevant clinical trial data that demonstrate a clear benefit associated with its use in the home setting (24).

A relatively large number of patients with a clear indication is not given a prescription for RAAS inhibitors (especially MRAs), at the recommended doses. Frequently this is related to the actual or the perceived risk of severe hyperkalaemia. In the PRIORITIZE-HF trial, *Tardif JC et al.* (*Merkely B* was a co-author) aimed to assess whether a treatment regimen containing sodium zirconium cyclosilicate (SZC) would allow RAASi to be up-titrated to target doses in patients with HF and elevated serum potassium or at high risk for this complication. Unfortunately, the study was terminated prematurely due to the COVID-19 pandemic and thus failed to demonstrate a significant improvement in the use of RAAS inhibitors in the setting of SZC use, when compared to placebo (25).

In the STOP-CA randomized clinical trial, *Neilan TG et*

al. (*Drobni Zs* was a co-author) investigated the benefits of atorvastatin in patients with anthracycline-associated cardiac dysfunction. Authors found that atorvastatin significantly reduced the incidence of cardiac dysfunction among patients with lymphoma treated with anthracycline-based chemotherapy (26).

Comorbidity-induced chronic systemic inflammation also plays a vital role in the development of HF. As such, better understanding of the link between inflammation and endothelial/microvascular dysfunction may lead to novel therapies in HF, especially HFpEF. In an interesting study (ENDEAVOR trial), *Lund LH et al.* (*Merkely B* was one of the authors) aimed to compare the efficacy of the myeloperoxidase inhibitor mitiperstat to placebo in improving symptoms and exercise capacity in patients with HFpEF or heart failure and mildly reduced ejection fraction (HFmrEF). The rationale and design of the ENDEAVOR trial was published in 2023 (27). In an extensive review, *Gál R. and co-workers* provided in-depth scientific evidence on the CV benefits of natural polyphenols with potent antioxidant properties. Authors not only included laboratory studies but also human clinical trial data relevant to HF (28).

Finally, several other papers with significant scientific value were published by Hungarian authors. These are primarily related to heart transplantation (29,30), right ventricle function (31), and biomarkers (32).

Focus issue of *Cardiologia Hungarica* on heart failure

Continuing an established tradition in 2023, *Cardiologia Hungarica* published a focused issue on HF that included original research manuscripts, case reports, as well as comprehensive reviews. *Sayour AA et al.* published original research work characterizing SGLT1 expression in the left ventricle of patients with end-stage HF (33). In another publication, *Teszak T et al.* presented the first Hungarian experience with non-invasive cell-free DNA (dd-cfDNA) testing evaluating allograft injury and rejection following heart transplantation (34). Furthermore, a total of seven reviews provided insights into the novelties of cardiac myosin inhibition (35, 36), the practical implementation of the current ESC (European Society of Cardiology) Heart Failure Guidelines (37), SGLT2 inhibitors (38), advanced heart failure (39), and cardiac device therapy (40, 41). In addition, two interesting case reports were published related to hypertrophic cardiomyopathy (42) and peripartum cardiomyopathy (43).

Conclusion

As we proudly summarized in this review, Hungarian researchers and clinician scientists contributed to nu-

merous remarkable publications with high impact factor in 2023, further advancing the field of HF. Our overview remains with limited scope as we were unable to include several other papers focusing on the imaging and experimental aspects of HF.

Declaration of interest

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

References

- McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, et al. 2023 focused update of the 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 2023; 44: 3627–39. <https://doi.org/10.1093/eurheartj/ehad195>
- Chatur S, Vaduganathan M, Claggett BL, Mc Causland FR, Desai AS, Jhund PS, et al. Dapagliflozin in Patients With Heart Failure and Deterioration in Renal Function. *J Am Coll Cardiol* 2023; 82(19): 1854–1863. <https://doi.org/10.1016/j.jacc.2023.08.026>
- Bhatt AS, Kosiborod MN, Claggett BL, Miao ZM, Vaduganathan M, Lam CSP, et al. Impact of COVID-19 in patients with heart failure with mildly reduced or preserved ejection fraction enrolled in the DELIVER trial. *Eur J Heart Fail* 2023; 25(12): 2177–2188. <https://doi.org/10.1002/ejhf.3043>
- Tafazzoli A, Reifsnider OS, Bellanca L, Ishak J, Carrasco M, Rakonczai P, et al. A European multinational cost-effectiveness analysis of empagliflozin in heart failure with reduced ejection fraction. *Eur J Health Econ* 2023; 24(9): 1441–1454. <https://doi.org/10.1007/s10198-022-01555-6>
- Tsutsui H, Sakamaki H, Momomura SI, Sakata Y, Kotobuki Y, Linden S, et al. Cost-effectiveness analysis of empagliflozin in patients with heart failure with reduced ejection fraction in Japan based on the EMPEROR-Reduced trial. *J Cardiol* 2023; 81(6): 522–530. <https://doi.org/10.1016/j.jjcc.2023.02.007>
- Pfeffer MA, Claggett B, Lewis EF, Granger CB, Køber L, Maggioniet AP, et al. Angiotensin Receptor-Nephrilysin Inhibition in Acute Myocardial Infarction. *N Engl J Med* 2021; 385: 1845–55. <https://doi.org/10.1056/NEJMoa2104508>
- Butt JH, Claggett BL, Miao ZM, Jering KS, Sim D, Van der Meer P, et al. Geographic differences in patients with acute myocardial infarction in the PARADISE-MI trial. *Eur J Heart Fail* 2023; 25(8): 1228–1242. <https://doi.org/10.1002/ejhf.2851>
- Kosiborod MN, Abildstrøm SZ, Borlaug BA, Butler J, Rasmussen S, Davies M, et al. Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity. *N Engl J Med* 2023; 389(12): 1069–1084. <https://doi.org/10.1056/NEJMoa2306963>
- Altenberger J, Parissis JT, Costard-Jaeckle A, Winter A, Ebner C, Karavidas A, et al. Efficacy and safety of the pulsed infusions of levosimendan in outpatients with advanced heart failure (LevoRep) study: A multicentre randomized trial. *Eur J Heart Fail* 2014; 16: 898–906. <https://doi.org/10.1002/ejhf.118>
- Comin-Colet J, Manito N, Segovia-Cubero J, Delgado J, García Pinilla JM, Almenar L, et al. LION-HEART Study Investigators. Efficacy and safety of intermittent intravenous outpatient administration of levosimendan in patients with advanced heart failure: The LION-HEART multicentre randomised trial. *Eur J Heart Fail* 2018; 20: 1128–1136. <https://doi.org/10.1002/ejhf.1145>
- García-González MJ, Aldea Perona A, Lara Padron A, Morales Rull JL, Martínez-Sellés M, de Mora MM, et al. Efficacy and safety of intermittent repeated levosimendan infusions in advanced heart failure patients: The LAICA study. *ESC Heart Fail* 2021; 8: 4820–4831. <https://doi.org/10.1002/ehf2.13670>
- Pözl G, Altenberger J, Comin-Colet J, Delgado JF, Fedele F, García-González MJ, et al. Repetitive levosimendan infusions for patients with advanced chronic heart failure in the vulnerable

- post-discharge period: The multinational randomized LeoDOR trial. *Eur J Heart Fail* 2023; 25(11): 2007–2017. <https://doi.org/10.1002/ejhf.3006>
13. Pollesello P, Papp ZJ. The Future for Inotropes in Heart Failure. *Do Not Throw the Baby Out With the Bathwater! Cardiovasc Pharmacol* 2023; 81(1): 1–3. <https://doi.org/10.1097/FJC.0000000000001377>
14. Merkely B, Hatala R, Wranicz JK, Duray G, Földesi Cs, Som Z. Upgrade of right ventricular pacing to cardiac resynchronization therapy in heart failure: a randomized trial. *Eur Heart J* 2023; 44(40): 4259–4269. <https://doi.org/10.1093/eurheartj/ehad591>
15. Goldenberg I, Aktas MK, Zareba W, Huang DTC, Rosero SZ, Younis A, et al. QRS Morphology and the Risk of Ventricular Tachyarrhythmia in Cardiac Resynchronization Therapy Recipients. *JACC Clin Electrophysiol* 2024; 10(1): 16–26. <https://doi.org/10.1016/j.jacep.2023.09.018>
16. Proff J, Merkely B, Papp R, Lenz C, Nordbeck P, Butter C, et al. Closed loop stimulation in patients with chronic heart failure and severe chronotropic incompetence: Responders versus non-responder. *Int J Cardiol* 2023; 370: 222–228. <https://doi.org/10.1016/j.ijcard.2022.10.019>
17. Behon A, Merkel ED, Schwertner WR, Kuthi LC, Veres B, Masszi R, et al. Long-term outcome of cardiac resynchronization therapy patients in the elderly. *Geroscience* 2023; 45(4): 2289–2301. <https://doi.org/10.1007/s11357-023-00739-z>
18. Merkel ED, Schwertner WR, Behon A, Kuthi L, Veres B, Oszthimer I, et al. Predicting the survival benefit of cardiac resynchronization therapy with defibrillator function for non-ischemic heart failure—Role of the Goldenberg risk score. *Front Cardiovasc Med* 2023; 9: 1062094. <https://doi.org/10.3389/fcvm.2022.1062094>
19. Veres B, Fehérvári P, Engh MA, Hegyi P, Gharehdaghi S, Zima E, et al. Time-trend treatment effect of cardiac resynchronization therapy with or without defibrillator on mortality: a systematic review and meta-analysis *Europace* 2023; 25(10): euaad289. <https://doi.org/10.1093/europace/euad289>
20. Arbelo E, Protonotarios A, Gimeno JR, Arbustini E, Barriales-Villa R, Basso C, Bezzina CR, et al. 2023 ESC Guidelines for the management of cardiomyopathies. *Eur Heart J* 2023; 44(37): 3503–3626. <https://doi.org/10.1093/eurheartj/ehad194>
21. Girolami F, Gozzini A, Pálkás ED, Ballerini A, Tomberli A, Baldini K, et al. Genetic Testing and Counselling in Hypertrophic Cardiomyopathy: Frequently Asked Questions. *J Clin Med* 2023; 12(7): 2489. <https://doi.org/10.3390/jcm12072489>
22. Zampieri M, Salvi S, Fumagalli C, Argirò A, Zocchi C, Del Franco A, et al. Clinical scenarios of hypertrophic cardiomyopathy-related mortality: Relevance of age and stage of disease at presentation. *Int J Cardiol* 2023; 374: 65–72. <https://doi.org/10.1016/j.ijcard.2022.12.056>
23. Bánfi-Bacsárdi F, Muk B, Pilecky D, Duray GZ, Kiss RG, Nyolczas N. The Optimization of Guideline-Directed Medical Therapy during Hospitalization among Patients with Heart Failure with Reduced Ejection Fraction in Daily Clinical Practice. *Cardiology* 2023; 148(1): 27–37. <https://doi.org/10.1159/000528505>
24. Khan WJ, Arriola-Montenegro J, Mutschler MS, Bensimhon D, Halmosi R, Toth K, Alexy T. A novel opportunity to improve heart failure care: focusing on subcutaneous furosemide. *Heart Fail Rev* 2023; 28(6): 1315–1323. <https://doi.org/10.1007/s10741-023-10331-4>
25. Tardif JC, Rouleau J, Chertow GM, Al-Shurbaji A, Lisovskaja V, Gustavson S, et al. Potassium reduction with sodium zirconium cyclosilicate in patients with heart failure. *ESC Heart Fail* 2023; 10(2): 1066–1076. <https://doi.org/10.1002/ehf2.14268>
26. Neilan TG, Quinaglia T, Onoue T, Mahmood SS, Drobní ZsD, Gilman HK, et al. Atorvastatin for Anthracycline-Associated Cardiac Dysfunction: The STOP-CA Randomized Clinical Trial. *JAMA* 2023; 330(6): 528–536. <https://doi.org/10.1001/jama.2023.11887>
27. Lund LH, Lam CSP, Pizzato PE, Gabrielsen A, Michaëlsson E, Nelander K, et al. Rationale and design of ENDEAVOR: A sequential phase 2b-3 randomized clinical trial to evaluate the effect of myeloperoxidase inhibition on symptoms and exercise capacity in heart failure with preserved or mildly reduced ejection fraction. *Eur J Heart Fail* 2023; 25(9): 1696–1707. <https://doi.org/10.1002/ejhf.2977>
28. Gál R, Halmosi R, Gallyas F, Tschida M, Mutirangura P, Tóth K, et al. Resveratrol and beyond: The Effect of Natural Polyphenols on the Cardiovascular System: A Narrative Review. *Biomedicines* 2023; 11(11): 2888. <https://doi.org/10.3390/biomedicines11112888>
29. Wayda B, Angleitner P, Smits JM, Van Kins A, Berchtold-Herz M, De Pauw M, et al. Disparities in donor heart acceptance between the USA and Europe: clinical implications. *Eur Heart J* 2023; 44(44): 4665–4674. <https://doi.org/10.1093/eurheartj/ehad684>
30. Teszak T, Assabiny A, Kiraly A, Tarjanyi Z, Parazs N, Szakal-Toth Zs, et al. Extracorporeal photopheresis in the treatment of cardiac allograft rejection: A single-centre experience. *Transpl Immunol* 2023; 79: 101853. <https://doi.org/10.1016/j.trim.2023.101853>
31. Inciardi RM, Abanda M, Shah AM, Cikes M, Claggett B, Skali H, et al. Right Ventricular Function and Pulmonary Coupling in Patients With Heart Failure and Preserved Ejection Fraction. *PARAGON-HF Investigators. J Am Coll Cardiol* 2023; 82(6): 489–499. <https://doi.org/10.1016/j.jacc.2023.05.010>
32. Sági B, Vas T, Jakabfi-Csepregi R, Horváth-Szalai Z, Kőszegi T, Csiky B, et al. The Role of Two Heart Biomarkers in IgA Nephropathy. *Int J Mol Sci* 2023; 24(12): 10336. <https://doi.org/10.3390/ijms241210336>
33. Sayour AA, Oláh A, Ruppert M, Barta BA, Horváth EM, Benke K, et al. Characterization of left ventricular myocardial sodium-glucose cotransporter 1 expression in patients with end-stage heart failure. *Cardiologia Hungarica* 2023; 53: 319–330. <https://doi.org/10.26430/chungarica.2023.53.4.319>
34. Teszák T, Bödör Cs, Hegyi L, Lévay L, Nagy Á, Fintha A, et al. Noninvasive detection of allograft injury after heart transplantation – Utilization of donor-derived cell-free DNA assay in the management of heart transplant recipients. *Cardiologia Hungarica* 2023; 53: 399–405. <https://doi.org/10.26430/chungarica.2023.53.4.399>
35. Papp Z, Sárkány F, Ráduly A, Pásztor D, Máté BI, Tóth A, Borbély A. What is the more effective strategy: activation or inhibition of myosin? *Cardiologia Hungarica* 2023; 53: 331–336. <https://doi.org/10.26430/chungarica.2023.53.4.331>
36. Pálkás ED, Sepp R, Olivotto I. A New Chapter in the Management of Hypertrophic Cardiomyopathy: Cardiac Myosin Inhibitors. *Cardiologia Hungarica* 2023; 53: 337–342. <https://doi.org/10.26430/chungarica.2023.53.4.337>
37. Muk B. Practical implementation of the 2021 European Society of Cardiology Heart Failure Guidelines – focusing on the Guideline-directed Medical Therapy for Heart Failure with Reduced Ejection Fraction. *Cardiologia Hungarica* 2023; 53: 351–359. <https://doi.org/10.26430/chungarica.2023.53.4.351>
38. Kosztin A. SGLT2 inhibitors on cardiovascular outcomes. *Cardiologia Hungarica* 2023; 53: 360–364. <https://doi.org/10.26430/chungarica.2023.53.4.360>
39. Sax B, Assabiny A, Becker D, Merkely B. Therapeutic algorithm of advanced heart failure – The role of early referral. *Cardiologia Hungarica*. 2023; 53: 393–398. <https://doi.org/10.26430/chungarica.2023.53.4.393>
40. Kosztin A, Polgár B, Kónyi A, Hejmel L, Gellér L, Vámos M. Interdisciplinary care of patients receiving cardiac resynchronization therapy. *Cardiologia Hungarica* 2023; 53: 365–374. <https://doi.org/10.26430/chungarica.2023.53.4.365>
41. Makai A, Sággy L. Changes in primary prevention ICD indications in the 2022 ESC guideline for the treatment of ventricular arrhythmias and prevention of sudden cardiac death. *Cardiologia Hungarica* 2023; 53: 375–385. <https://doi.org/10.26430/chungarica.2023.53.4.375>
42. Nagy V, Rácz G, Takács H, Radics B, Borbás J, Kormányos Á, Csányi B. Does the GLA p. Ala143Thr variant cause Fabry disease? *Cardiologia Hungarica* 2023; 53: 343–350. <https://doi.org/10.26430/chungarica.2023.53.4.343>
43. Bánfi-Bacsárdi F, Muk B, Polgár B, Török GM, Duray GZ, Kiss RG. The role of optimal medical and device therapy in the complex treatment of peripartum cardiomyopathy. *Cardiologia Hungarica* 2023; 53: 386–392. <https://doi.org/10.26430/chungarica.2023.53.4.386>