**Supplemental data**

**PCHF-COVICAV registry**

**Supplemental results.**

**Sensitivity analysis, excluding Italy as largest contributing country:**

**Italy excluded as largest country:** \*

The CVDRF cohort showed high overall in-hospital mortality (23%, n=194/833 deaths) (*vs all group* 25%, n=323/1282 deaths). In-hospital mortality was significantly higher in patients with HF (35%, n=58) (*vs all group* 36%, n=92) compared to non-HF patients (20%, n=136) (*vs all group*: 23%, n=231, P<0.001) with an odds ratio of 2.10 (1.45-3.04), P<0.001) (*vs all group*: 1.93 [95% CI: 1.44-2.59] (Figure 2A-B). Several factors were significantly associated with in-hospital mortality in the CVDRF cohort. After adjustment for age, sex, risk factors and comorbidities, HF remained associated with in-hospital mortality (OR 1.70 (1.07-2.70), P=0.023) (*vs all group*: OR 1.45 [95% CI: 1.01-2.06], p=0.041) (Figure 2B).

(\*in green results of all group analysis).

**Supplemental methods.**

**Variable definitions.**

HFpEF: Heart failure with preserved ejection fraction LVEF ≥ 50%

HFmrEF: Heart failure with mid-range ejection fraction LVEF 40-49%

HFrEF: Heart failure with reduced ejection fraction LVEF < 40%

Family\_history\_of\_heart\_disease: Family history of ischemic heart disease in first degree relative <65y

Sepsis\_during\_hospitalisation: Life-threatening organ dysfunction caused by a dysregulated host response to infection.

Septic\_shock\_during\_hospitalisation: Clinical construct of sepsis with persisting hypotension requiring vasopressors to maintain MAP ≥65 mm Hg and having a serum lactate level >2 mmol/L (18 mg/dL) despite adequate volume resuscitation.

MOF\_during\_hospitalisation: Multiple organ failure (≥2 more organ systems with progressive, potentially reversible dysfunction; for GFR >50% reduction compared to baseline

Acute\_heart\_failure\_on\_admission: Acute heart failure (AHF) (need for diuretics or inotropic drugs)

Acute\_heart\_failure\_de\_novo\_during\_hospitalisation: Acute heart failure de novo during hospitalization (e.g. as a complication of infection or acute myocardial infarction)

Worsening\_heart\_failure\_during\_hospitalisation: Worsening heart failure during hospitalisation, at least need for doubling steady state diuretic dose

Following variables were calculated from datapoints entered by the researchers:

\* Body Mass Index as (Weight\_kg) / ((Height\_cm \* Height\_cm)/10000) in kg/m2.

\* Centers were organized per country.

\* Length of hospital stay as Date\_of\_discharge\_or\_in\_hospital\_death minus Admission\_date in days.

\* Time of first symptoms to hospitalization as Admission\_date minus Date\_of\_symptom\_onset in days.

\* Heart failure event as an acute heart failure event at admission and/or acute heart failure de novo during hospitalization and/or worsening heart failure during hospitalization.

\* History of heart failure as a history of HFpEF, HFmrEF or HFrEF according to ESC definition.

\* Cause of death during hospitalization was entered as a free string variable by the researchers and was recategorized by the core working group into the following categories based on used keywords: 1) acute respiratory distress syndrome (ARDS), pneumonia, respiratory failure; 2) cancer, oncologic; 3) cardiac, heart; 4) coagulation and bleeding disorders; 5) gastro-intestinal, bowel; 6) kidney, renal; 7) multiple organ failure; 8) neurologic; 9) sepsis, septic shock, 10) other. For analysis, 5 groups were generated: i) respiratory failure, ii) multiple organ failure, iii) cardiovascular, iv) sepsis, v) other (cancer, coagulation and bleeding disorders, gastro-intestinal, kidney, neurologic and other). More than one cause of death could be entered by the researchers.

**Ethics information**

1. Austria

Institution: Medical University of Graz

Ethics number: 32-400 ex 19/20

Informed consent: waived

1. Belgium

Institution: ZNA Antwerpen; Department of Cardiology, Ziekenhuis Oost-Limburg, Genk; Division of Cardiology, Department of Cardiovascular Diseases, Cliniques Universitaires St. Luc and Pôle de Recherche Cardiovasculaire (CARD).

Ethics number: Approved by our local ethical committee. Cliniques St Luc was the Central ethical committee for all the Centers in Belgium, n° : 2020/28AOU/433

Informed consent: waived.

1. Brazil

Institution: PROCAPE- Pernambuco's Cardiology Emergency, Recife, PE, Brazil.

Ethics number: The study was also approved by the Ethics Comitte of PROCAPE/ University of Pernambuco (Number: 4.011.032) and registered in the Plataforma Brasil as Registro Multicêntrico PCHF (Registro COViCAV) with number 31460720.0.0000.5192.

Informed consent: waived

1. Denmark

Institution: Institution Herlev & Gentofte University Hospital (recruiting patients from Rigshospitalet, Amager Hvidovre Hospital, Bispebjerg Hospital, Zealand University Hospital Roskilde, Zealand University Hospital Roskilde, Næstved-Slagelse Hospital in addition to our two local sites(Herlev & Gentofte Hospital))

Ethics number: H-20021500.

Informed consent written

1. France

Institution: CPP - Ile-de-France VI Groupe Hospitalier Pitié-Salpêtrière

Ethics number: 41-20 NI Cat. 3 ; File n° 20.04.28.38741 ID RCB : 2020-A01192-37

Informed consent: Informed consent was obtained either during hospitalisation or retrospectively by phone contact and postal sending of the consent form. It was waived for patients who died during hospitalization

1. Germany

a) Institution: University of Greifswald

Ethics number: Institution Ethics Committee of the University of Greifswald, BB059-20a.

Informed consent waived.

b) Institution: German Heart Center Berlin

Ethics number: IRB No: EA2/066/20

Informed consent: yes

1. Greece

Institution: University of Ioannina, Ioannina.

Ethics number: Local ethics committee of University Hospital of Ioannina, nr 7/21-4-2020.

Informed consent was given by all patients discharged alive, and waived for patients who died during hospitalization.

1. Italy
2. Institution: Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy.

Ethics number: Prot ID 3106

Informed consent: Informed consent for all the patients that the investigators were able to contact. For the others informed consent was waived since they signed a general consent for all the study related to the COVID-19.

1. Institution: Division of Infectious Diseases, Azienda ULSS 9, M. Magalini Hospital, Villafranca di Verona, Verona, Italy.

Ethics number: The study was approved by the Ethics committee of Provinces of Verona and Rovigo (2671CESC).

Informed consent: Informed consent was given by all patients discharged alive, and waived for patients who died during hospitalization.

1. Institution: Centro Cardiologico Monzino IRCCS, Milano – Italy

Ethics number: Comitato Etico degli IRCCS Istituto Europeo di Oncologia e Centro Cardiologico Monzino, CCM 1284

Informed consent: “Given the difficulty to systematically obtain informed consent and given the great public interest of the project, the research has been conducted in the context of the authorizations guaranteed by Article 89 of the GDPR EU Regulation 2016/679, which guarantees the processing for public interest, scientific or historical research or statistical purposes of health data.”

1. Institution: Azienda Sanitaria Universitaria Integrata Giuliano Isontina and University Hospital of Trieste.

Ethics number: 042\_2020H

Informed consent: waived

1. Institution: Emergency Department, Public Health Company Valle Olona, Busto Arsizio,

Ethics number: Public Health Company VALLE OLONA: 659.

Informed consent waived for patients died during hospitalization, given by all patients discharged alive.

1. Japan

Institution: Juntendo University Graduate School of Medicine, Tokyo, Japan.

Ethics number: The study was approved by the Ethics Committee and Institutional Review Board of Juntendo University, Tokyo, Japan (Approval No. 20-041).

Informed consent: Owing to the retrospective and observational nature of the present study, written informed consents were not required and waived under Japanese law (Japan).

1. Moldova

Institution: Department of Cardiology, State University of Medicine and Pharmacy „Nicolae Testemitanu”, Chisinau, Republic of Moldova.

Ethics number: Taking in consideration the fact that our Centre corresponds to a University Hospital dedicated to research in the field of Cardiology, all the admitted patients are informed about scientific character of the institution that their data are collected and could be used anonymously for scientific purposes, so they present their approval signing the Patient Consent Form, so their data can be collected and used for research purpose. Thus, PCHF-COVICAV Registry is an observational non-interventional study, there is no need in supplementary Ethics Approval according to our national legislation.

Informed consent: Informed consent was given by all patients discharged alive, and waived for patients who died during hospitalization.

1. Poland

Institution: Wroclaw Medical University

Ethics number: 240/2020

Informed consent: was given by all patients discharged alive for prospective observation, and waived for patients who died during hospitalization. For retrospective part of the study was not required.

1. Serbia

Institution: Institute for Cardiovascular Diseases Dedinje, Belgrade

Ethics number 2767/2020

Informed consent waived.

1. Spain

Institution: A Coruña University Hospital, A Coruña, Spain.

Ethics number: The study protocol was approved by the Committee for Ethics in Clinical Investigation of the Autonomous Community of Galicia (Spain), 240/2020.

Informed consent: oral informed consent.

1. Switzerland

Institutions: University Hospital Zurich, Luzerner Kantonsspital, University Hospitals of Geneva

Ethics number: Ethics committee of Zurich, BASEC-Nr. 2020-00853

Informed consent or general informed consent was given by all patients discharged alive, and waived for patients who died during hospitalization.

1. Turkey

Institution: Department of Cardiology, Mersin University Medical Faculty, Mersin

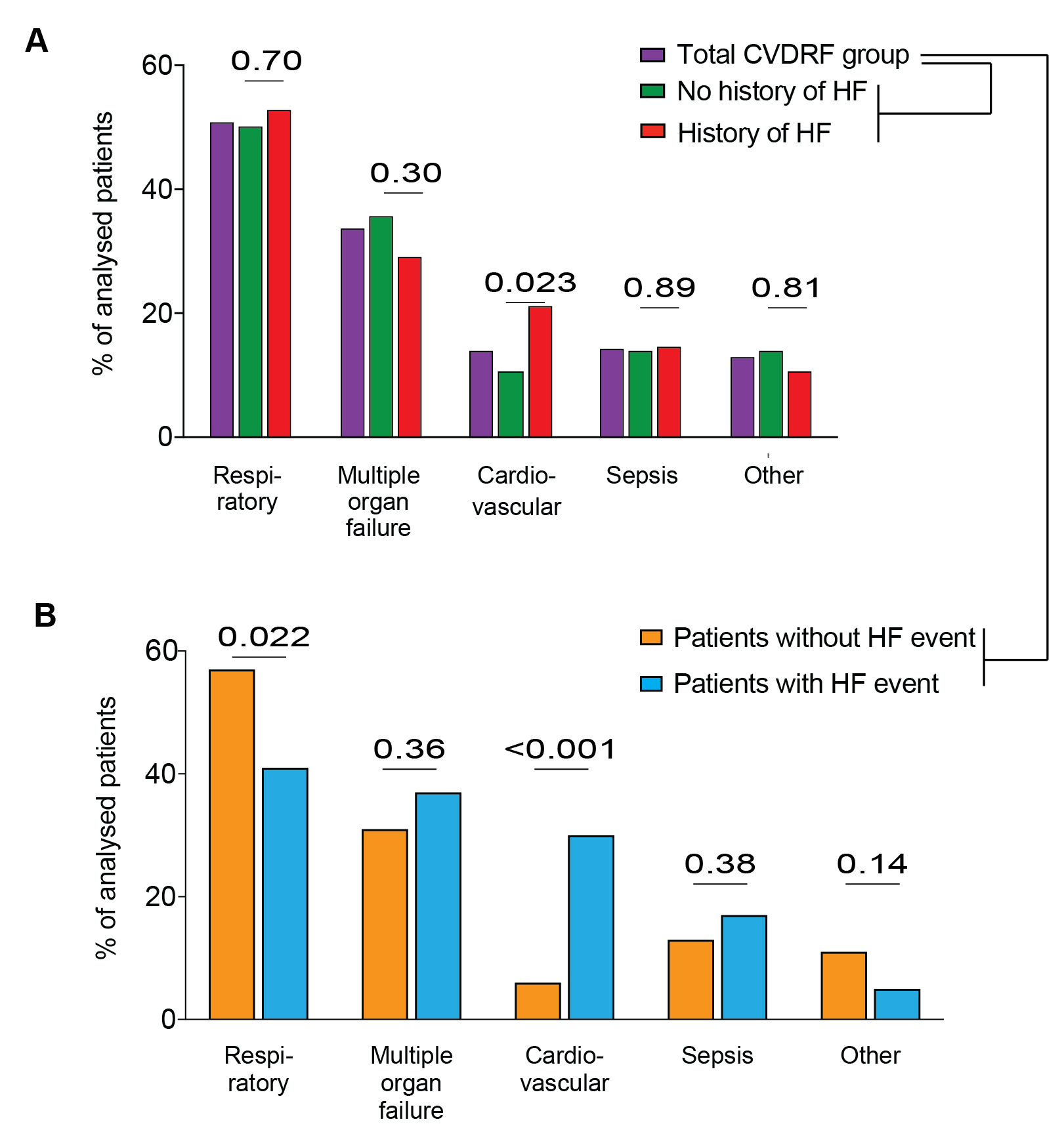
Ethics number: 2020/345

Informed consent: waived.

**Supplemental figures.**



**Figure S1.** **Univariable regression models for demographical parameters, cardiovascular risk factors, cardiovascular diseases and comorbidities and their association with in-hospital mortality in patients with CVDRF**. BMI=body mass index, CKD=chronic kidney disease, COPD=chronic obstructive pulmonary disease, eGFR=estimated glomerular filtration rate, PAD=peripheral artery disease.



**Figure S2.** **Reported causes of death in patients with cardiovascular disease and/or risk factors during hospitalization for COVID-19** (available in 253/323 deceased patients) in several subgroups: (A): total CVDRF group (cardiovascular disease and/or risk factors), further subdivided in patients with or without history of heart failure and (B) patients from the CVDRF group with a heart failure event at admission/during COVID-19 hospitalization (more than 1 cause of death could be reported per patient). CVDRF=cardiovascular disease and/or risk factors; HF=heart failure.

**Figure S3. Age distribution in patients with cardiovascular disease/and or risk factors (CVDRF cohort).**



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Age per 5 years** | **n patients** | **% (of 1282)** | **In-hospital mortality** | | |
| **CVDRF** | **CVDRF**  **HF subgroup** | **CVDRF**  **non-HF subgroup** |
| <50y | 86 | 6.7 | 5 (6) | 1 (13) | 4 (5) |
| 50-54 | 61 | 4.8 | 4 (6) | 1 (25) | 3 (5) |
| 55-59 | 114 | 8.9 | 11 (10) | 4 (20) | 8 (9) |
| 60-64 | 123 | 9.6 | 20 (16) | 3 (14) | 16 (16) |
| 65-69 | 160 | 12.5 | 32 (20) | 9 (39) | 24 (18) |
| 70-74 | 191 | 14.9 | 36 (19) | 16 (37) | 21 (14) |
| 75-79 | 178 | 13.9 | 67 (37) | 17 (40) | 50 (37) |
| 80-84 | 167 | 13 | 60 (36) | 14 (39) | 44 (34) |
| 85-89 | 114 | 8.9 | 46 (40) | 16 (48) | 30 (37) |
| >90y | 87 | 6.8 | 42 (47) | 11 (42) | 31 (51) |
| missing | 1 |  |  |  |  |

**Supplemental tables.**

**Table S1.** Excluded patients (n) from the registry for the primary endpoint: regression analysis for in-hospital death in patients with CVDRF with HF *versus* patients with CVDRF without HF. CVDRF: cardiovascular disease and/or risk factors

|  |  |  |  |
| --- | --- | --- | --- |
|  | **CVDRF** | | **no CVDRF** |
| History of heart failure not recorded | 13 | | not applicable |
|  | **CVDRF HF subgroup** | **CVDRF, non-HF subgroup** | **no CVDRF** |
| Ongoing hospitalization/in-hospital death variable not recorded | 8 | 15 | 5 |

**Table S2. Data collection sheet.**

|  |  |  |
| --- | --- | --- |
| **PRE-EXISTING CARDIOVASCULAR DISEASE** | Heart\_failure | Heart failure of any type, according to ESC definition |
| HFpEF | Heart failure with preserved ejection fraction LVEF ≥ 50% |
| HFmrEF | Heart failure with mid-range ejection fraction LVEF 40-49% |
| HFrEF | Heart failure with reduced ejection fraction LVEF < 40% |
| Etiology\_of\_heart\_failure\_pre | Etiology of heart failure |
| Last\_LVEF\_before\_admission\_in\_percent | LVEF in %, last value before admission |
| Ischemic\_heart\_disease\_pre | Ischemic heart disease |
| History\_of\_myocardial\_infarction | History of myocardial infarction |
| Signifciant\_valvular\_heart\_disease\_pre | Valvular heart disease (significant - moderate/severe) |
| Congenital\_heart\_disease\_pre | Congenital heart defect (GUCH) |
| Type\_of\_congenital\_heart\_disease\_pre | If GUCH- specify: |
| Atrial\_fibrillation | Atrial fibrillation, paroxysmal or permanent |
| Other\_supraventricular\_or\_ventricular\_arrhythmias\_pre | Arrhythmias (supraventricular or ventricular), other than atrial fibrillation |
| Type\_of\_arrhythmia\_pre | If arrhythmias- specify |
| Cardiomyopathy\_pre | Cardiomyopathy (CM) |
| Type\_of\_cardiomyopathy\_pre | Type of cardiomyopathy |
| Heart\_transplantation\_pre | Heart translantation |
| Heart\_transplantation\_date\_pre | If heart transplantation- date: |
| VAD\_pre | Ventricular assist device implantation |
| VAD\_date\_pre | Ventricular assist device implantation date |
| VAD\_type | Ventricular assist device type: LVAD or BiVAD |
| Pacemaker\_pre | Conventional pacemaker (VVI, DDD, Micra, ...) |
| Pacemaker\_date\_pre | Pacemaker implantation date |
| ICD\_pre | Internal cardiac defibrillator (ICD, S-ICD) |
| ICD\_date\_pre | Date of ICD implantation |
| CRT\_pre | Cardiac-resynchronization therapy |
| ICD\_date\_pre | Date of cardiac resynchronization therapy CRT-implantation |
| Peripheral\_artery\_disease\_pre | Peripheral arterial disease |
| Stroke\_or\_transient\_ischemic\_attack\_pre | Stroke/transient ischaemic attack |
| Other\_remarks\_pre\_existing\_CV\_disease | Other comments |
| Current\_smoker | Current smoker |
| **CARDIOVASCULAR RISK FACTORS** | Former\_smoker | Former smoker |
| Pack\_years | number of packyears |
| Dyslipidaemia | Dyslipidaemia |
| Diabetes\_type\_1 | Diabetes mellitus type I |
| Diabetes\_type\_2 | Diabetes mellitus type II |
| Family\_history\_of\_heart\_disease | Family history of ischemic heart disease in first degree relative <65y |
| Arterial\_hypertension\_pre | History of arterial hypertension |
| COPD\_or\_asthma | Chronic lung disease (COPD/asthma) |
| **OTHER CHRONIC MEDICAL CONDITIONS** | Malignant\_neoplasms | Malignant neoplasms (active or history) |
| Chronic\_kidney\_disease\_GFR\_less\_60 | Chronic kidney disease with GFR < 60ml/min/1.73m2 |
| Chronic\_kidney\_disease\_GFR\_less\_30 | Chronic kidney disease with GFR < 30ml/min/1.73m2 |
| Dialysis | Hemo- or peritoneal dialysis |
| Other\_diseases\_pre | Other diseases |

**Table S3. In-hospital death per country.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CVDRF, overall** | | | | | **Heart failure subgroup** | | | | | **Non-heart failure subgroup** | | | | |  |
|  | **Survival** | | **In-hospital death** | | **Total n** | **Survival** | | **In-hospital death** | | **Total n** | **Survival** | | **In-hospital death** | | **Total n** | **HR** |
| **Country** | **n** | **%** | **n** | **%** | **n** | **n** | **%** | **n** | **%** | **n** | **n** | **%** | **n** | **%** | **n** |  |
| Austria | 46 | 68% | 22 | 32% | 68 | 1 | 10% | 9 | 90% | 10 | 45 | 78% | 13 | 22% | 58 | 7.11 (2.86-17.7) |
| Belgium | 81 | 73% | 30 | 27% | 111 | 5 | 33% | 10 | 67% | 15 | 76 | 79% | 20 | 21% | 96 | 3.97 (1.83-8.59) |
| Brazil | 9 | 41% | 13 | 59% | 22 | 3 | 38% | 5 | 63% | 8 | 6 | 43% | 8 | 57% | 14 | 1.14 (0.35-3.76) |
| Denmark | 114 | 89% | 14 | 11% | 128 | 11 | 69% | 5 | 31% | 16 | 103 | 92% | 9 | 8% | 112 | 3.72 (1.24-11.15) |
| France | 56 | 66% | 29 | 34% | 85 | 11 | 69% | 5 | 31% | 16 | 45 | 65% | 24 | 35% | 69 | 0.87 (0.33-2.30) |
| Germany | 6 | 67% | 3 | 33% | 9 | 2 | 67% | 1 | 33% | 3 | 4 | 67% | 2 | 33% | 6 | 1.08 (0.09-11.89) |
| Greece | 3 | 75% | 1 | 25% | 4 | NA | NA | NA | NA | NA | 3 | 75% | 1 | 25% | 4 |  |
| Italy | 320 | 71% | 129 | 29% | 449 | 56 | 62% | 34 | 38% | 90 | 264 | 74% | 95 | 27% | 359 | 1.69 (1.14-2.51) |
| Japan | 9 | 75% | 3 | 25% | 12 | NA | NA | NA | NA | NA | 9 | 75% | 3 | 25% | 12 |  |
| Moldova | 39 | 85% | 7 | 15% | 46 | 30 | 83% | 6 | 17% | 36 | 9 | 90% | 1 | 10% | 10 | 1.35 (0.16-11.67) |
| Poland | 15 | 83% | 3 | 17% | 18 | 6 | 86% | 1 | 14% | 7 | 9 | 82% | 2 | 18% | 11 | 0.68 (0.06-7.66) |
| Serbia | 10 | 48% | 11 | 52% | 21 | 2 | 20% | 8 | 80% | 10 | 8 | 73% | 3 | 27% | 11 | 2.11 (0.56-7.97) |
| Spain | 76 | 64% | 43 | 36% | 119 | 6 | 50% | 6 | 50% | 12 | 70 | 65% | 37 | 35% | 107 | 1.68 (0.70-4.02) |
| Switzerland | 144 | 92% | 13 | 8% | 157 | 17 | 90% | 2 | 11% | 19 | 127 | 92% | 11 | 8% | 138 | 1.25 (0.28-5.66) |
| Turkey | 31 | 94% | 2 | 6% | 33 | 14 | 100% | 0 | 0% | 14 | 17 | 90% | 2 | 11% | 19 |  |

In-hospital death represented as n (%) per country in the CVDRF group and the two subgroups. CVDRF=cardiovascular disease and/or risk factors. HR= Hazard ratio.

**Table S4. Sensitivity analysis.**

|  |  |  |
| --- | --- | --- |
| **Variables**, units | **Included**  **n=1064** | **Excluded**  **n=218** |
| **Demographic parameters** | | |
| Age, years | 72 [62-81] (1064) | 73 [62-81] (217) |
| Sex, male | 640/1064 (60) | 106/218 (49) |
| Body mass index, kg/m2 | 27 [24-31] (743) | 26 [23-30] (164) |
| **Cardiovascular risk factors** | | |
| Arterial hypertension | 828/1064 (78) | 158/213 (74) |
| Dyslipidemia | 477/1064 (45) | 86/211 (41) |
| Diabetes | 371/1064 (35) | 57/215 (27) |
| Smoking | 297/1013 (29) | 78/205 (38) |
| Family history of heart disease | 119/952 (13) | 4/72 (6) |
| **Cardiovascular diseases** | | |
| History of heart failure | 225/1064 (21) | 31/218 (14) |
| Ischemic heart disease | 278/1064 (26) | 28/162 (17) |
| Atrial fibrillation | 187/1064 (18) | 46/178 (26) |
| Valvular heart disease | 92/1064 (9) | 23/167 (14) |
| Stroke/TIA | 120/1064 (11) | 12/49 (24) |
| Peripheral artery disease | 110/1064 (10) | 15/178 (8) |
| **Other co-morbidities** | | |
| Chronic kidney disease | 172/1064 (16) | 13/169 (8) |
| COPD or asthma | 177/1064 (17) | 10/46 (22) |
| Malignancy | 135/1062 (13) | 8/49 (16) |
| **In-hospital course and outcome** | | |
| Mechanical ventilation | 194/1031 (19) | 17/171 (10) |
| Non-invasive ventilation | 342/1022 (33) | 16/36 (36) |
| Respiratory failure | 566/1054 (54) | 84/213 (39) |
| Sepsis | 181/1050 (17) | 10/83 (12) |
| Septic shock | 102/1050 (10) | 7/82 (9) |
| Multiple organ failure | 189/1053 (18) | 10/84 (12) |
| Renal replacement therapy | 58/1028 (6) | 2/46 (4) |
| ICU | 278/1062 (26) | 23/213 (11) |
| ICU, length of stay, days | 4 [0-11] (434) | 9 [2-14] (23) |
| Length of hospital stay, days | 11 [6-18] (984) | 10 [5-16] (180) |
| In-hospital death | 286/1064 (27) | 37/218 (17) |

Baseline characteristics, in-hospital course and outcome in patients included in prediction of heart failure events (Table 3) *vs* patients excluded from the model due to the missing values. Continuous data are presented as median with [95% Confidence intervals] and (number of patients), binary data are presented as number/total number (%). COPD=chronic obstructive lung disease, ICU=intensive care unit. Chronic kidney disease=eGFR<60ml/min/1.73m2, TIA=transient ischemic attack.

**Table S5. Baseline characteristics, in-hospital course and outcome for the 5 largest contributing countries to the registry (CVDRF group: cardiovascular disease and/or risk factors).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Country*** | Italy (n=449) | | | | | Switzerland (n=157) | | | | | | Denmark (n=128) | | | | | | Spain (n=119) | | | | | | Belgium (n=111) | | | | | |
|  | n | % | | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | |
| ***Demographics*** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Sex, male | 291 | 65% | | 449 | | 99 | | 63% | | 157 | | 59 | | 46% | | 128 | | 81 | | 68% | | 119 | | 54 | | 49% | | 111 | |
| Age, years (median, IQR) | 74 | 65-82 | | 449 | | 63 | | 54-73 | | 157 | | 73 | | 64-82 | | 127 | | 76 | | 68-82 | | 119 | | 72 | | 60-81 | | 111 | |
| Body mass index, kg/m2 (median, IQR) | 26 | 23-28 | | 310 | | 28 | | 25-32 | | 120 | | 26 | | 24-30 | | 128 | | 29 | | 27-33 | | 53 | | 28 | | 24-31 | | 50 | |
| ***Cardiovascular risk factors*** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| History of smoking | 93 | 21% | | 444 | | 54 | | 38% | | 143 | | 70 | | 55% | | 128 | | 39 | | 33% | | 119 | | 13 | | 12% | | 111 | |
| Dyslipidaemia | 165 | 37% | | 449 | | 66 | | 43% | | 154 | | 60 | | 47% | | 128 | | 78 | | 66% | | 119 | | 29 | | 26% | | 111 | |
| Diabetes mellitus | 137 | 31% | | 449 | | 54 | | 35% | | 156 | | 27 | | 21% | | 128 | | 29 | | 25% | | 118 | | 50 | | 45% | | 111 | |
| Family History of Heart Disease | 57 | 13% | | 433 | | 17 | | 14% | | 118 | | *NA* | | | | | | 1 | | 1% | | 113 | | 5 | | 5% | | 111 | |
| Arterial Hypertension | 352 | 79% | | 446 | | 108 | | 69% | | 156 | | 91 | | 71% | | 128 | | 80 | | 67% | | 119 | | 89 | | 80% | | 111 | |
| ***Cardiovascular disease*** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Heart Failure | 90 | 20% | | 449 | | 19 | | 12% | | 157 | | 16 | | 13% | | 128 | | 12 | | 10% | | 119 | | 15 | | 14% | | 111 | |
| Ischaemic Heart Disease | 97 | 22% | | 443 | | 37 | | 24% | | 155 | | 14 | | 11% | | 128 | | 19 | | 16% | | 119 | | 24 | | 32% | | 74 | |
| Valvular Heart Disease | 37 | 8% | | 443 | | 11 | | 7% | | 153 | | 20 | | 16% | | 128 | | 9 | | 8% | | 116 | | 6 | | 8% | | 74 | |
| Stroke or Transient Ischemic Attack | 29 | 7% | | 446 | | 15 | | 10% | | 157 | | *NA* | | | | | | 14 | | 12% | | 119 | | 12 | | 16% | | 74 | |
| Atrial Fibrillation (Paroxysmal or Permanent) | 78 | 18% | | 446 | | 18 | | 12% | | 157 | | 34 | | 27% | | 128 | | 23 | | 19% | | 119 | | 16 | | 22% | | 74 | |
| Peripheral artery disease | 47 | 11% | | 447 | | 9 | | 6% | | 157 | | 9 | | 7% | | 128 | | 8 | | 7% | | 119 | | 5 | | 7% | | 74 | |
| ***Comorbidities*** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| COPD or Asthma | 66 | 15% | | 445 | | 20 | | 13% | | 155 | | *NA* | | | | | | 19 | | 16% | | 119 | | 10 | | 14% | | 73 | |
| Malignancy | 50 | 11% | | 446 | | 13 | | 8% | | 156 | | *NA* | | | | | | 21 | | 18% | | 118 | | 11 | | 15% | | 73 | |
| Chronic kidney disease (eGFR<60 ml/min/1.73m2) | 86 | 20% | | 441 | | 17 | | 11% | | 156 | | 4 | | 3% | | 128 | | 14 | | 12% | | 119 | | 13 | | 18% | | 73 | |
| ***Country*** | Italy (n=449) | | | | Switzerland (n=157) | | | | | | Denmark (n=128) | | | | | | Spain (n=119) | | | | | | Belgium (n=111) | | | | | |
|  | n | % | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | | n | | % | | analyzed n | |
| ***Treatment before admission*** |  |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| Loop diuretics | 117 | 27% | 441 | | 26 | | 17% | | 156 | | 27 | | 21% | | 128 | | 34 | | 30% | | 114 | | 16 | | 22% | | 74 | |
| ACE inhibitors | 138 | 31% | 442 | | 34 | | 22% | | 156 | | *NA* | | | | | | 21 | | 18% | | 119 | | 24 | | 32% | | 74 | |
| Angiotensin receptor blockers | 97 | 22% | 442 | | 39 | | 25% | | 156 | | *NA* | | | | | | 42 | | 35% | | 119 | | 12 | | 16% | | 74 | |
| Sacubitril/Valsartan | 6 | 1% | 444 | | 4 | | 3% | | 155 | | *NA* | | | | | | 1 | | 1% | | 116 | | 0 | | 0% | | 74 | |
| Betablockers | 180 | 41% | 444 | | 53 | | 34% | | 156 | | 31 | | 24% | | 128 | | 28 | | 24% | | 119 | | 31 | | 42% | | 74 | |
| Calcium channel blockers | 126 | 28% | 444 | | 33 | | 21% | | 156 | | 41 | | 32% | | 128 | | 26 | | 22% | | 116 | | 20 | | 27% | | 74 | |
| Mineralocorticoid receptor antagonists | 37 | 8% | 444 | | 9 | | 6% | | 156 | | 13 | | 10% | | 128 | | 0 | | 0% | | 116 | | 10 | | 14% | | 74 | |
| SGLT2-inhibitors | 2 | 0% | 447 | | 9 | | 6% | | 155 | | *NA* | | | | | | 6 | | 5% | | 116 | | 1 | | 1% | | 74 | |
| Oral antidiabetics (other than SGLT2i) | 71 | 16% | 447 | | 32 | | 21% | | 156 | | 25 | | 20% | | 128 | | 21 | | 18% | | 116 | | 27 | | 37% | | 74 | |
| Insulin | 56 | 13% | 447 | | 22 | | 14% | | 156 | | 20 | | 16% | | 128 | | 9 | | 8% | | 116 | | 9 | | 12% | | 74 | |
| Statins | 134 | 30% | 445 | | 61 | | 39% | | 156 | | 58 | | 45% | | 128 | | 62 | | 53% | | 117 | | 31 | | 42% | | 74 | |
| Aspirin | 120 | 27% | 443 | | 42 | | 27% | | 156 | | 15 | | 12% | | 128 | | 25 | | 22% | | 116 | | 25 | | 34% | | 74 | |
| P2Y12 inhibitors | 34 | 8% | 445 | | 9 | | 6% | | 156 | | 13 | | 10% | | 128 | | 4 | | 3% | | 116 | | 11 | | 15% | | 74 | |
| Vitamin K antagonists | 23 | 5% | 445 | | 8 | | 5% | | 156 | | 7 | | 6% | | 128 | | 12 | | 10% | | 118 | | 3 | | 4% | | 74 | |
| Direct oral anticoagulants | 45 | 10% | 446 | | 11 | | 7% | | 155 | | *NA* | | | | | | 8 | | 7% | | 116 | | 15 | | 20% | | 74 | |
| Nonsteroidal anti-inflammatory drugs | 7 | 2% | 444 | | 2 | | 1% | | 155 | | 25 | | 20% | | 128 | | 1 | | 1% | | 119 | | 1 | | 1% | | 74 | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Country*** | | Italy (n=449) | | | Switzerland (n=157) | | | Denmark (n=128) | | | Spain (n=119) | | | Belgium (n=111) | | |
|  | | n | % | analyzed n | n | % | analyzed n | n | % | analyzed n | n | % | analyzed n | n | % | analyzed n |
| ***In-Hospital Course and Outcome*** |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Invasive mechanical ventilation | 76 | | 17% | 437 | 25 | 16% | 152 | 9 | 7% | 125 | 19 | 16% | 116 | 8 | 14% | 58 |
| Non-invasive ventilation | 230 | | 53% | 434 | 10 | 7% | 151 | *NA* | | | 4 | 4% | 115 | 12 | 22% | 54 |
| Renal replacement therapy | 22 | | 5% | 434 | 12 | 8% | 155 | *NA* | | | 2 | 2% | 116 | 1 | 2% | 56 |
| Pneumonia | 332 | | 76% | 438 | 128 | 83% | 155 | *NA* | | | 108 | 93% | 116 | 102 | 92% | 111 |
| Respiratory failure | 268 | | 61% | 440 | 39 | 25% | 155 | 26 | 20% | 128 | 78 | 67% | 116 | 90 | 81% | 111 |
| Sepsis during Hospitalization | 64 | | 15% | 436 | 26 | 17% | 154 | *NA* | | | 27 | 23% | 116 | 13 | 12% | 111 |
| Multiple Organ Failure during Hospitalization | 60 | | 14% | 438 | 24 | 16% | 155 | *NA* | | | 37 | 32% | 116 | 8 | 7% | 111 |
| Intensive Care Unit Hospitalization | 89 | | 20% | 446 | 39 | 25% | 156 | 9 | 7% | 128 | 19 | 16% | 116 | 26 | 23% | 111 |
| Heart failure event | 73 | | 16% | 449 | 17 | 11% | 156 | *NA* | | | 15 | 13% | 116 | 7 | 6% | 111 |
| Death during Hospitalization | 129 | | 29% | 449 | 13 | 8% | 157 | 14 | 11% | 128 | 43 | 36% | 119 | 30 | 27% | 111 |

**Table S6. Distribution of patients per country (alphabetical order).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Total group** | | **CVDRF** | | **No CVDRF** | |
| n | % of total | n | % of total | n | % of total |
| Total Registry | 1974 | 100 | 1282 | 100 | 692 | 100 |
| Austria | 90 | 4.6 | 68 | 5.3 | 22 | 3.2 |
| Belgium | 179 | 9.1 | 111 | 8.7 | 68 | 9.8 |
| Brazil | 22 | 1.1 | 22 | 1.7 | 0 | 0.0 |
| Denmark | 178 | 9.0 | 128 | 10.0 | 50 | 7.2 |
| France | 100 | 5.1 | 85 | 6.6 | 15 | 2.2 |
| Germany | 9 | 0.5 | 9 | 0.7 | 0 | 0.0 |
| Greece | 9 | 0.5 | 4 | 0.3 | 5 | 0.7 |
| Italy | 673 | 34.1 | 449 | 35.0 | 224 | 32.4 |
| Japan | 21 | 1.1 | 12 | 0.9 | 9 | 1.3 |
| Moldova | 58 | 2.9 | 46 | 3.6 | 12 | 1.7 |
| Poland | 21 | 1.1 | 18 | 1.4 | 3 | 0.4 |
| Serbia | 21 | 1.1 | 21 | 1.6 | 0 | 0.0 |
| Spain | 151 | 7.6 | 119 | 9.3 | 32 | 4.6 |
| Switzerland | 332 | 16.8 | 157 | 12.2 | 175 | 25.3 |
| Turkey | 110 | 5.6 | 33 | 2.6 | 77 | 11.1 |

CVDRF=cardiovascular disease and/or risk factors.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Data are presented as n and % of total registry for the respective groups (total group, CVD/RF and non-CVD/RF). CVDRF denotes Cardiovascular Disease and/or Risk Factors.  **Table S7. Demographics and endpoints in the total group and the sugbroups with or without Cardiovascular Disease/Risk Factors.** | | | | | | | |
|  | **Total group** | | **No Cardiovascular Disease/Risk Factors** | | **Cardiovascular Disease/Risk Factors** | | ***P*-value** |
|  | **n/total n** | **n=1974** | **n/total n** | **n=692 (35%)** | **n/total n** | **n=1282 (65%)** |
| Age, years | 1973/1974 | 66 [54-78] | 692/692 | 54 [44-63] | 1281/1282 | 72 [62-81] | <0.001 |
| Sex | 1974/1974 |  | 692/692 |  | 1282/1282 |  | 0.22 |
| Female |  | 845 (43) |  | 309 (45) |  | 536 (42) |  |
| Male |  | 1129 (57) |  | 383 (55) |  | 746 (58) |  |
| In-Hospital deaths | 1974/1974 | 362 (18) | 692/692 | 39 (6) | 1282/1282 | 323 (25) | <0.001 |
| ICU Hospitalisation | 1966/1974 | 387 (20) | 691/692 | 86 (12) | 1275/1282 | 301 (24) | <0.001 |
| Length of hospitalisation, days\* | 1785/1974 | 9 [5-17] | 621/692 | 7 [5-13] | 1164/1282 | 11 [5-18] | <0.001 |
| Data are median [with interquartile range] for non-normal data, or n (%). Significance level P<0.05 two-sided. Mann-Whitney U for continuous variables and Chi-Square for discrete variables. ICU=intensive care unit. \*Patients that died during hospitalisation are included in the calculation. | | | | | | | |

**Table S8. Risk of in-hospital death in COVID-19 patients with a history of heart failure.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **In-hospital death - history of HF** | | **OR** | **95%CI** | | ***p*** |
| **LB** | **UB** |
| Unadjusted | History of HF | 1.93 | 1.44 | 2.59 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model I | History of HF | 1.61 | 1.19 | 2.20 | 0.002 |
| Age per 5 years | 1.33 | 1.26 | 1.41 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model II | History of HF | 1.63 | 1.19 | 2.22 | 0.002 |
| Age per 5 years | 1.35 | 1.27 | 1.44 | <0.001 |
| Sex | 0.55 | 0.42 | 0.73 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model III | History of HF | 1.60 | 1.15 | 2.22 | 0.005 |
| Age per 5 years | 1.36 | 1.27 | 1.45 | <0.001 |
| Sex | 0.57 | 0.42 | 0.76 | <0.001 |
| AHT | 0.82 | 0.59 | 1.14 | 0.239 |
| Diabetes | 1.27 | 0.95 | 1.70 | 0.100 |
| Dyslipidemia | 0.94 | 0.71 | 1.25 | 0.680 |
| Smoking | 0.86 | 0.63 | 1.17 | 0.342 |
|  |  |  |  |  |  |
| Adjusted model IV | History of HF | 1.45 | 1.01 | 2.06 | 0.041 |
| Age per 5 years | 1.37 | 1.28 | 1.47 | <0.001 |
| Sex | 0.55 | 0.40 | 0.76 | <0.001 |
| AHT | 0.87 | 0.61 | 1.25 | 0.445 |
| Diabetes | 1.24 | 0.91 | 1.69 | 0.170 |
| Dyslipidemia | 0.91 | 0.67 | 1.24 | 0.554 |
| Smoking | 0.88 | 0.63 | 1.23 | 1.235 |
| Malignancy | 1.80 | 1.20 | 2.70 | 0.004 |
| CKD | 0.93 | 0.63 | 1.37 | 0.716 |

Sequentially built model for the association between a history of HF and in-hospital death, based on clinical knowledge and existing literature. OR=odds ratio, 95%CI=95% Confidence interval, LB=lower bound, UB=upper bound, AHT=arterial hypertension, CKD=chronic kidney disease (eGFR<60ml/min/1.73m2), HF=heart failure.

**Table S9. Predictors of in-hospital death in patients with history of HF and COVID-19**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Univariable models** | | **Multivariable model** | |
| **OR (95% CI)** | **P** | **OR (95% CI)** | **P** |
| **Age, per 5 years** | **1.19 (1.06-1.34)** | **0.004** | **1.18 (1.01-1.39)** | **0.040** |
| Sex, male | 1.31 (0.78-2.21) | 0.310 | - | - |
| Body mass index, kg/m2 | 1.03 (0.98-1.09) | 0.184 | - | - |
| **Arterial hypertension** | **0.54 (0.28-1.09)** | **0.085** | 1.18 (0.48-2.89) | 0.710 |
| **Dyslipidemia** | **0.54 (0.32-0.92)** | **0.022** | 0.71 (0.35-1.43) | 0.332 |
| Diabetes mellitus type 2 | 0.86 (0.51-1.44) | 0.555 |  |  |
| Ejection fraction < 50% | 0.95 (0.54-1.67) | 0.868 |  |  |
| Ischaemic Heart Disease | 1.34 (0.77-2.33) | 0.294 |  |  |
| **Atrial fibrillation** | **1.68 (1.00-2.84)** | **0.051** | 1.01 (0.50-2.02) | 0.981 |
| Stroke/transient ischemic attack | 0.72 (0.37-1.42) | 0.344 |  |  |
| Peripheral artery disease | 1.13 (0.58-2.21) | 0.717 |  |  |
| Chronic kidney disease (eGFR<60ml/min/1.73m2) | 1.32 (0.75-2.32) | 0.337 |  |  |
| COPD or asthma | 1.47 (0.82-2.67) | 0.196 |  |  |
| **Malignancy** | **2.79 (1.32-5.93)** | **0.007** | 2.13 (0.90-5.05) | 0.085 |
| **Loop diuretics** | **2.11 (1.19-3.72)** | **0.010** | 1.55 (0.76-3.20) | 0.229 |
| **ACE inhibitors** | **3.34 (1.86-5.99)** | **<0.001** | **3.75 (1.89-7.44)** | **<0.001** |
| ARB | 1.41 (0.74-2.69) | 0.288 |  |  |
| MRA | 1.17 (0.65-2.10) | 0.593 |  |  |
| Systolic blood pressure, mmHg | 0.99 (0.98-1.00) | 0.109 |  |  |
| NT-proBNP, 1 Ln pg/mL | 1.19 (0.96-1.49) | 0.111 |  |  |
| **CRP, 1 Ln mg/L** | **1.58 (1.21-2.06)** | **<0.001** | **1.73 (1.25-2.37)** | **<0.001** |

The multivariable model included variables with a P-value < 0.10 in the univariable models. Chi2=46.2, P<0.001, available n=212/256. Results are presented as odds ratio with 95% confidence intervals and P-value, level of significance P<0.05. CRP and NT-proBNP were Ln-logarithmic transformed because of non-normal distribution. ACE=angiotensin converting enzyme, ARB=angiotensin receptor blockers, COPD=chronic obstructive pulmonary disease, CRP=C-reactive protein, MRA=mineralocorticoid receptor antagonists, NT-proBNP=N-terminal pro-type brain natriuretic peptide.

**Table S10. Risk of in-hospital death in COVID-19 patients experiencing heart failure events.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **In-hospital death - HF events** | | **OR** | **95%CI** | | ***P*** |
| **LB** | **UB** |
| Unadjusted | HF event | 3.10 | 2.24 | 4.29 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model I | HF event | 2.57 | 1.83 | 3.62 | <0.001 |
| Age per 5 years | 1.34 | 1.26 | 1.43 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model II | HF event | 2.72 | 1.92 | 3.85 | <0.001 |
| Age per 5 years | 1.37 | 1.28 | 1.46 | <0.001 |
| Sex | 0.49 | 0.36 | 0.66 | <0.001 |
|  |  |  |  |  |  |
| Adjusted model III | HF event | 3.05 | 2.12 | 4.39 | <0.001 |
| Age per 5 years | 1.38 | 1.29 | 1.48 | <0.001 |
| Sex | 0.51 | 0.37 | 0.71 | <0.001 |
| AHT | 0.77 | 0.54 | 1.10 | 0.152 |
| Diabetes | 1.13 | 0.83 | 1.53 | 0.437 |
| Dyslipidemia | 0.89 | 0.66 | 1.20 | 0.426 |
| Smoking | 0.97 | 0.69 | 1.35 | 0.845 |
|  |  |  |  |  |  |
| Adjusted model IV | HF event | 2.91 | 2.00 | 4.22 | <0.001 |
| Age per 5 years | 1.38 | 1.28 | 1.48 | <0.001 |
| Sex | 0.52 | 0.37 | 0.72 | <0.001 |
| AHT | 0.84 | 0.58 | 1.21 | 0.356 |
| Diabetes | 1.19 | 0.87 | 1.63 | 0.271 |
| Dyslipidemia | 0.89 | 0.65 | 1.21 | 0.448 |
| Smoking | 0.90 | 0.64 | 1.27 | 0.542 |
| Malignancy | 1.75 | 1.16 | 2.64 | 0.008 |
| CKD | 0.84 | 0.56 | 1.25 | 0.384 |

Sequentially built model for the association between HF events and in-hospital death, based on clinical knowledge and existing literature. OR=odds ratio, 95%CI=95% Confidence interval, LB=lower bound, UB=upper bound, AHT=arterial hypertension, CKD=chronic kidney disease (eGFR<60ml/min/1.73m2), HF=heart failure.

**Table S11. The comparison of patients with HFpEF vs HFrEF.**

|  |  |  |
| --- | --- | --- |
| **Variables**, units | **HFpEF**  **n=83** | **HFrEF**  **n=154** |
| **Demographic parameters** | | |
| Age, years | 78 [70-86] (1064) | 73 [65-81]\* |
| Sex, male | 42/83 (51) | 95/154 (62) |
| Body mass index, kg/m2 | 26 [23-31] (743) | 28 [24-32] |
| **Cardiovascular risk factors** | | |
| Arterial hypertension | 68/83 (82) | 134/153 (88) |
| Dyslipidemia | 46/83 (55) | 101/153 (66) |
| Diabetes | 26/83 (31) | 78/154 (51)\* |
| Smoking | 32/79 (41) | 64/149 (43) |
| Family history of heart disease | 20/79 (25) | 40/129 (31) |
| **Cardiovascular diseases** | | |
| Ischemic heart disease | 32/83 (39) | 119/153 (78)\*\* |
| Atrial fibrillation | 29/83 (35) | 60/154 (39) |
| Valvular heart disease | 23/83 (28) | 37/152 (24) |
| Stroke/TIA | 15/81 (19) | 31/139 (22) |
| Peripheral artery disease | 11/82 (13) | 30/154 (19) |
| **Other co-morbidities** | | |
| Chronic kidney disease | 30/81 (37) | 40/152 (26) |
| COPD or asthma | 22/82 (27) | 36/139 (26) |
| **In-hospital course and outcome** | | |
| Mechanical ventilation | 16/82 (20) | 36/153 (24) |
| Non-invasive ventilation | 32/79 (41) | 72/136 (53) |
| Sepsis | 11/81 (14) | 30/136 (22) |
| Septic shock | 5/80 (6) | 15/136 (11) |
| Multiple organ failure | 18/82 (22) | 39/136 (29) |
| ICU | 20/83 (24) | 61/152 (40)\* |
| Length of hospital stay, days | 11 [6-17] | 10 [6-19] |
| In-hospital death | 30/83 (36) | 54/154 (35) |
| \*P<0.05, \*\*P<0.001. | | |

Baseline characteristics, in-hospital course and outcome in patients with HFpEF *vs* patients with HFrEF. Continuous data are presented as median with [95% Confidence intervals] and (number of patients), binary data are presented as number/total number (%). HFpEF=Heart failure with preserved ejection fraction, HFrEF=Heart Failure with Reduced Ejection Fraction, COPD=chronic obstructive lung disease, ICU=intensive care unit. Chronic kidney disease=eGFR<60ml/min/1.73m2, TIA=transient ischemic attack.

|  |  |  |
| --- | --- | --- |
| **Variables**, units | **ADHF**  **n=110** | **AHF de novo**  **n=76** |
| **Demographic parameters** | | |
| Age, years | 76 [67-84] (1064) | 78 [68-87] |
| Sex, male | 61/110 (55) | 40/76 (53) |
| Body mass index, kg/m2 | 29 [25-32] (743) | 26 [23-29]\* |
| **Cardiovascular risk factors** | | |
| Arterial hypertension | 95/108 (88) | 62/76 (82) |
| Dyslipidemia | 70/109 (64) | 33/76 (43)\* |
| Diabetes | 52/110 (47) | 30/39 (39) |
| Smoking | 32/103 (31) | 19/73 (26) |
| Family history of heart disease | 30/104 (29) | 11/62 (18) |
| **Cardiovascular diseases** | | |
| Ischemic heart disease | 68/107 (64) | 13/75 (17)\*\* |
| Atrial fibrillation | 44/109 (40) | 26/75 (35) |
| Valvular heart disease | 26/106 (25) | 9/76 (12)\* |
| Stroke/TIA | 22/108 (20) | 9/75 (12) |
| Peripheral artery disease | 21/109 (19) | 7/76 (9) |
| **Other co-morbidities** | | |
| Chronic kidney disease | 38/107(36) | 20/75 (27) |
| COPD or asthma | 32/109 (29) | 9/75 (12)\*\* |
| **In-hospital course and outcome** | | |
| Mechanical ventilation | 30/108 (28) | 22/75 (29) |
| Non-invasive ventilation | 54/105 (51) | 21/74 (28)\* |
| Sepsis | 33/107 (31) | 29/75(39) |
| Septic shock | 17/107 (16) | 21/75 (28)\* |
| Multiple organ failure | 42/107 (39) | 31/76 (41) |
| ICU | 48/108 (44) | 29/76 (38) |
| Time in hospital, days | 13 [7-20] | 18 [9-32] |
| In-hospital death | 46/110 (42) | 43/76 (57)\* |
| \*P<0.05, \*\*P<0.001. | | |

**Table S12. The comparison of patients with ADHF vs AHF de novo.**

Baseline characteristics, in-hospital course and outcome in patients with ADHF *vs* patients with AHF de novo. Continuous data are presented as median with [95% Confidence intervals] and (number of patients), binary data are presented as number/total number (%). ADHF= acute decompensated chronic heart failure, AHF=acute heart failure, COPD=chronic obstructive lung disease, ICU=intensive care unit. Chronic kidney disease=eGFR<60ml/min/1.73m2, TIA=transient ischemic attack.

**Table S13.** **Treatment of acute heart failure in hospitalized COVID-19 patients.**

|  |  |
| --- | --- |
| Loop diuretic | 152/180 (84) |
| Vasopressors | 41/182 (23) |
| Inotropes | 32/182 (18) |

Treatment of acute heart failure during hospitalisation. AHF=acute heart failure

**Table S14. Number and percentage of patients with multi-organ failure (MOF) and these requiring vasopressors or inotropic support**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **CVDRF, overall** | **HF subgroup** | **Non-HF subgroup** |
| N (%) with MOF | 199/1137 (18) | 60/237 (25) | 139/900 (15) |
| N (%) with inotropes and/or vasopressors | 182/1067 (17) | 54/236 (23) | 128/831 (15) |
| N (%) with inotropes  and/or vasopressors in  MOF subgroup | 43/175 (25) | 17/59 (29) | 26/116 (22) |

**Table S15. Total number of admission mortality in relation to the magnitude of COVID-19 cases per country.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Total group, n=1974** | | | | | **World Health Organisation data per country\*** | |
|  | **Survival** | | **In-hospital death** | | **Total n** | **Total COVID-19 cases until 20th of May 2020** | **COVID-19 cases per 100 000**  **until 20th of May 2020** |
| **Country** | **n** | **%** | **n** | **%** | **n** | **n** | **n** |
| Austria | 64 | 71% | 26 | 29% | 90 | 16257 | 183 |
| Belgium | 141 | 79% | 38 | 21% | 179 | 57013 | 496 |
| Brazil | 9 | 41% | 13 | 59% | 22 | 254220 | 120 |
| Denmark | 163 | 92% | 15 | 8% | 178 | 11042 | 190 |
| France | 71 | 71% | 29 | 29% | 100 | 143415 | 221 |
| Germany | 6 | 67% | 3 | 33% | 9 | 176007 | 212 |
| Greece | 8 | 89% | 1 | 11% | 9 | 2840 | 27 |
| Italy | 529 | 79% | 144 | 21% | 673 | 226699 | 380 |
| Japan | 18 | 86% | 3 | 14% | 21 | 16385 | 13 |
| Moldova | 47 | 81% | 11 | 19% | 58 | 6340 | 159 |
| Poland | 18 | 86% | 3 | 14% | 21 | 19268 | 51 |
| Serbia | 10 | 48% | 11 | 52% | 21 | 10733 | 156 |
| Spain | 104 | 69% | 47 | 31% | 151 | 238239 | 504 |
| Switzerland | 316 | 95% | 16 | 5% | 332 | 30636 | 356 |
| Turkey | 108 | 98% | 2 | 2% | 110 | 151615 | 180 |
| \*Based on the https://covid19.who.int/ | | | | | | | |