Identifying and profiling patients with heart failure in a population-based cohort through linkage of primary and secondary care data

Evaluation of the management and treatment of heart failure in a real-world data (EMERALD) cohort

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Background

Epidemiology of Heart Failure (HF)

- HF is among the leading causes of morbidity and mortality globally, is linked to several comorbidities, and is associated with a substantial healthcare burden.

Rationale for creating the EMERALD cohort

- The EMERALD cohort is a newly created real-world cohort of patients with HF identified in GP data from the PHARMO Data Network.
- It provides real-world evidence (RWE) of diagnosis, prognosis, treatment risks and benefits, and long-term outcomes.

Challenge

- Coding of HF diagnosis in GP data lacks granularity, posing challenges to determining the clinical profile of patients.

Objective

- To investigate whether hospital data may improve the profiling of patients with HF diagnosed in primary care.

Methods

- The PHARMO Data Network links anonymous, patient-level electronic healthcare data from primary and secondary healthcare settings in the Netherlands.
- GP data were obtained from 2015 to 2022. Patients with HF were identified by ICPC code K77 or free text using a text mining algorithm. In the linked hospital data, ICD-10 codes were subsequently used to further differentiate HF subtypes.
- Patients were followed from the first HF diagnosis in the study period (cohort entry date; CED) until end of follow-up or death.
- Differences between HF patients diagnosed in GP and hospital data vs those only diagnosed in GP data were tested using chi-squared tests, t-tests, standardised mean differences (SMD), and hazard ratios (HR).

Results

(1) Cohort selection

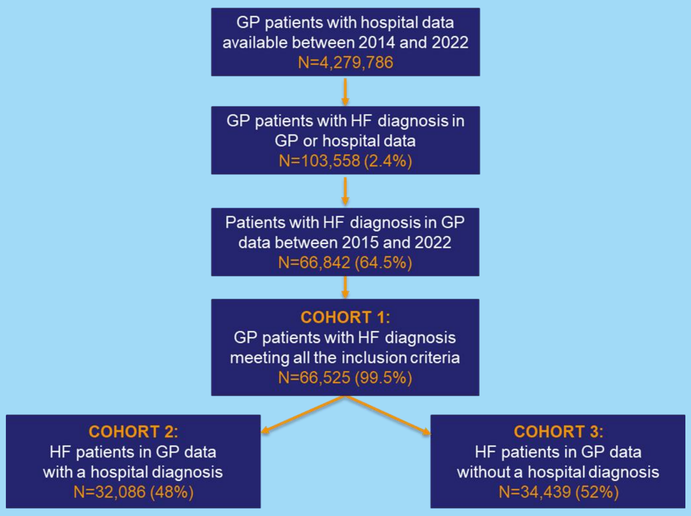

Figure 1. Cohort selection flowchart

- The source population included **4,279,786** GP patients.
- After applying all inclusion and exclusion criteria, **66,525** patients with a recorded HF diagnosis in GP data were included, of which 48% (**N=32,086**) also had an HF diagnosis in the linked hospital data.

(2) Demographic characteristics

		COHORT 1 (total)	COHORT 2 (+ HOSP)	COHORT 3 (- HOSP)
		N = 66,525	**N = 32,086**	**N = 34,439**
Sex	Men	32,131 (48)	16,710 (52)	15,421 (45)
	Women	34,392 (52)	15,376 (48)	19,016 (55)
Age at index	Mean (SD)	78.3 (11.5)	77.4 (11.2)	79.2 (11.8)
Socioeconomic status (SES)	High	15,399 (23)	7,652 (24)	7,747 (22)
	Low	25,330 (38)	12,597 (39)	12,733 (37)
	Middle	25,546 (38)	11,714 (37)	13,832 (40)
	Unknown	165 (<0.5)	82 (<0.5)	83 (<0.5)
Follow-up length (years)	Mean (SD)	2.6 (2.2)	2.7 (2.2)	2.6 (2.2)

Table 1. Demographic characteristics

- **Cohort 1:** 52% were female, the mean age at diagnosis was 78.3 years (SD: 11.5), and mean follow-up time from CED was 2.6 years (SD: 2.2). 44% of patients died during the follow-up, with a median time to death of approximately 5 years.
- **Cohort 2 (+HOSP) vs Cohort 3 (-HOSP):** Patients diagnosed in both GP and hospital data (Cohort 2) were slightly more likely to be male and had younger age, but SMDs were small (<0.2).

(3) HF diagnosis subtypes

- Among patients diagnosed in both GP and hospital settings (Cohort 2), 80% of patients had an unspecified HF diagnosis in GP data.
- Of these, 64% also had an unspecified diagnosis in hospital data, whereas 23% were diagnosed with left ventricular failure (LVF), 13% with congestive heart disease (CHD), and 1% had HF with hypertension.

(4) Comorbidities, medications, and mortality risk

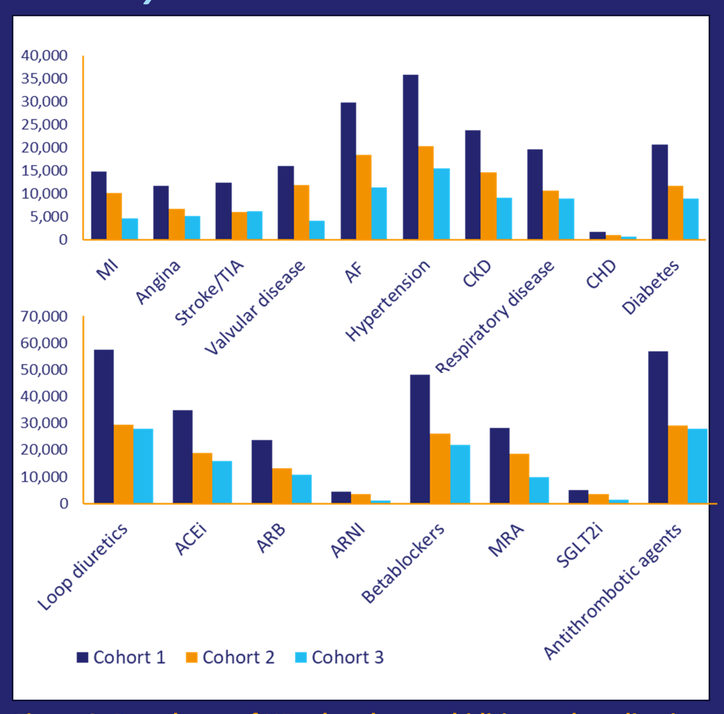

Figure 2. Prevalence of HF-related comorbidities and medications in GP and hospital data

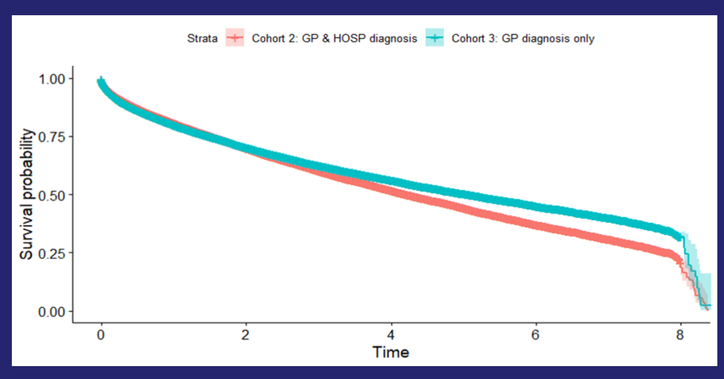

Figure 3. Kaplan-Meier analysis of survival probability

- Compared to patients diagnosed in primary care only (Cohort 3), those diagnosed in both GP and hospital data (Cohort 2) had a higher number of cardiovascular comorbidities (3.5 vs 2.2, SMD=0.811), greater use of HF-related medications (4.4 vs 3.4, SMD=0.694), and greater risk of death (47% vs 40%, HR=1.13, CI: 1.10-1.16).

Conclusion

Linking GP and hospital data can provide more detailed diagnosis information and improve the identification of HF subtypes in real-world data, compared to using GP data alone. Patients identified in both GP and hospital data had a more severe clinical profile compared to those identified in GP data only.