



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**SESSIE 5: Heart failure**

	Zaal: Dexter 11 t/m 16	Voorzitters: dr. Solmaz Assa, cardioloog Treant dr. Laura Meems, cardioloog UMCG
1	09.00 - 09.10	<b>The Influence of Cardiovascular Risk-related Comorbidities on the Development of Dilated Cardiomyopathy</b> <i>Nina Beelen, Maastricht University Medical Center+, Maastricht</i>
2	09.11 - 09.21	<b>External Validation of the EHMRG30-ST Score for Short-Term Mortality Risk Stratification in European Patients With Acute Decompensated Heart Failure</b> <i>Dina Mouha, Erasmus MC, Rotterdam</i>
3	09.22 - 09.32	<b>Elevated hsCRP Unmasks a Distinct Metabolic-Inflammatory HFpEF Phenotype</b> <i>Eline Verghote, Maastricht University Medical Centre+, Maastricht</i>
4	09.33 - 09.43	<b>Development of a Risk Score to Predict Heart Failure in Patients receiving Coronary Artery Bypass Grafting Surgery</b> <i>Tijmen Ris, Amsterdam UMC, Amsterdam</i>
5	09.44 - 09.54	<b>Abnormal Left Atrial Strain Predicts Dilated Cardiomyopathy Development in Asymptomatic Relatives</b> <i>Max Venner, Maastricht University Medical Centre+, Maastricht</i>
6	09.55 - 10.05	<b>Intubation Rather Than Cardiac Arrest as a Predictor of Mortality in Acute Myocardial Infarction-Related Cardiogenic Shock</b> <i>Sanne ten Berg, Amsterdam UMC, Amsterdam</i>
7	10.06 - 10.16	<b>Phospholamban Cardiomyopathy: From in Vitro Disease Modeling to Therapy</b> <i>Frederik Deiman, UMCG, Groningen</i>



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Abstract 1

**The Influence of Cardiovascular Risk-related Comorbidities on the Development of Dilated Cardiomyopathy**

Presenting author: N.J. Beelen

Department: Cardiology

*N.J. Beelen (Maastricht University Medical Center+, Maastricht); N.J. Beelen (Maastricht University Medical Center+, Maastricht); S.L.V.M. Stroeks (Maastricht University Medical Center+, Maastricht); A. Paldino (Azienda Sanitaria Universitaria Giuliano-Isontina, Trieste); X. Li (Maastricht University Medical Center+, Maastricht); A.B.M. Heymans (Maastricht University Medical Center+, Maastricht); M. Dal Ferro (Azienda Sanitaria Universitaria Giuliano-Isontina, Trieste); M. Merlo (Azienda Sanitaria Universitaria Giuliano-Isontina, Trieste); N.K. Lakdawala (Brigham and Women's Hospital, Boston); G. Sinagra (Azienda Sanitaria Universitaria Giuliano-Isontina, Trieste); J.A.J. Verdonschot (Maastricht University Medical Center+, Maastricht); S.R.B. Heymans (Maastricht University Medical Center+, Maastricht)*

**Purpose:**

Dilated cardiomyopathy (DCM) is a multifactorial disease, which genetic, environmental factors, as well as comorbidities, contribute to disease development. However, the individual and combined role that hypertension, diabetes mellitus, and obesity play in disease development remains largely unknown. This study aims to research the effect of these comorbidities and their potential interplay on DCM development.

**Methods:**

Patients with DCM and a control group of unaffected relatives were included from nine international centers. The presence of hypertension, diabetes mellitus and obesity prior to diagnosis was assessed, using multivariable regression analysis, in order to evaluate their influence on DCM development and age at diagnosis.

**Results:**

In total, 3809 patients were included (36.6% female; mean age  $51.5 \pm 14.0$ ; (likely) pathogenic variant carriers 16.7%), along with 457 unaffected relatives (62.9% female; mean age  $44.9 \pm 15.6$ ; (likely) pathogenic variant carriers 29.2%). Hypertension, diabetes, male sex, and genotype negative carriers were independently associated with a later age at diagnosis (Figure 1). Obesity was not associated with an earlier or later age at diagnosis when considered in isolation. However, obesity modified the effect of hypertension and diabetes, shifting towards an earlier age of onset in patients with combined obesity and hypertension ( $p < .01$ ), with a similar trend for obesity and diabetes ( $p = .07$ ) (Figure 1).

**Conclusion:**

When considering the interplay between comorbidities, obesity appears to accelerate the development of DCM. Hypertension and diabetes were associated with an earlier age of onset, only in the presence of obesity. The underlying mechanisms driving these effects need to be further studied.

**Keywords:**

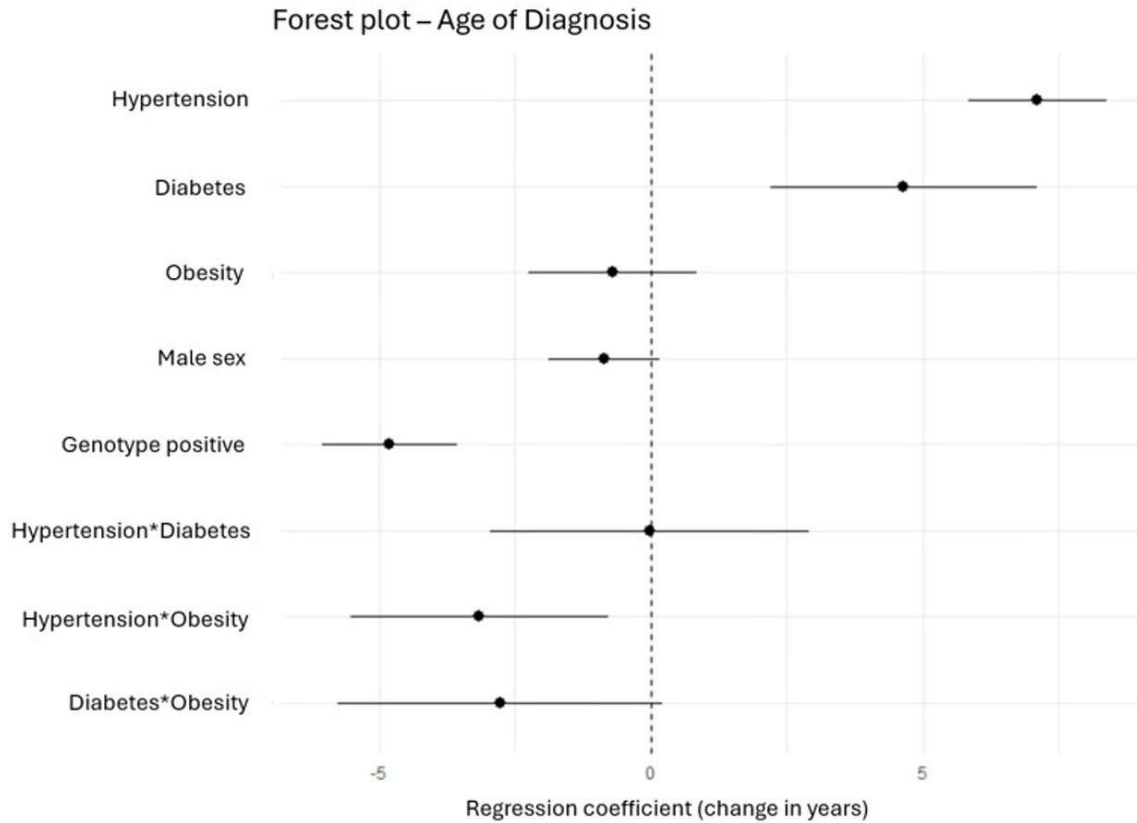
Dilated cardiomyopathy, Comorbidities, Cardiovascular risk



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**Figure:**

Figure 1. Forest plot showing regression coefficients for age of dilated cardiomyopathy diagnosis. Coefficients were derived from multivariable regression analysis. Positive coefficients indicate later age of diagnosis, negative coefficients indicate earlier age of diagnosis, \* indicates interaction term between two variables. Black points indicate regression coefficients, horizontal lines indicate 95% confidence intervals.





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Abstract 2

**External Validation of the EHMRG30-ST Score for Short-Term Mortality Risk Stratification in European Patients With Acute Decompensated Heart Failure**

Presenting author: D. Mouha

Department: Cardiology

*A. Mkrtchjan (Erasmus MC, Rotterdam); D. Mouha (Erasmus MC, Rotterdam); A. Mkrtchjan (Erasmus MC, Rotterdam); D. Mouha (Erasmus MC, Rotterdam); M.C. van Herwerden (Erasmus MC, Rotterdam); K. Veen (Erasmus MC, Rotterdam); A.A. Constantinescu (Erasmus MC, Rotterdam); K. Caliskan (Erasmus MC, Rotterdam); O.C. Manintveld (Erasmus MC, Rotterdam); J.J. Brugts (Erasmus MC, Rotterdam); R.A. de Boer (Erasmus MC, Rotterdam); L. Feyz (Erasmus MC, Rotterdam); R.M.A. van der Boon (Erasmus MC, Rotterdam)*

**Purpose:**

Acute decompensated heart failure (ADHF) is associated with high short-term mortality and healthcare burden. Risk scores may guide clinical decisions, including early discharge or hospital-at-home strategies. This study aimed to externally validate the Emergency Heart Failure Mortality Risk Grade (EHMRG) 30-day score in a European hospitalized ADHF cohort.

**Methods:**

We conducted a retrospective cohort study of consecutive ADHF admissions to a tertiary center in the Netherlands (January–December 2022). EHMRG 30-day scores were calculated using demographic, clinical, and laboratory data at presentation, classifying patients into low, intermediate, or high-risk strata. The primary outcome was 30-day all-cause mortality. Discrimination was assessed by receiver operating characteristic analysis, and calibration by the Hosmer–Lemeshow test.

**Results:**

Among 270 eligible patients, 193 had complete data. Median age was 71 years (IQR 61–77); 60.1% were male. Most patients were low risk (60.6%), followed by intermediate (25.4%) and high risk (14.0%). Thirty-day mortality increased across strata, highest in the high-risk group (37.0%). Area under the curve was 0.749 (95% CI 0.649–0.848). Calibration showed systematic underestimation of observed mortality (Hosmer–Lemeshow  $P < 0.001$ ).

**Conclusion:**

In this European cohort, the EHMRG 30-day score demonstrated fair discrimination but poor calibration. Recalibration and prospective validation are required before routine clinical implementation.

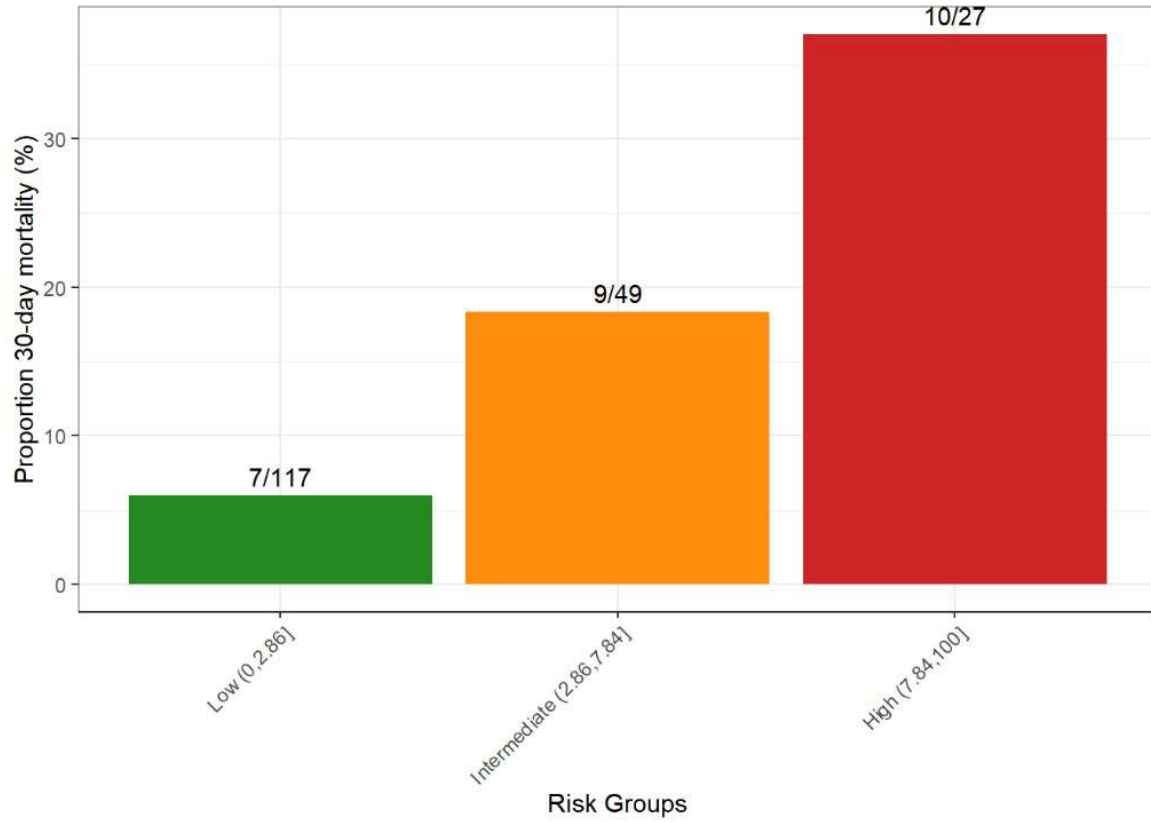
**Keywords:**

Acute decompensated heart failure, Risk stratification, 30-day mortality



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**Figure:**  
Mortality rate and number of patients in each risk group.





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Abstract 3

**Elevated hsCRP Unmasks a Distinct Metabolic-Inflammatory HFpEF Phenotype**

Presenting author: E. Verghote

Department: Cardiology

*E. Verghote (Maastricht University Medical Centre+, Maastricht); A. Achten (Maastricht University Medical Centre, Maastricht); J. Weerts (Maastricht University Medical Centre, Maastricht); S.G.J. Mourmans (Maastricht University Medical Centre, Maastricht); A.B. Aizpurua (Maastricht University Medical Centre, Maastricht); C. Knackstedt (Maastricht University Medical Centre, Maastricht); V. van Empel (Maastricht University Medical Centre, Maastricht)*

**Purpose:**

An hsCRP threshold  $\geq 2$  mg/L has been used to identify heart failure patients with preserved ejection fraction (HFpEF) with a heightened inflammatory state at increased risk. We aimed to evaluate whether hsCRP  $\geq 2$  mg/L defines a distinct clinical HFpEF phenotype, and evaluate its prognostic association.

**Methods:**

This single-centre prospective observational cohort study included HFpEF patients diagnosed via a specialised outpatient clinic. Clinical features were compared between patients with low ( $< 2$  mg/L) and high ( $\geq 2$  mg/L) baseline hsCRP levels. Factors associated with high hsCRP and its prognostic value were assessed for heart failure hospitalisation or all-cause mortality.

**Results:**

Among 401 HFpEF patients (mean age, 75 years; 68% female), median hsCRP was 2.4 mg/L [1.2, 5.6]. Low and high hsCRP was measured in 171 (43%) and 230 (57%) patients, respectively. Patients with high hsCRP were more often obese (55.2% vs 31%,  $p < 0.001$ ). High hsCRP was independently associated with higher body mass index (OR 1.10, 95% CI 1.05-1.15,  $p < 0.001$ ), lower eGFR (OR 0.99, 95% CI 0.97-1.00,  $p = 0.046$ ) and increased low-density lipoprotein concentrations (OR 1.33, 95% CI 1.02-1.76,  $p = 0.036$ ). Prognosis was worse in patients with high versus low hsCRP (97 (40.2%) vs 45 (26.3%) events, log rank  $p = 0.0058$ ), which remained significant after multivariable adjustment (HR 1.42, 95% CI 1.13-1.77,  $p = 0.002$ ).

**Conclusion:**

HFpEF patients with hsCRP  $\geq 2$  mg/L exhibit a distinct metabolic-inflammatory profile, providing a basis for data-driven identification of patients with elevated hsCRP, who may potentially benefit from emerging anti-inflammatory therapies.

**Keywords:**

HFpEF, hsCRP, Inflammation



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**Figure:**

Table 1: Univariable and multivariable logistic regression models identifying factors associated with high hsCRP. Model 1 represents univariable analysis; Model 2 represents multivariable analysis including all covariates; Model 3 corresponds to the final multivariable model derived using Akaike's Information Criterion. Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; LDL, low-density lipoprotein; CI, confidence interval; OR, odds ratio.

Characteristic	Model 1			Model 2			Model 3		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Age (years)	0.98	0.96, 1.01	0.3	1.00	0.96, 1.05	0.8	1.00	0.96, 1.05	0.8
Sex									
Female	—	—		—	—		—	—	
Male	1.21	0.79, 1.86	0.4	1.50	0.86, 2.66	0.2	1.51	0.88, 2.64	0.14
BMI (kg/m <sup>2</sup> )	1.12	1.07, 1.16	<0.001	1.09	1.04, 1.16	<0.001	1.10	1.05, 1.15	<0.001
Diabetes Mellitus	1.53	0.96, 2.47	0.075	1.29	0.70, 2.40	0.4			
Sleepapnea	1.48	0.89, 2.51	0.14	0.84	0.43, 1.62	0.6			
Hypertension	1.14	0.72, 1.79	0.6	1.16	0.64, 2.11	0.6			
Atrial Fibrillation	1.26	0.84, 1.88	0.3	1.17	0.70, 1.95	0.5			
Coronary Artery Disease	0.65	0.37, 1.15	0.14	0.65	0.35, 1.21	0.2	0.64	0.34, 1.20	0.2
COPD	1.60	0.93, 2.83	0.10	1.36	0.69, 2.73	0.4	1.41	0.72, 2.83	0.3
eGFR (mL/min/1.73m <sup>2</sup> )	0.98	0.97, 0.99	0.003	0.99	0.97, 1.00	0.059	0.99	0.97, 1.00	0.046
Transferrin saturation (%)	0.97	0.95, 0.99	0.003	0.98	0.95, 1.00	0.078	0.97	0.95, 1.00	0.067
LDL (mmol/L)	1.27	1.04, 1.57	0.019	1.35	1.03, 1.79	0.033	1.33	1.02, 1.76	0.036



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Abstract 4

**Development of a Risk Score to Predict Heart Failure in Patients receiving Coronary Artery Bypass Grafting Surgery**

Presenting author: T.H. Ris

Department: Cardiology

*Roel Hoek (Amsterdam UMC, Amsterdam); R. Hoek; T.H. Ris; S. Houterman; J.W.R. Twisk; M. L. Handoko; A. Nap; J.P.S. Henriques; R. Delewi; R.S. Driessen; P.A. van Diemen; F.W. Asselbergs; P. Knaapen; A.B.A. Vonk; R.A.F. de Lind van Wijngaarden; R.W. de Winter; A. Uijl; on behalf of the cardiothoracic surgery registration committee of the Netherlands Heart Registration*

**Purpose:**

Heart failure (HF) after coronary artery bypass grafting (CABG) is associated with poor long-term outcomes. Early identification of patients at high risk for post-CABG HF and subsequent cardiovascular (CV) mortality is warranted, yet determinants among patients undergoing bypass surgery with preserved left ventricular ejection fraction (LVEF) remain poorly defined. We aimed to develop clinical risk models to predict HF hospitalization and CV mortality after isolated CABG in patients with normal baseline LVEF.

**Methods:**

Nationwide cohort study using data from the Netherlands Heart Registration linked with the national cause of death registry and Dutch Hospital Data. All patients undergoing isolated CABG between 2013 and 2023 were eligible. Those with unavailable outcome data or unsuccessful data linkage, LVEF <50% or unknown LVEF or prior HF hospitalization were excluded. The primary endpoint was a composite of HF hospitalization and CV mortality. Secondary endpoints were HF hospitalization and CV mortality. Cox regression with backward stepwise selection ( $p < 0.10$ ) was used. Model performance was evaluated using the area under the curve (AUC).

**Results:**

Among 48,062 patients (mean age  $66.16 \pm 9.40$  years; 9,476 [19.7%] female) followed for a median of 4.6 years (IQR 2.3-7.1), 2,895 patients (6.0%) experienced the primary endpoint. The final model included 22 predictors and is shown in Figure 1. The primary model AUC was 0.755 (95%CI: 0.745-0.764), with good calibration at 1-, 3-, and 5-year follow-up. Endpoint-specific models had AUCs of 0.748 (95%CI: 0.735-0.761) for HF hospitalization and 0.773 (95%CI: 0.759-0.786) for CV mortality. An online calculator was developed to estimate an individual's risk to experience the primary endpoint at the time of CABG (<http://hoek.shinyapps.io/CABG-HF>).

**Conclusion:**

We developed risk models that accurately predict HF hospitalization and CV mortality after isolated CABG with preserved LVEF. These models may support informed perioperative planning, closer follow-up, and timely implementation of preventive strategies of patients at high risk of these cardiac sequelae after CABG.

**Keywords:**

Heart Failure, Prior Coronary Artery Bypass Grafting, Risk Model

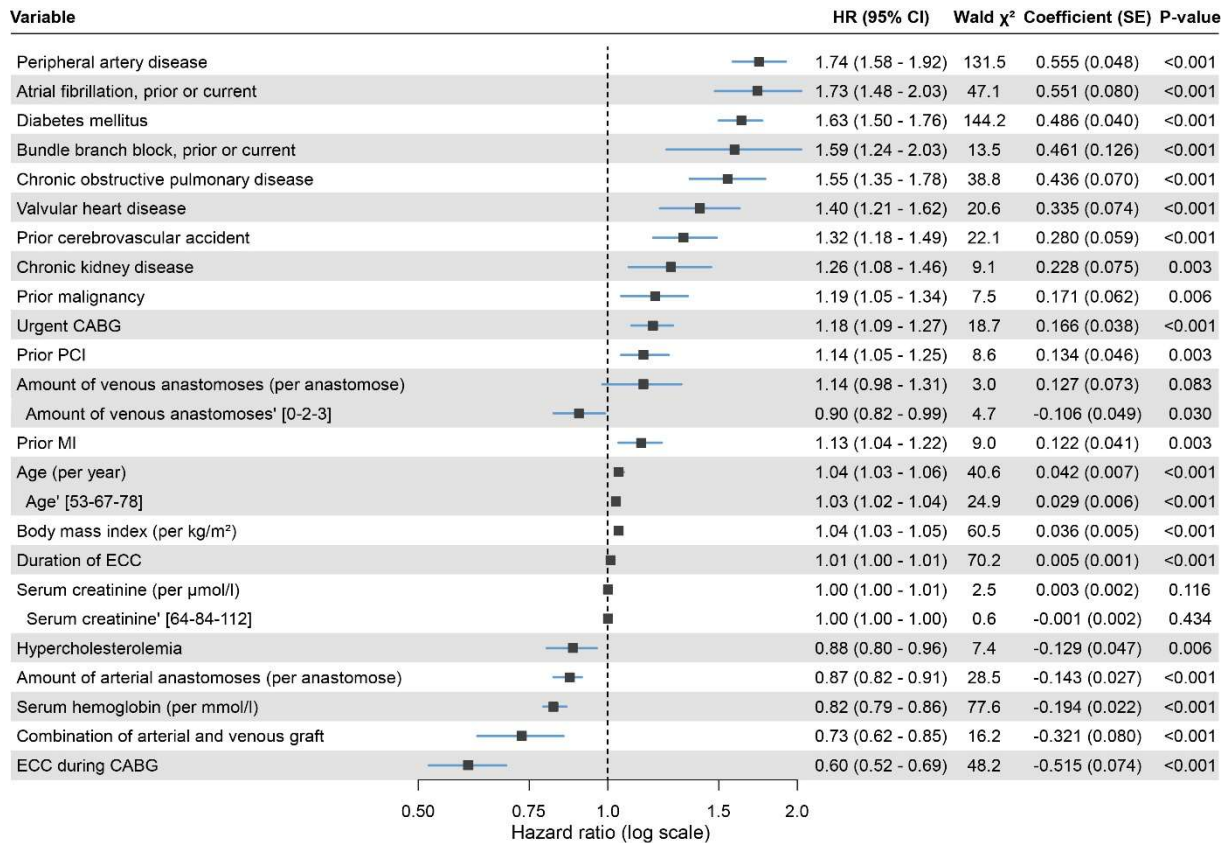


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**Figure:**

Forest plot of the risk prediction model for the primary composite endpoint of heart failure hospitalization and cardiovascular mortality.

Abbreviations: CABG: coronary artery bypass grafting, CI: confidence interval, ECC: extracorporeal circulation, HR: hazard ratio, MI: myocardial infarction, PCI: percutaneous coronary intervention, SE: standard error.





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Abstract 5

**Abnormal Left Atrial Strain Predicts Dilated Cardiomyopathy Development in Asymptomatic Relatives**

Presenting author: M.F.G.H.M. Venner

Department: Cardiologie

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**Purpose:**

Speckle tracking echocardiography (STE) of the left atrium (LA) is a novel imaging technique capable of detecting subtle cardiac dysfunction. This study evaluated whether LA STE can predict DCM development in asymptomatic DCM relatives.

**Methods:**

DCM relatives were included from two international centers. The predictive value of baseline echocardiographic LA (reservoir, conduit, and booster) strain was studied in asymptomatic DCM relatives (LVEF >50% and LVEDD <2 z-scores). The primary endpoint was DCM development, based on current guidelines. Cubic spline analysis was performed to dichotomize all strain variables. Survival analysis was performed to determine the value of strain-derived parameters to predict DCM development.

**Results:**

Sixteen of the 94 asymptomatic included relatives (median age 45 [33-56] years, 57% male), developed DCM (17%) during a median follow-up of 63 months (IQR: 30-94 months). The predictive cut-off value derived from cubic spline analysis for LA conduit strain was 28.0%. Univariable analysis showed that LA conduit strain (HR: 3.17, 95%-confidence interval [CI]: 1.12-8.94, p=0.03) and beta-blocker use (HR: 3.94, 95%-CI: 1.09-14.21, p=0.04) were associated with DCM development, while a trend was observed for NYHA-1 (HR: 0.15, 95%-CI: 0.02-1.28, p=0.07), BMI (HR: 1.10, 95%-CI: 0.99-1.21, p=0.07) and presence of genetic variant (HR: 3.20, 95%-CI: 0.89-11.50, p=0.07). An abnormal LA conduit strain at baseline was associated with a significantly higher risk of DCM development (Kaplan Meier analysis; p=0.023).

**Conclusion:**

Abnormal echocardiographic LA conduit strain is associated with future DCM development in asymptomatic family members. Incorporation of LA strain parameters into routine cardiac screening may improve risk stratification and help identify relatives at increased risk who could benefit from closer follow-up or early intervention.

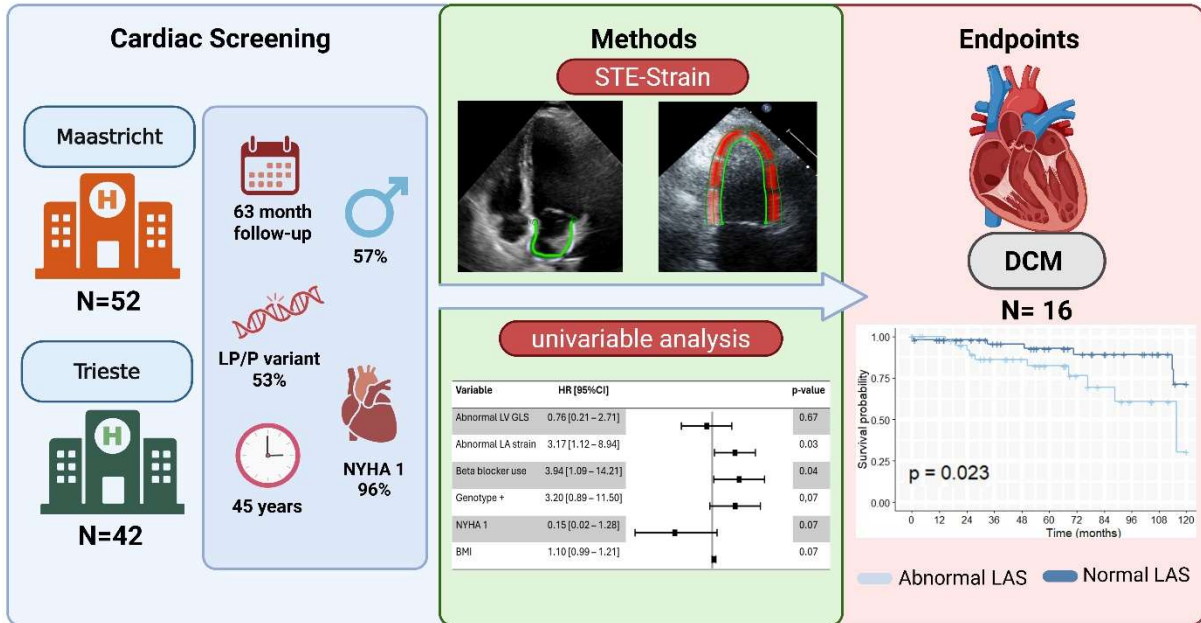
**Keywords:**

Echocardiography, Speckle tracking strain analysis, Family members



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**Figure:**  
Central illustration





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Abstract 6

**Intubation Rather Than Cardiac Arrest as a Predictor of Mortality in Acute Myocardial Infarction-Related Cardiogenic Shock**

Presenting author: S. ten Berg

Department: Cardiologie

*S. ten Berg (Amsterdam UMC, Amsterdam); M. Bogerd (Amsterdam UMC, Amsterdam); M.J.C. Timmermans (Netherlands Heart Registration, Utrecht); E.J. Peters (Amsterdam UMC, Amsterdam); A.O. Kraaijeveld (UMC Utrecht, Utrecht); S. Akin (Haga ziekenhuis, Den Haag); C.A. den Uil (Maasstad ziekenhuis, Rotterdam); E. Lipsic (UMC Groningen, Groningen); E.A. Dubois (Erasmus, Rotterdam); L.C. Otterspoor (Catharina Ziekenhuis, Eindhoven); A.E. Engström (Amsterdam UMC, Amsterdam); A.P.J. Vlaar (Amsterdam UMC, Amsterdam); J.P.S. Henriques (Amsterdam UMC, Amsterdam)*

**Purpose:**

The Society for Cardiovascular Angiography and Intervention (SCAI) has suggested an arrest modifier for patients with anoxic brain injury to each cardiogenic shock (CS) stage. However, outcomes differ between those with favourable and unfavourable out-of-hospital cardiac arrest (OHCA) characteristics. Intubation might capture a wider spectrum of critical illness and may alternatively predict mortality in patients with acute myocardial infarction related CS (AMICS), with and without OHCA. We aimed (1) To assess whether using 'arrest' as a modifier in the SCAI classification is justified, by comparing 30-day mortality risk in AMICS patients without OHCA, favourable and unfavourable AMICS-OHCA patients, and- 2) To evaluate the impact of intubation on 30-day mortality across all 3 abovementioned categories of AMICS patients.

**Methods:**

We used data from the Netherlands Heart Registration (2017–2021) from 14 hospitals, including patients with AMICS undergoing percutaneous coronary intervention. Patients were stratified into 3 subgroups; AMICS without OHCA, favourable AMICS-OHCA (witnessed arrest and Return of Spontaneous Circulation <30 minutes) and unfavourable AMICS-OHCA. Multivariable Cox regression was used to compare 30-day mortality between the three groups and subsequent subgroup analyses assessed the association between intubation and 30-day mortality in each group.

**Results:**

In total 2226 patients were included (AMICS without OHCA = 1313, favourable AMICS-OHCA = 490 and unfavourable AMICS-OHCA = 423). Favourable AMICS-OHCA was associated with lower (HR 0.67, 95%-CI 0.53– 0.84), but unfavourable AMICS-OHCA with similar adjusted risk of 30-day mortality compared to AMICS without OHCA. Intubation was associated with higher 30-day mortality across all groups.

**Conclusion:**

In AMICS patients undergoing PCI, 30-day mortality risk was lower in patients with favourable OHCA compared to those without OHCA. Intubation was an independent predictor for 30-day mortality in all subgroups. These findings support further research to determine whether intubation, rather than arrest, is a robust clinical marker suitable for inclusion in the SCAI shock classification.



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**Keywords:**

Cardiogenic shock, Intubation, Cardiac arrest

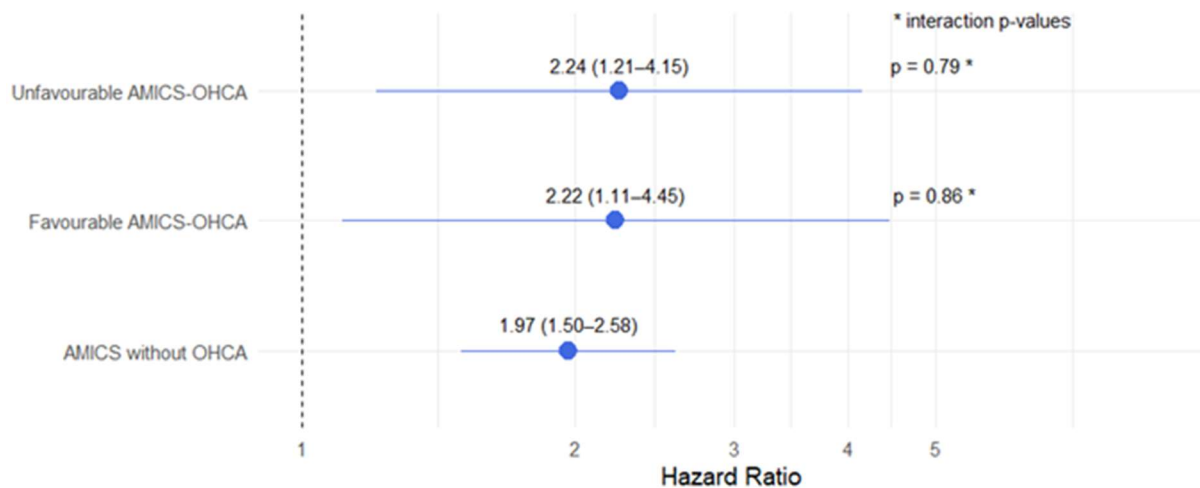
**Figure:**

Multivariable Cox regression results predicting 30-day mortality. Results are shown as Hazard Ratios with 95% Confidence Intervals. Interaction p-values are shown for the interaction term between intubation and patient subgroup (AMICS without OHCA, favourable AMICS-OHCA, and unfavourable AMICS-OHCA).

The models were adjusted for intubation, age, diabetes, MAP, heart rate, IHCA, lactate, hemoglobin, glucose, creatinine, and IRA/RCA.

Gender, BMI, STEMI, prior event, complaints >3 hours, IRA LM and LAD, and multivessel disease were included in the multivariable regression model, but were not independently associated with 30-day mortality in any of the subgroups.

BMI = body mass index, NSTEMI = non-ST-elevation myocardial infarction, IHCA = in-hospital cardiac arrest, IRA = Infarct related artery, LM = left main, LAD = left anterior descending, RCA = right coronary artery





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Abstract 7

**Phospholamban Cardiomyopathy: From in Vitro Disease Modeling to Therapy**

Presenting author: F.E. Deiman

Department: Department of Cardiology

*F.E. Deiman (UMCG, Groningen); P. Davidsson (AstraZeneca, Gothenburg); D. Später (AstraZeneca, Gothenburg); K.F. Arevalo Gomez (UMCG, Groningen); A.N. Linders (UMCG, Groningen); I.B. Dias (UMCG, Groningen); A. Walentinsson (AstraZeneca, Gothenburg); C. Ahlstrom (AstraZeneca, Gothenburg); A.E. Mullick (Ionis Pharmaceuticals, Carlsbad); K.M. Hansson (AstraZeneca, Gothenburg); H.H.W. Sillje (UMCG, Groningen); N. Bomer (UMCG, Groningen); N. Grote Beverborg (UMCG, Groningen); P. Van Der Meer (UMCG, Groningen)*

**Purpose:**

Phospholamban (PLN) p.Arg14del (R14del) is a pathogenic variant that can lead to heart failure (HF). Phospholamban antisense oligonucleotides (PLN-ASOs) have shown therapeutic promise for HF in murine models, including PLN R14del. Here, we identify the therapeutic mechanisms of PLN-ASOs in a human in vitro PLN R14del model.

**Methods:**

To study therapeutic mechanisms of PLN-ASOs, CRISPR-Cas9 engineered PLN R14del and isogenic control (WT) induced pluripotent stem cell-derived cardiomyocytes (iPSC-CMs) were extensively characterized before and after PLN-ASO therapy, including calcium transients, contractility, mitochondrial respiration, protein aggregation, the proteome and phosphoproteome, and validated in PLN R14del iPSC-CMs derived from a PLN R14del patient.

**Results:**

PLN-ASOs dose-dependently reduced PLN mRNA and protein levels in iPSC-CMs, and 62 differentially expressed proteins (DEPs) and 372 differentially expressed phosphorylation sites (DEPSs) were identified. Gene ontology enrichment was performed on the identified DEPs and DEPSs, to identify related biological processes. Here, proteomics confirmed PLN-ASO induced PLN protein downregulation, and an altered protein expression pattern related to cellular metabolism and mitochondria. Phosphoproteomics demonstrated that PLN-ASOs alter phosphorylation sites related to transcription, calcium handling and contractility. In line with this, functional characterization of PLN R14del iPSC-CMs revealed that PLN-ASOs enhance calcium uptake and release kinetics. In line with this, PLN-ASOs also enhance contractile kinetics by decreasing the time to contraction and relaxation. Lastly, PLN-ASOs dose-dependently enhance metabolism by increasing basal respiration and ATP production and reducing PLN R14del induced PLN/LC3 protein clusters.

**Conclusion:**

PLN R14del cardiomyocytes have a degenerative phenotype characterized by PLN/LC3 clustering, a proxy for PLN protein aggregation. The therapeutic mechanism of PLN-ASOs in PLN R14del cardiomyopathy include enhancement of mitochondrial respiration, calcium- and contractile kinetics and reduction of PLN/LC3 clusters.

**Keywords:**

Cardiomyopathies, Phospholamban, RNA Therapy



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**Figure:**

Functional characterization of PLN-ASO therapy in iPSC-CMs. A) PLN-ASOs dose-dependently reduce PLN mRNA expression and protein levels. B) PLN-ASOs enhance calcium- and contractile kinetics. C) PLN-ASOs dose dependently enhance metabolism by increasing basal respiration and ATP production. D) PLN-ASOs reduce PLN/LC3 clusters, a proxy for PLN protein aggregation.

