Managing complex heart failure: a specialist view of the primary/ secondary interface

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Is HF a problem?

- Prevalence
- Prognosis
- Resource use

1. HEART FAILURE PREVALENCE

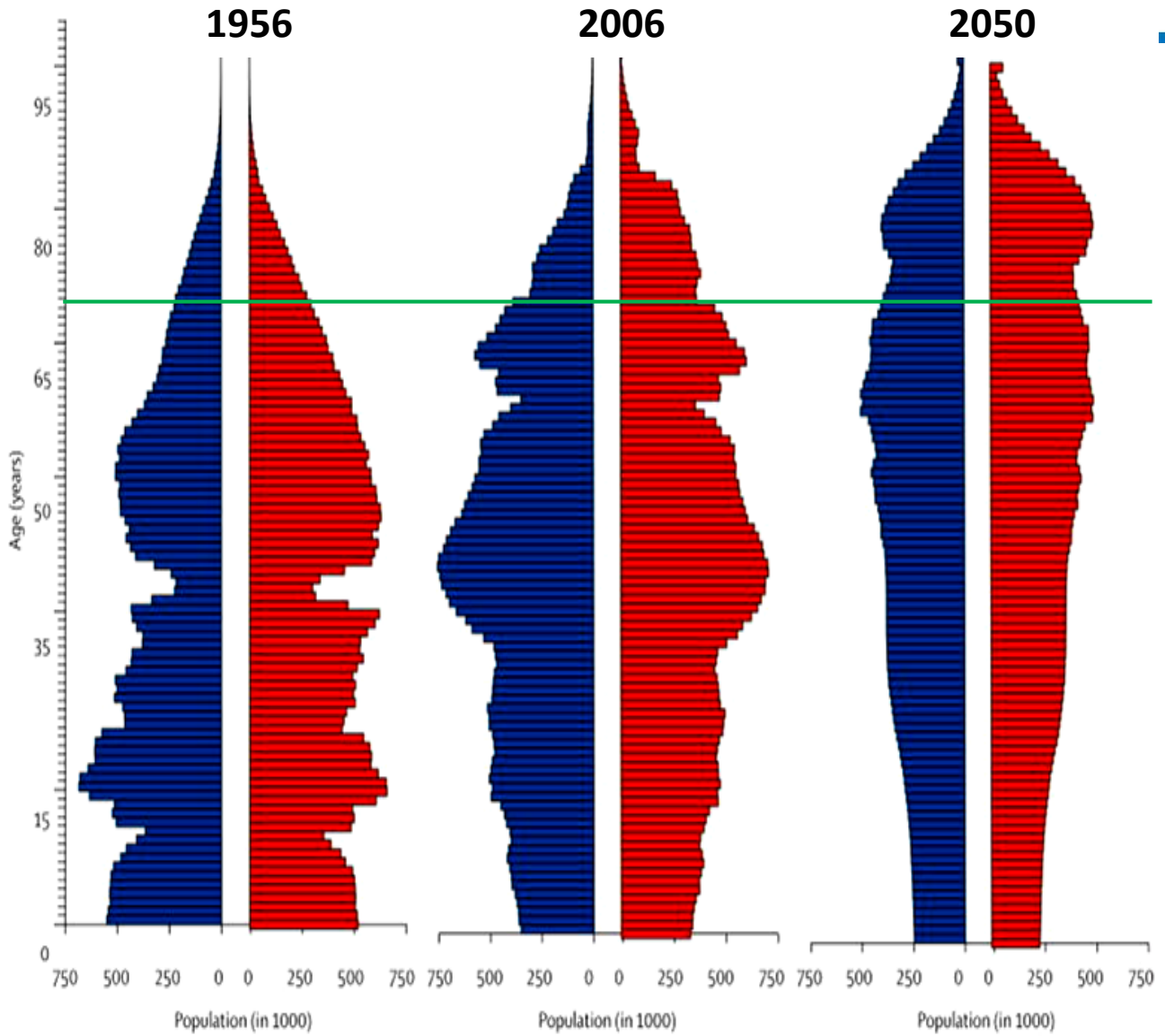
Incidence: 4.2% incident HF

Prevalence: 1,1% population level:

- 0,3% 45-54 years
- 0,9% 55-64 years
- 2,5% 65-74 years
- 8,8% > 75 years

Koudstaal S et al. Eur J Heart Fail. 2017;19(9):1119-1127.
Farré et al. PLoS One. 2017;12(2):e0172745

Envelliment de la població



Christensen et al. Lancet, 2009; 374(9696): 1196–1208

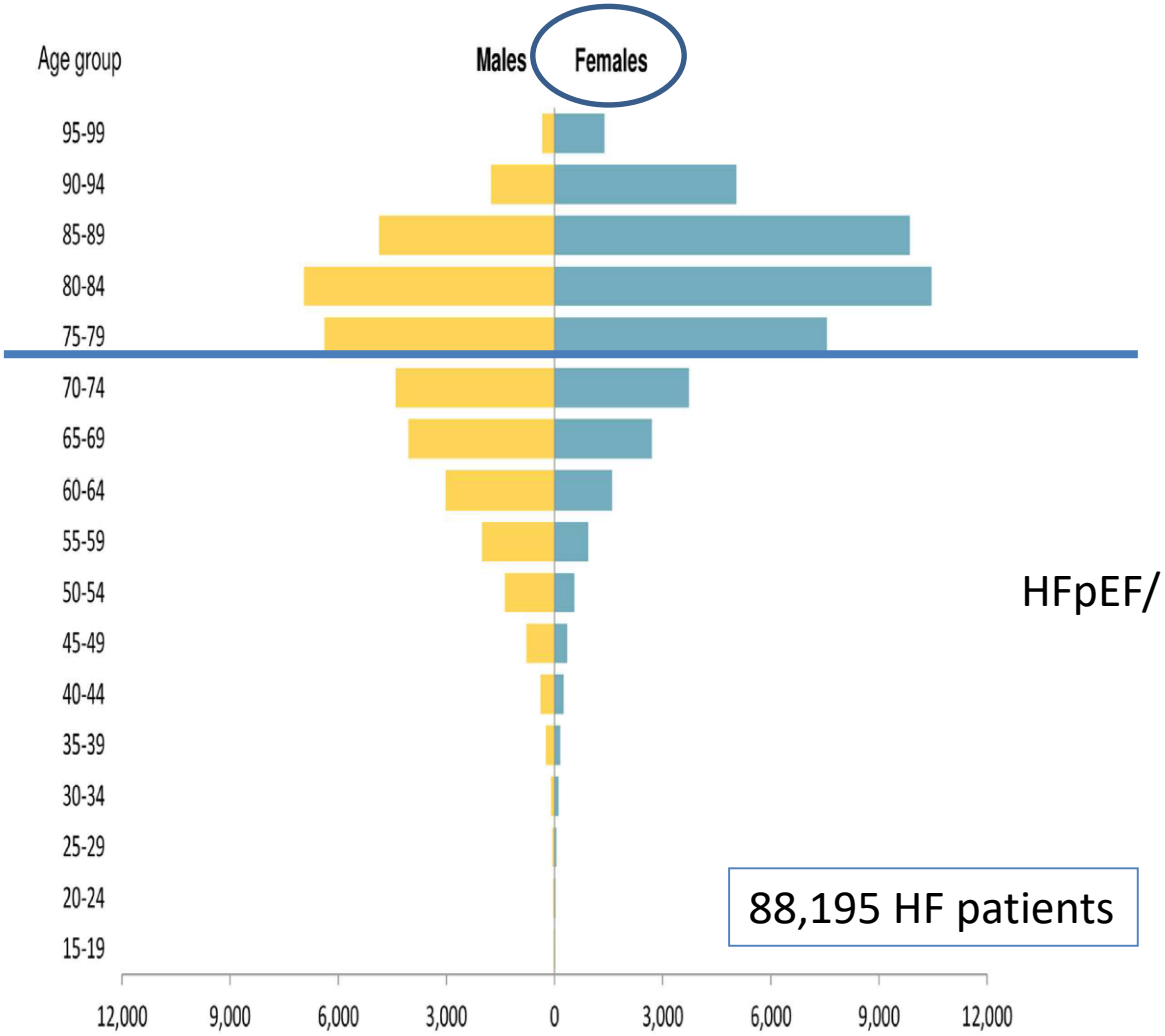


Fig 1. Distribution of heart failure according to age and gender.

HFpEF/ HFrEF/ HFmrEF

88,195 HF patients

Farré et al. PLoS One. 2017 Feb 24;12(2):e0172745

2. PROGNOSIS

Table 1. Baseline characteristics according to group of diagnosis.

	Total	Never admitted due to HF	Remote HF hospitalization	Recent HF hospitalization	p-value
Cases	88,195	12,407	62,982	12,806	
Age, years, mean ± SD	77.4 ± 12.0	79.9 ± 10.5	76.6 ± 12.4	79.0 ± 10.6	<0.001
Female, n (%)	48,320 (54.8)	8,173 (65,9)	33,026 (52.4)	8,173 (55.6)	<0.001
Number of comorbidities, mean ± SD	5.7 ± 2.0	5.1 ± 2.0	5.7 ± 2.0	6.4 ± 2.0	<0.001
Hypertension, n (%)	85,803 (97.3)	12,407 (100.0)	60,659 (96.3)	12,737 (99.5)	<0.001
Ischemic heart disease, n (%)	42,215 (47.9)	4,375 (35.3)	31,065 (49.3)	6,775 (52.9)	<0.001
Atrial fibrillation, n (%)	41,950 (47.6)	4,464 (36.0)	29,639 (47.1)	7,847 (61.3)	<0.001
Diabetes mellitus, n (%)	37,188 (42.2)	4,259 (34.3)	26,613 (42.3)	6,316 (49.3)	<0.001
Anemia, n (%)	29,429 (33.4)	2,521 (20.3)	21,235 (33.7)	5,673 (44.3)	<0.001
COPD, n (%)	28,612 (32.4)	2,802 (22.6)	20,920 (33.2)	4,890 (38.2)	<0.001
Valve heart disease, n (%)	28,263 (32.0)	1,539 (12.4)	21,074 (33.5)	5,650 (44.1)	<0.001
Chronic kidney disease, n (%)	25,974 (29.5)	2,447 (19.7)	18,207 (28.9)	5,320 (41.5)	<0.001
Depression, n (%)	23,043 (26.1)	3,235 (26.1)	16,202 (25.7)	3,606 (28.2)	<0.001
Cardiac conduction disorders, n (%)	19,865 (22.5)	1,290 (10.4)	14,633 (23.2)	3,942 (30.8)	<0.001
Cancer, n (%)	18,545 (21.0)	2,196 (17.7)	13,506 (21.4)	2,843 (22.2)	<0.001
Stroke, n (%)	16,127 (18.3)	1,776 (14.3)	11,802 (18.7)	2,549 (19.9)	<0.001
Previous acute myocardial infarction, n (%)	13,254 (15.0)	887 (7.1)	10,510 (16.7)	1,857 (14.5)	<0.001
Dementia, n (%)	10,257 (11.6)	1,470 (11.8)	7,179 (11.4)	1,608 (12.6)	<0.001
Cirrhosis, n (%)	2,416 (2.7)	244 (2,0)	1,718 (2.7)	454 (3.5)	<0.001

HF: heart failure; COPD: chronic obstructive pulmonary disease; SD: standard deviation

doi:10.1371/journal.pone.0172745.t001

Table 2. One-year outcome and rates of healthcare resource use according to group of diagnosis.

	Total	Never admitted due to HF	Remote HF hospitalization	Recent HF hospitalization	p-value
Mortality rate, n (%)	12,611 (14.3)	1,361 (11.3)	8,188 (13.0)	3,035 (23.7)	<0.001
Patients with an emergency department visit, n (%)	47,096 (53.4)	5,570 (44.8)	33,002 (52.4)	8,554 (66.8)	<0.001
Patients with unplanned HF hospital admission, n (%)	7,725 (8.8)	503 (4.1)	4,369 (6.9)	2,853 (22.3)	<0.001
Patients with unplanned all-cause hospital admission, n (%)	27,164 (30.8)	2,580 (20.8)	18,391 (29.2)	6,121 (47.8)	<0.001
Length of hospitalization, days (per admission), mean ± SD	4.1 ± 10.3	2.4 ± 7.5	3.8 ± 9.7	7.4 ± 13.8	<0.001
Patients with more than one hospital admission, n (%)	10,760 (12.2)	794 (6.4)	6,991 (11.1)	2,907 (22.7)	<0.001
Patients with more than 1 emergency department visit, n (%)	26,634 (30.2)	2,816 (22.7)	18,328 (29.1)	5,532 (43.2)	<0.001
Out-patient specialist contact (per patient)	5.0	3.9	5.1	5.7	<0.001
Primary care contact (per patient)	22.4	21.6	21.6	27.1	<0.001
Patients with use of skilled nursing facility, n (%)	11,377 (12.9)	1,241 (10.0)	7,495 (11.9)	2,650 (20.7)	<0.001

HF: heart failure; SD: standard deviation

doi:10.1371/journal.pone.0172745.t002

3. RESOURCE USE

- 1-2% of healthcare budget
- 2/3 due to hospitalization

» HF RESOURCE USE

» ? RESOURCE USE OF PATIENT WITH HF

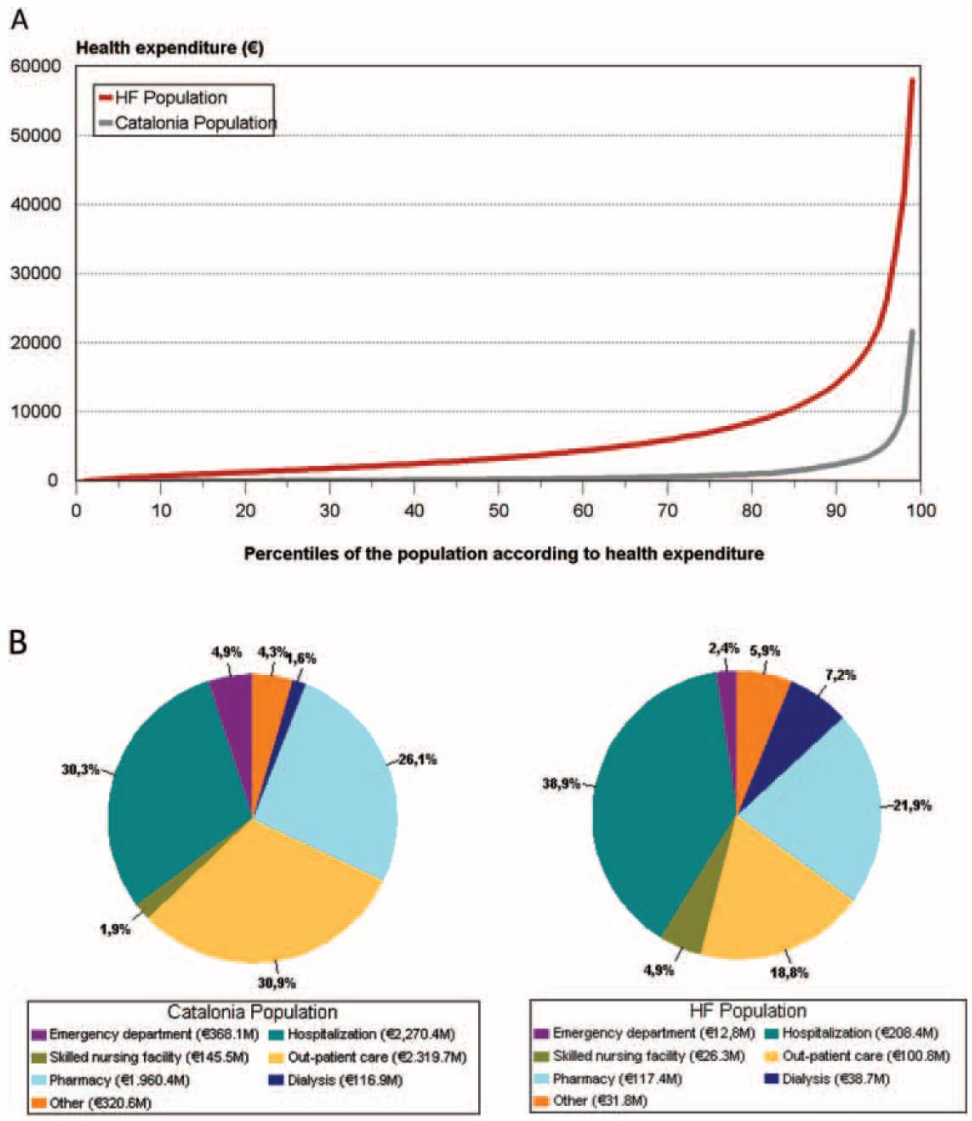
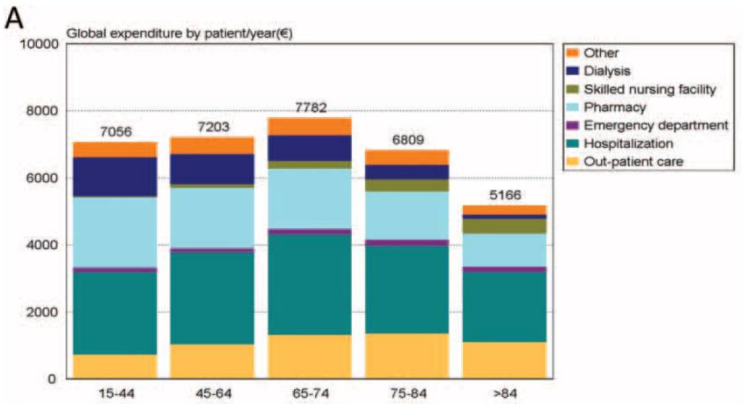
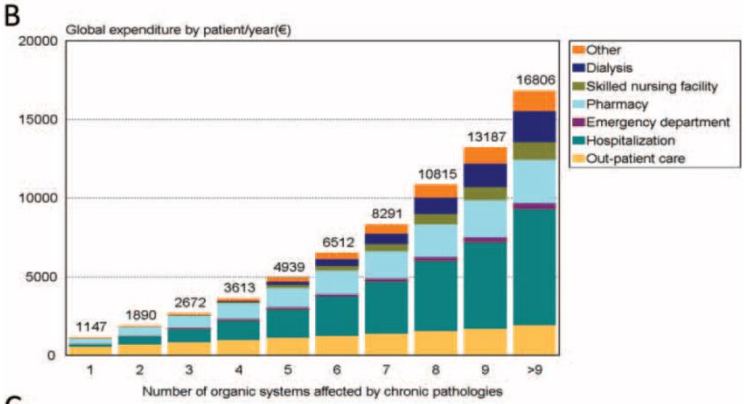


Figure 1 (*A*) Differences in healthcare expenditure in patients with heart failure (HF) and in the whole Catalonia population. (*B*) Health expenditure by type of resource in the general population and in HF patients, in millions of Euros. Other includes mental health services, non-urgent medical transportation, home rehabilitation. and domiciliary oxygen therapy.

- €536,2 M was spent in 2013 in the care of HF patients
- **7,1% of healthcare budget**
- Average expenditure of **€6571 per patient/year**

Farré N et al. Eur J Heart Fail. 2016;18(9):1132-40





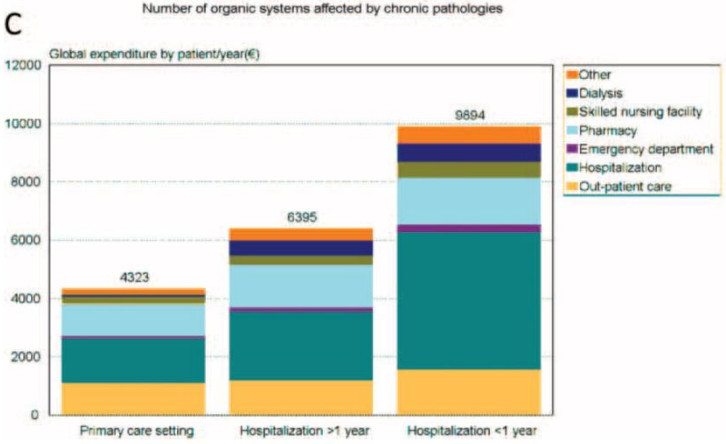


Figure 2 Healthcare resource use in heart failure (HF) patients by age (*A*), co-morbidities (*B*), and HF diagnostic setting (*C*).

Farré N et al. Eur J Heart Fail. 2016;18(9):1132-40

- Prevalence of HF increases with age
- Bad prognosis
- Intensive resource use (hospitalization, pharmacy, primary care)

WHO LOOKS AFTER HF PATIENTS?

- Hospital: Cardiology, Internal Medicine, Geriatrics, Emergency room, Palliative care
- Primary care: General practitioners, case managers, nurses
- Skilled nursing centers
- Pharmacies
- Social workers…

IS IT IMPORTANT TO COORDINATE CARE?

- 2.1 million inhabitants of England, 89 554 patients with newly recorded HF:
  - 23 547 (26%) were recorded in PC but never hospitalized
  - 30 629 (34%) in hospital admissions but not known in PC
  - 23 681 (27%) in both → highest prescription ACEI, BB, MRA
  - 11 697 (13%) in death certificates only.

Koudstaal S et al. Eur J Heart Fail. 2017;19(9):1119-1127.

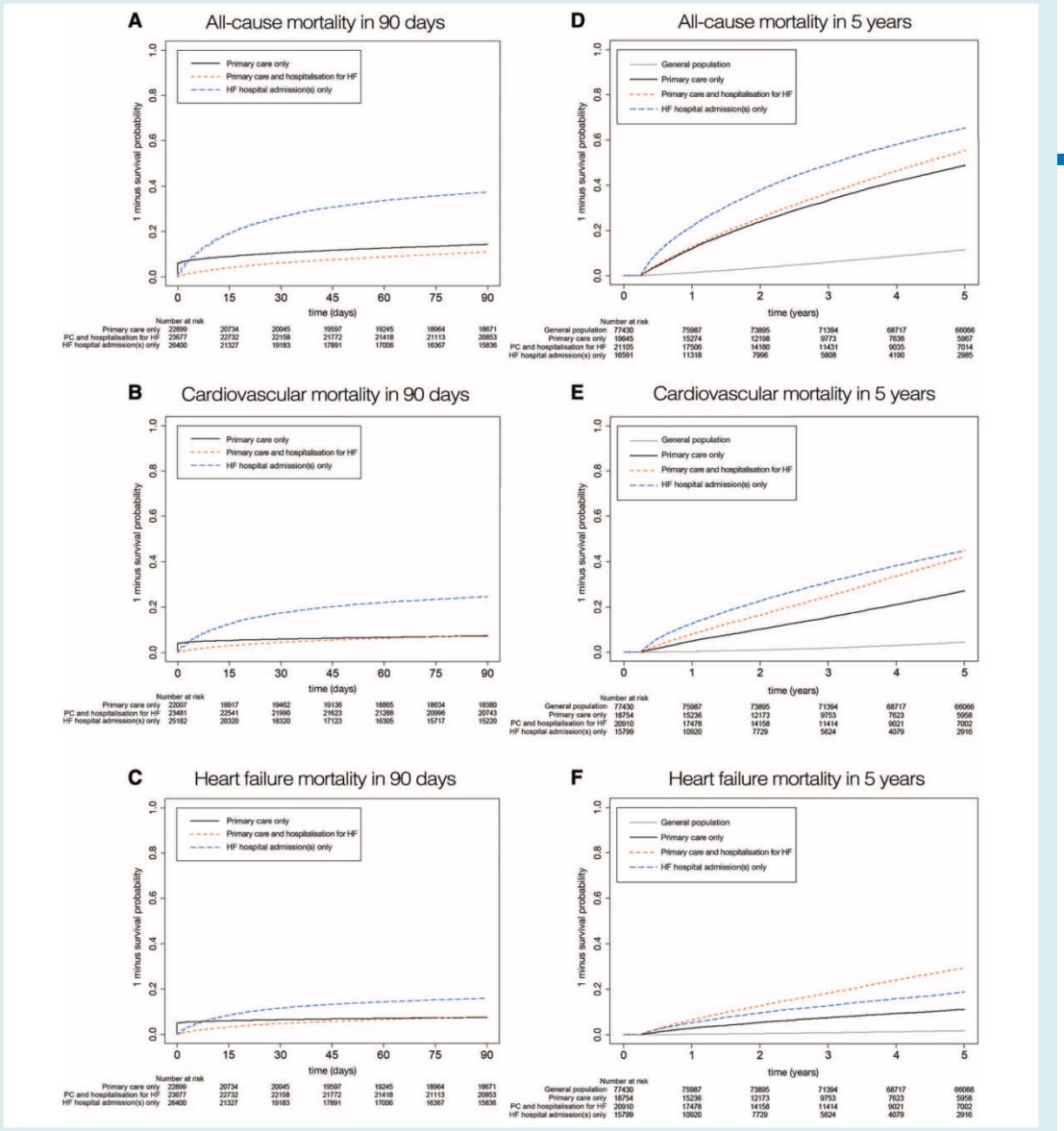


Figure 2 Kaplan–Meier survival curves showing the survival following heart failure (HF) recorded in primary care, acute hospital admissions, or both, for all-cause mortality (*A* and *D*), cardiovascular mortality (*B* and *E*), and HF as cause of death (*C* and *F*). (*A*–*C*) Ninety-day mortality; (*D*–*F*) 5-year mortality in patients surviving the first 3 months. PC, primary care.

33.1% of death occurred within 3 months

Koudstaal S et al. Eur J Heart Fail. 2017;19(9):1119-1127.

Working alone is not an option

Transitions

EUROPEAN SOCIETY OF CARDIOLOGY®

European Journal of Heart Failure (2017) **19**, 1427–1443
doi:10.1002/ejhf.765

RESEARCH ARTICLE

Comparative effectiveness of transitional care services in patients discharged from the hospital with heart failure: a systematic review and network meta-analysis

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- 53 randomized studies
- 12.356 patients
- 58% male
- Age 57-85 (approx. 70-75)
- 19 studies no LVEF available
- 35 studies LVEF <40%

TYPE OF INTERVENTION

- Education
- Pharmacist intervention
- Telemonitoring
- Telephone
- Home visits (nurse)
- Nurse case manager: home visit + phone
- Disease Managment Clinic (Multidisciplinary team (hospital)

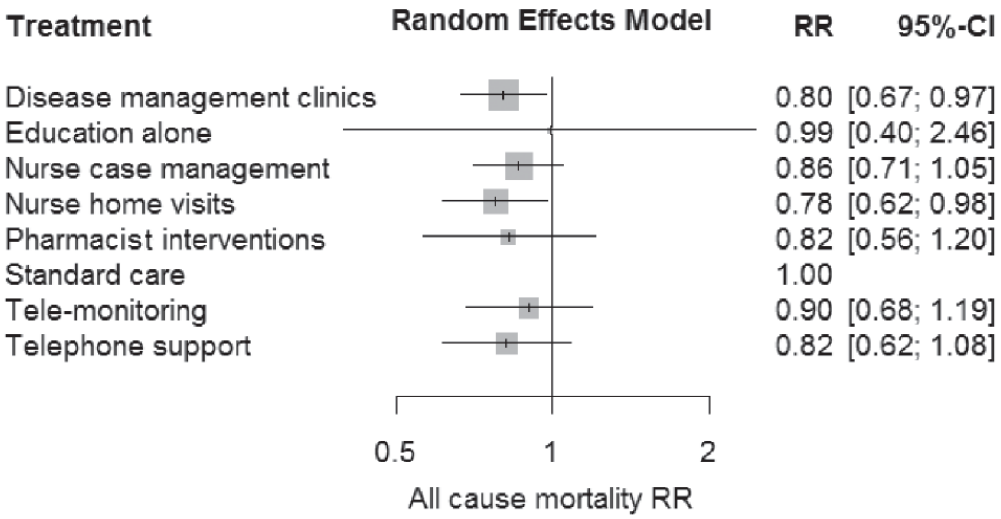

Figure 2 Comparative effectiveness of transitional care services in reducing all-cause mortality after hospitalization for heart failure. Results of the network meta-analysis are depicted in the forest plot. CI, confidence interval; RR, relative risk.

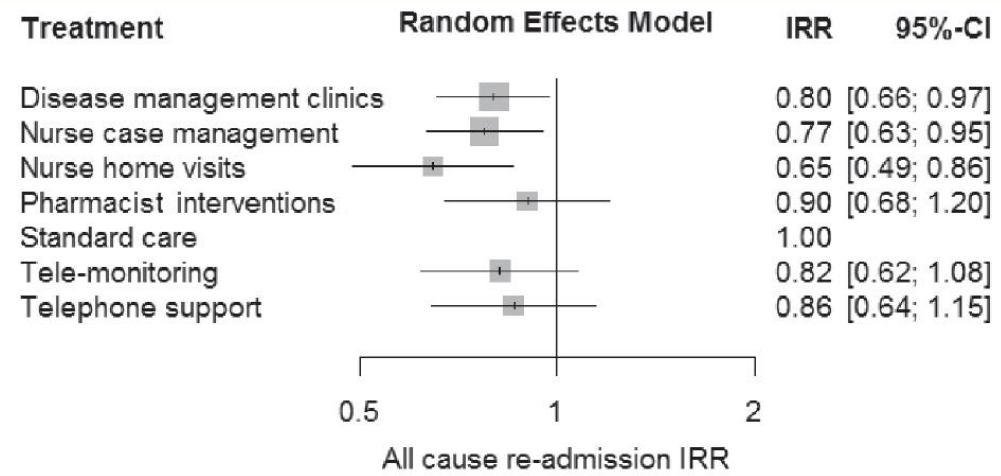

Figure 3 Comparative effectiveness of transitional care services in reducing all-cause readmissions after hospitalization for heart failure. Results of the network meta-analysis are depicted in the forest plot. CI, confidence interval; IRR, incident rate ratio.

Rev Esp Cardiol. 2014;67(4):283–293

Original article

Efficacy of an Integrated Hospital-primary Care Program for Heart Failure: A Population-based Analysis of 56 742 Patients

Josep Comín-Colet,[a,b,c,d,*] José María Verdú-Rotellar,[b,c,d,e,f] Emili Vela,[g] Montse Clèries,[g] Montserrat Bustins,[g] Lola Mendoza,[b,h] Neus Badosa,[a,b,c] Mercè Cladellas,[c,d] Sofía Ferré,[b] and Jordi Bruguera[a,b,c] on behalf of the working group of the Integrated Program for Heart Failure Management of the Barcelona Litoral Mar Integrated Health Care Area, Spain[◇]

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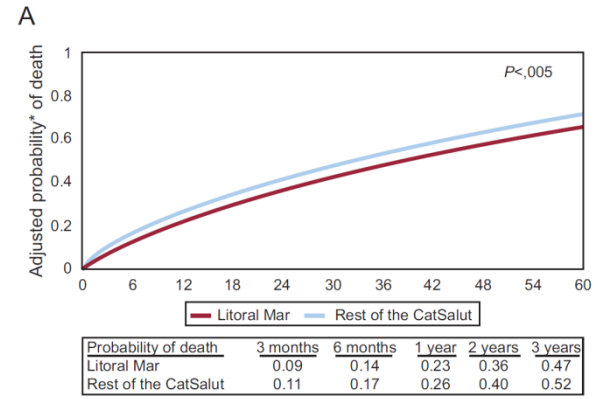
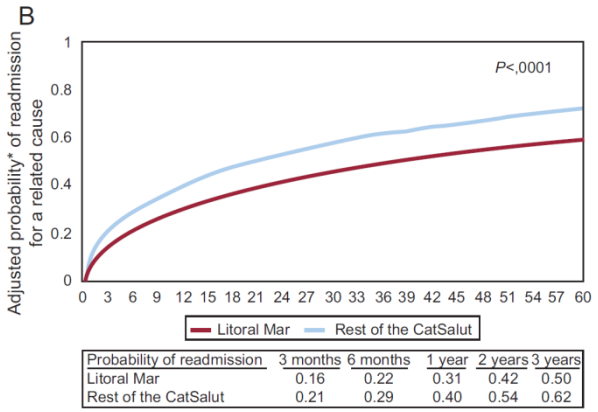
Table 3
Descriptive Analysis of the Study Population. Baseline Demographic and Clinical Characteristics According to Analysis Group

	Litoral Mar (n = 2083)	CatSalut[a] (n = 54 659)	*P*
Demographic variables			
Sex			.227
Male	898 (43)	24 297 (44)	
Female	1185 (57)	30 362 (56)	
Age, mean (SD), y	77 (11)	78 (11)	< .0001
Age groups, y			
15-64	297 (14)	5744 (10)	< .0001
65-74	398 (19)	9608 (18)	
75-84	885 (42)	23 095 (42)	
≥ 85	503 (24)	16 212 (30)	
Cardiovascular disease			
Hypertension	1546 (74)	36 519 (67)	< .0001
Previous AMI	173 (8)	3883 (7)	.037
Atrial fibrillation	1012 (49)	25 648 (47)	.136
Peripheral vascular disease	187 (9)	3433 (6)	< .0001
Stroke	85 (4)	2433 (4)	.420
Comorbidities			
Diabetes mellitus	775 (36)	18 863 (34)	.102
Chronic kidney disease	450 (22)	11 315 (21)	.319
COPD	656 (31)	15 406 (28)	.001
Anemia	473 (23)	10 774 (20)	.001
Cancer	100 (5)	2734 (5)	.679
Marked cognitive impairment	64 (3)	2513 (5)	.001
Charlson index, mean (SD)	5.90 (1.93)	5.97 (1.84)	.084
Hospitalization during the year prior to the index admission[b]			
Number of admissions, mean (SD)	0.49 (0.94)	0.47 (0.89)	.339
Hospital stay, mean (SD), days	5.17 (11.10)	4.57 (10.68)	.012

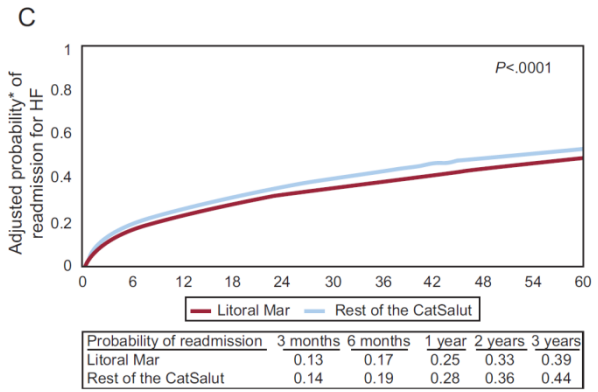
AMI, acute myocardial infarction; CatSalut, Catalan Health Service; COPD, chronic obstructive pulmonary disease; SD, standard deviation.
[a] Rest of the CatSalut (excluding Litoral Mar).
[b] Corresponds to emergency hospital admissions for medical reasons during the year prior to the index admission.
Unless otherwise indicated, the data are expressed as No. (%).



Probability of death	3 months	6 months	1 year	2 years	3 years
Litoral Mar	0.09	0.14	0.23	0.36	0.47
Rest of the CatSalut	0.11	0.17	0.26	0.40	0.52



Probability of readmission	3 months	6 months	1 year	2 years	3 years
Litoral Mar	0.16	0.22	0.31	0.42	0.50
Rest of the CatSalut	0.21	0.29	0.40	0.54	0.62



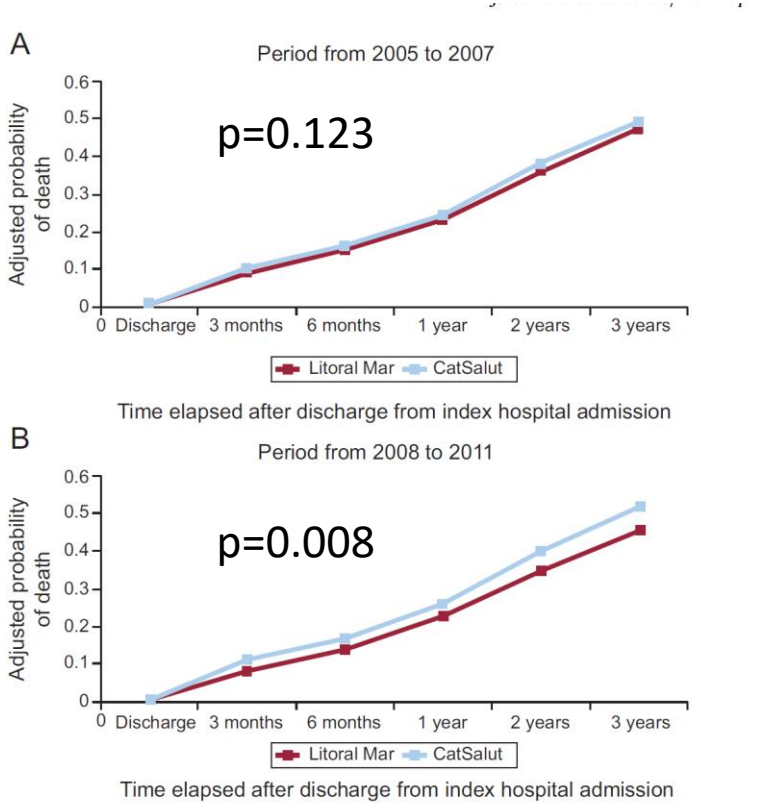
Probability of readmission	3 months	6 months	1 year	2 years	3 years
Litoral Mar	0.13	0.17	0.25	0.33	0.39
Rest of the CatSalut	0.14	0.19	0.28	0.36	0.44

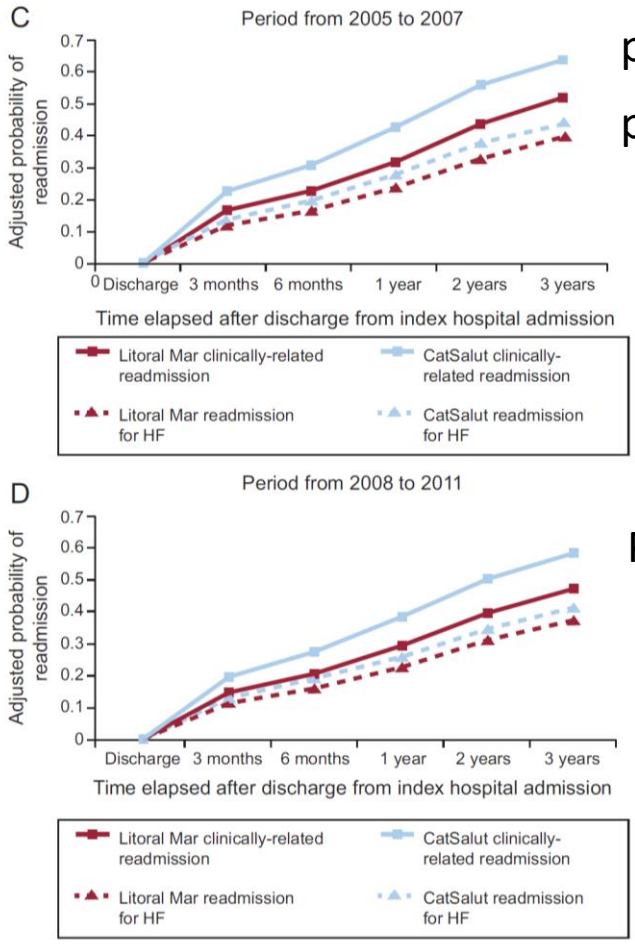
Figure 1. Survival curves estimated on the basis of multivariate Cox models for adjusted probability of death (A), clinically-related readmission (B), and readmission for heart failure (C) during the study period (2005-2011). CatSalut, Catalan Health Service; HF, heart failure.
*Probability adjusted for the variables associated with the outcome variable in the corresponding multivariate Cox proportional hazards models (Table 4).

HR 0.92 (0.86-0.97), p=0.005

HR 0.71 (0.66-0.76), p<0.001

HR 0.86 (0.80-0.94), p<0.001





p<0.001

p=0.085

P<0.001

p=0.001

Higher risk re-hospitalization the first 30-90 days after discharge

Close follow-up can decrease hospitalization

- Not all patients can come to the hospital frequently
- Logistic limitations (space and professionals)

How can we improve results?

TELEMEDICINE

Impact on clinical events and healthcare costs of adding telemedicine to multidisciplinary disease management programmes for heart failure: Results of a randomized controlled trial

Josep Comín-Colet[1,2,3], Cristina Enjuanes[1,2,3], José M Verdú-Rotellar[2,3,4], Anna Linas[1,2], Pilar Ruiz-Rodriguez[1,2], Gina González-Robledo[1,2], Núria Farré[1,2], Pedro Moliner-Borja[1,2], Sonia Ruiz-Bustillo[1,2] and Jordi Bruguera[1,2]

J Telemed Telecare. 2016 Jul;22(5):282-95.

Single-center prospective randomized open blinded

Biometric monitoring (heart rate, blood pressure, weight)

Symptoms reporting (7 questions)

Daily

Warning alarms

Bleutooth and 3G technology

Telefonica Soluciones, S.A.

Table 1. Demographics and baseline characteristics of the overall study population and according to treatment group.

Variables	Total ($n = 178$)	HF programme ($n = 97$)	HF programme +telemedicine ($n = 81$)
Age, years	74 ± 11	75 ± 11	74 ± 11
Gender (female), no. (%)	73 (41)	38 (39)	35(43)
BMI, kg/m^2	28 ± 5	28 ± 5	28 ± 6
Blood pressure, mm Hg			
Systolic	121 ± 21	122 ± 18	121 ± 24
Diastolic	69 ± 13	67 ± 13	71 ± 14
Heart rate, bpm	74 ± 14	74 ± 14	73 ± 13
NYHA functional class, no. (%)			
I–II	96 (46)	57 (59)	39 (48)
III–IV	82 (54)	40 (41)	42 (52)
LVEF, no. (%)	47 ± 16	49 ± 16	45 ± 16
HFpEF, no. (%)	102 (57)	58 (60)	44 (54)
Ischaemic cause of HF, no. (%)	63 (35)	32 (33)	31 (38)
Comorbidities, no. (%)			
Hypertension	157 (88)	87 (90)	70 (86)
AFib	76 (43)	41 (43)	35 (44)
Diabetes mellitus	86 (48)	49 (50)	37 (46)
CKD[a]	103 (58)	57 (59)	46 (57)
COPD	51 (29)	25 (26)	26 (32)
Iron deficiency[b]	114 (64)	62 (64)	52 (64)
Anemia[c]	92 (52)	52 (54)	40 (49)
Psychosocial evaluation			
Self-efficacy,[d] points	22 ± 11	21 ± 10	22 ± 11
Educational level, no. (%)			
Illiterate	10 (6)	5 (5)	5 (6)
Elementary education	116 (65)	64 (66)	52 (64)
Middle school or higher education	52 (29)	28 (29)	24 (30)
Frailty, no. (%)	44 (25)	25 (26)	19 (24)
Treatment, no. (%)			
ACEI or ARBs	108 (61)	59 (61)	49 (61)
Beta-blockers	149 (84)	82 (84)	67 (83)
Aldosterone antagonists	47 (26)	24 (25)	23 (28)
Digoxin	23 (13)	14 (14)	9 (11)
Loop diuretics	174 (98)	93 (96)	81 (100)
Hydralazine-nitrate combination	48 (27)	27 (28)	21 (26)
Antiplatelet therapy/anticoagulant	152 (85)	81 (84)	71 (88)
Laboratory measurements			
Haemoglobin, g/dl	12.4 ± 2.5	12.2 ± 2.6	12.6 ± 2.3
eGFR, ml/min/1.73 m^2	60 ± 26	58 ± 26	62 ± 27
NT-pro BNP, pg/ml	1585 (1349–1859)	1645 (1317–2054)	1514 (1196–1917)

BMI: body mass index; CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease; HF: heart failure; HFpEF: heart failure preserved ejection fraction; LVEF: left ventricular ejection fraction; NYHA: New York Heart Association; eGFR: estimated glomerular filtration rate; NT-proBNP:N-terminal prohormone of brain natriuretic peptide; AFib: atrial fibrillation; ACEI: angiotensin-converting-enzyme inhibitor; ARB: angiotensin receptor blockers.

Data are presented as arithmetic means±standard deviation (SD) or numbers (with percentages) where appropriate. Data on NT-proBNP are presented as geometric means (95% confidence interval).

[a]CKD (chronic kidney disease) was defined as eGFR < 60 ml/min/1.73 m^2.

[b]Iron deficiency was defined as ferritin < 100 ng/ml or % transferrin saturation < 20%.

[c]Anaemia was defined using the World Health Organization criteria (haemoglobin level < 12 g/dl in women and < 13 g/dl in men).

[d]Self-efficacy was evaluated using the European Self-Care Behaviour Scale (score range 12–60, with higher scores indicating worse self-efficacy).

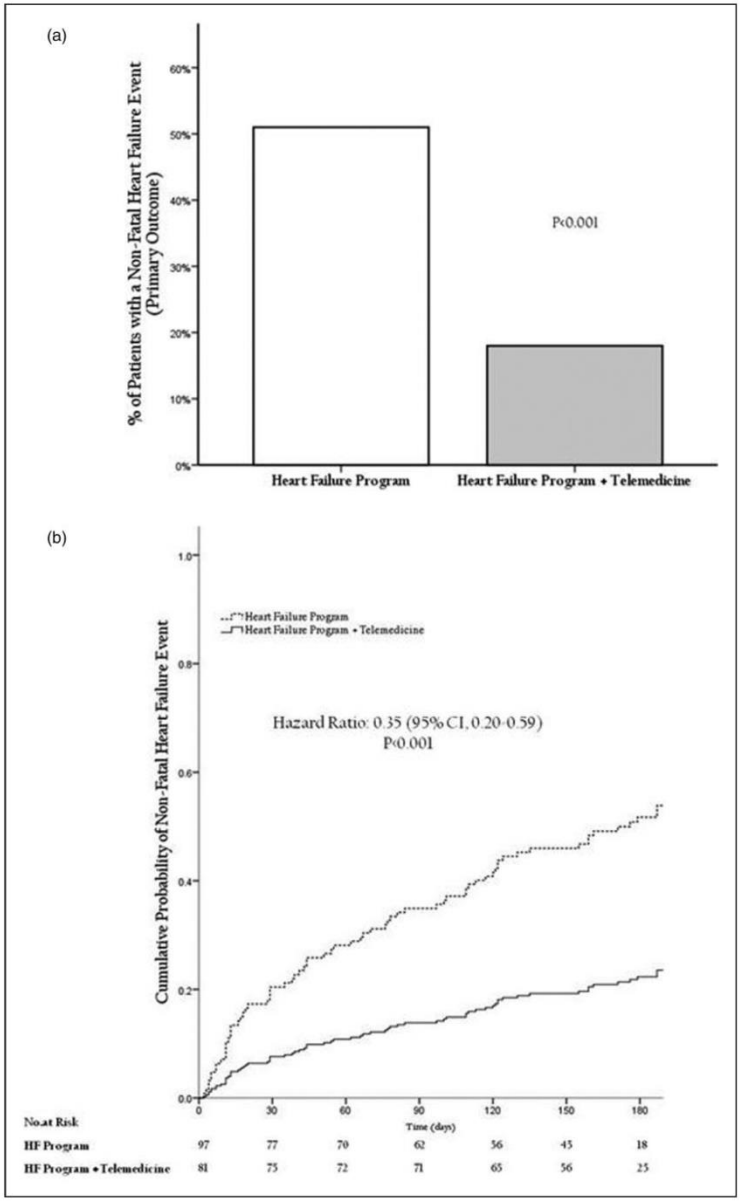


Figure 2. Analysis of rate and risk of non-fatal heart failure (HF) events (primary end-point of the study) according to treatment group. (a) Proportion of patients experiencing the primary end-point according to the treatment group allocation. (b) Kaplan-Meier time-to-event estimates for the primary end point. CI: confidence interval.

Table 2. Clinical primary and secondary pre-specified endpoints according to treatment group.

	HF programme ($n = 97$)			HF programme + telemedicine ($n = 81$)				
Primary endpoint	Total events	Patients with event	Incidence per 100 patient-years at risk	Total events	Patients with event	Incidence per 100 patient-years at risk	Hazard ratio (95% CI)[a]	*p*-value
Non-fatal HF events	94	51	160.9	27	18	51.9	0.35 (0.20–0.59)	<0.001
Secondary endpoints								
HF hospitalization	40	32	81.6	15	11	30.4	0.39 (0.19–0.77)	0.007
CV hospitalization	51	36	95.4	20	14	39.4	0.43 (0.23–0.80)	0.008
Non-CV hospitalization	25	16	37.0	10	9	24.6	0.76 (0.33–1.74)	0.509
All-cause hospitalization	78	45	126.4	30	20	59.3	0.50 (0.30–0.86)	0.011
All-cause death	12	12	25.6	5	5	12.9	0.68 (0.23–2.00)	0.485
CV death	10	10	21.3	4	4	10.3	0.70 (0.20–2.39)	0.570
All-cause death or non-fatal HF event	51	51	160.6	18	18	51.7	0.35 (0.20–0.59)	<0.001
All cause death of HF hospitalization	33	33	84.0	12	12	33.2	0.36 (0.19–0.71)	0.003

CI: confidence interval; HF: heart failure; CV: cardiovascular.

[a]Comparison of HF programme+telemedicine vs HF programme alone (reference category).

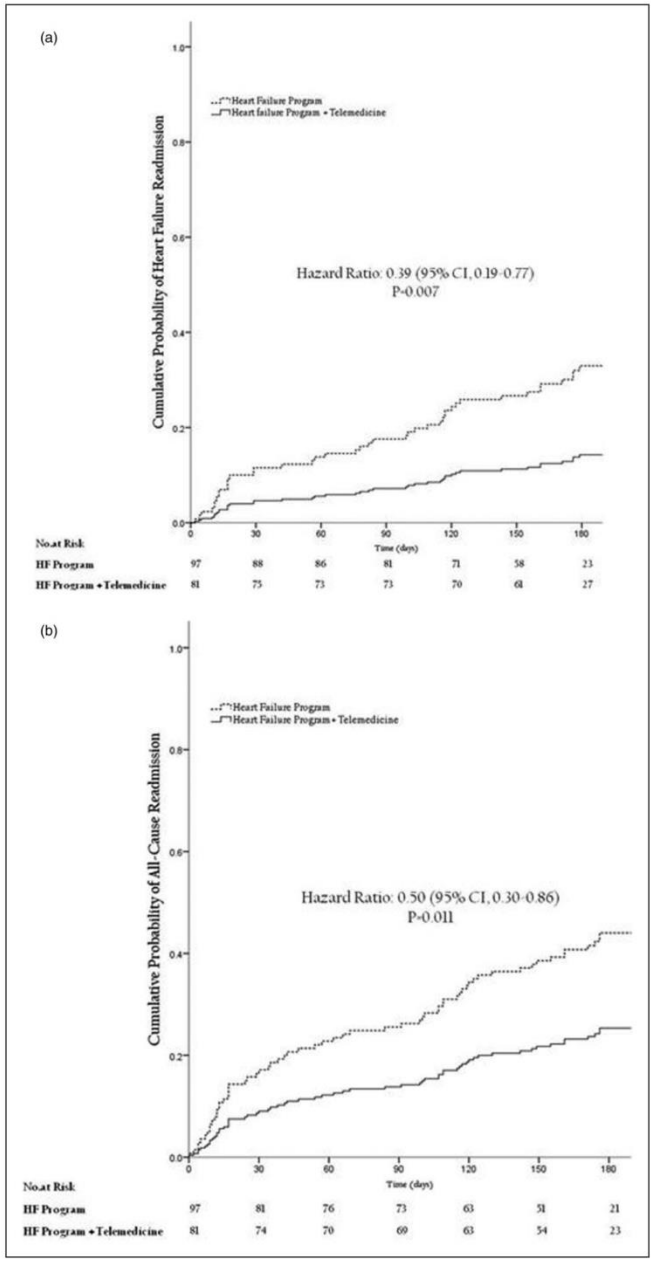


Figure 3. Kaplan-Meier time-to-event estimates for selected secondary end points according to treatment group: (a) heart failure (HF) readmission; (b) all-cause readmission. CI: confidence interval.

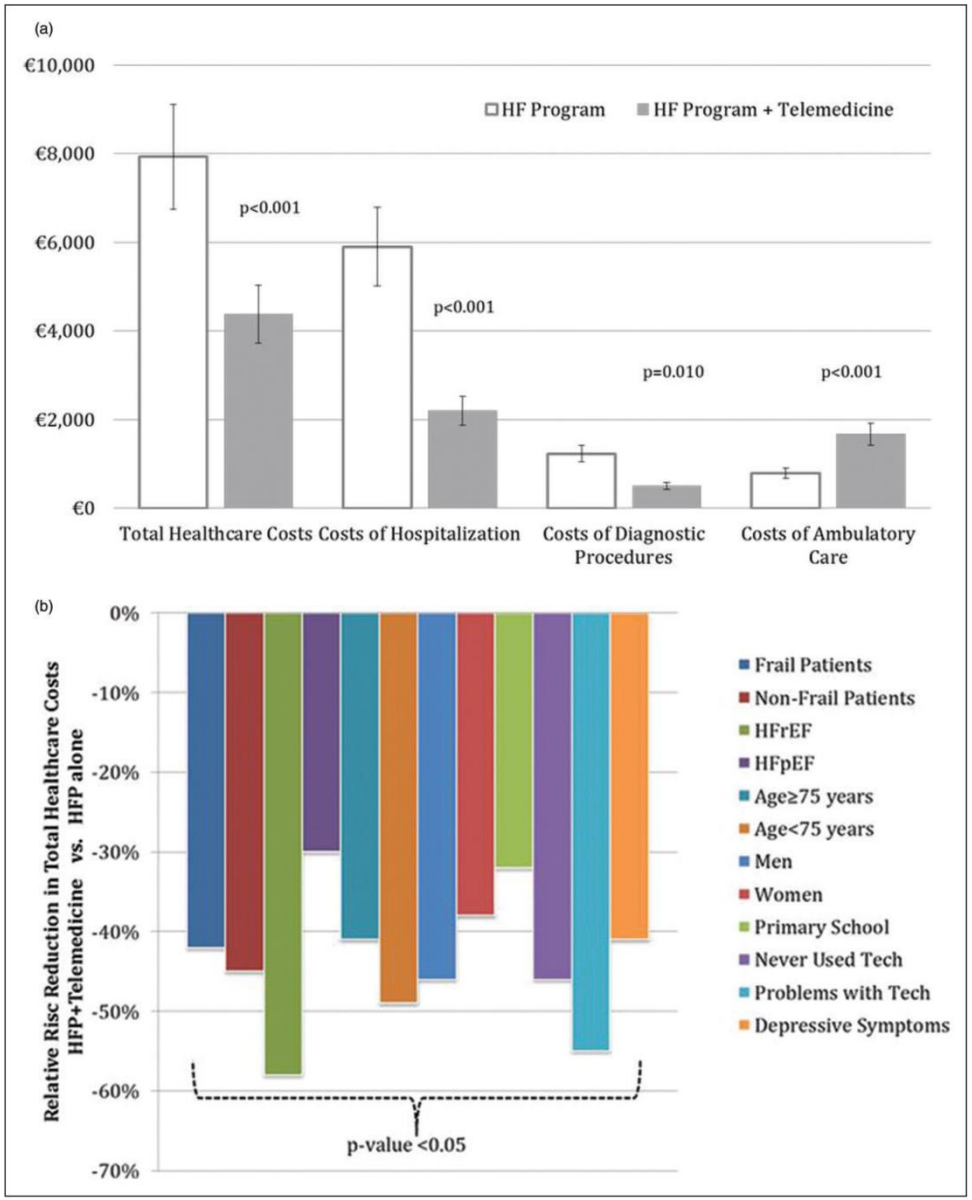


Figure 5. Analyses of global and unitary direct hospital health care costs expressed in euros (€): (a) represents the unitary costs per patient, expressed as mean value ±standard error of the mean (SEM) according to the allocation group; (b) represents the relative reduction in total health care costs in selected subgroups of patients. 'Never used tech', denotes the subgroup of patients that never used any technological device except from telephone. 'Primary school': subgroup of patients with primary studies. 'Problems with tech denotes' the subgroup of patients that would anticipate problems using technology for follow-up.

CONCLUSIONS

- HF is frequent and associated with bad prognosis
- Transitional care improves prognosis
- It should be adapted to resources available in every area.