



Novel paradigms for managing hospital transitions in heart failure

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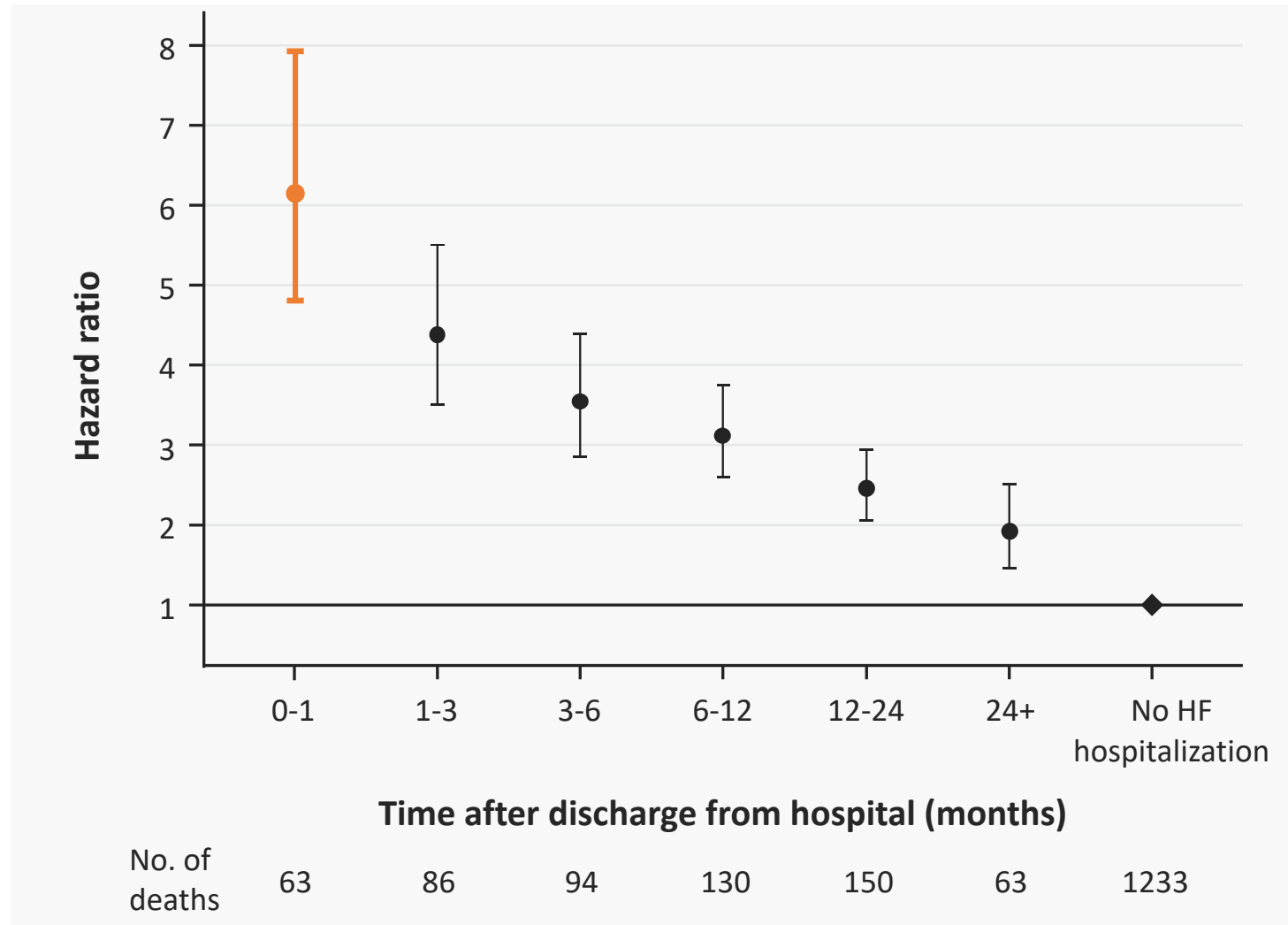
Funding

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- Ontario's Ministry of Health and Long-Term Care
- Heart and Stroke Foundation
- Hamilton Health Sciences Foundation

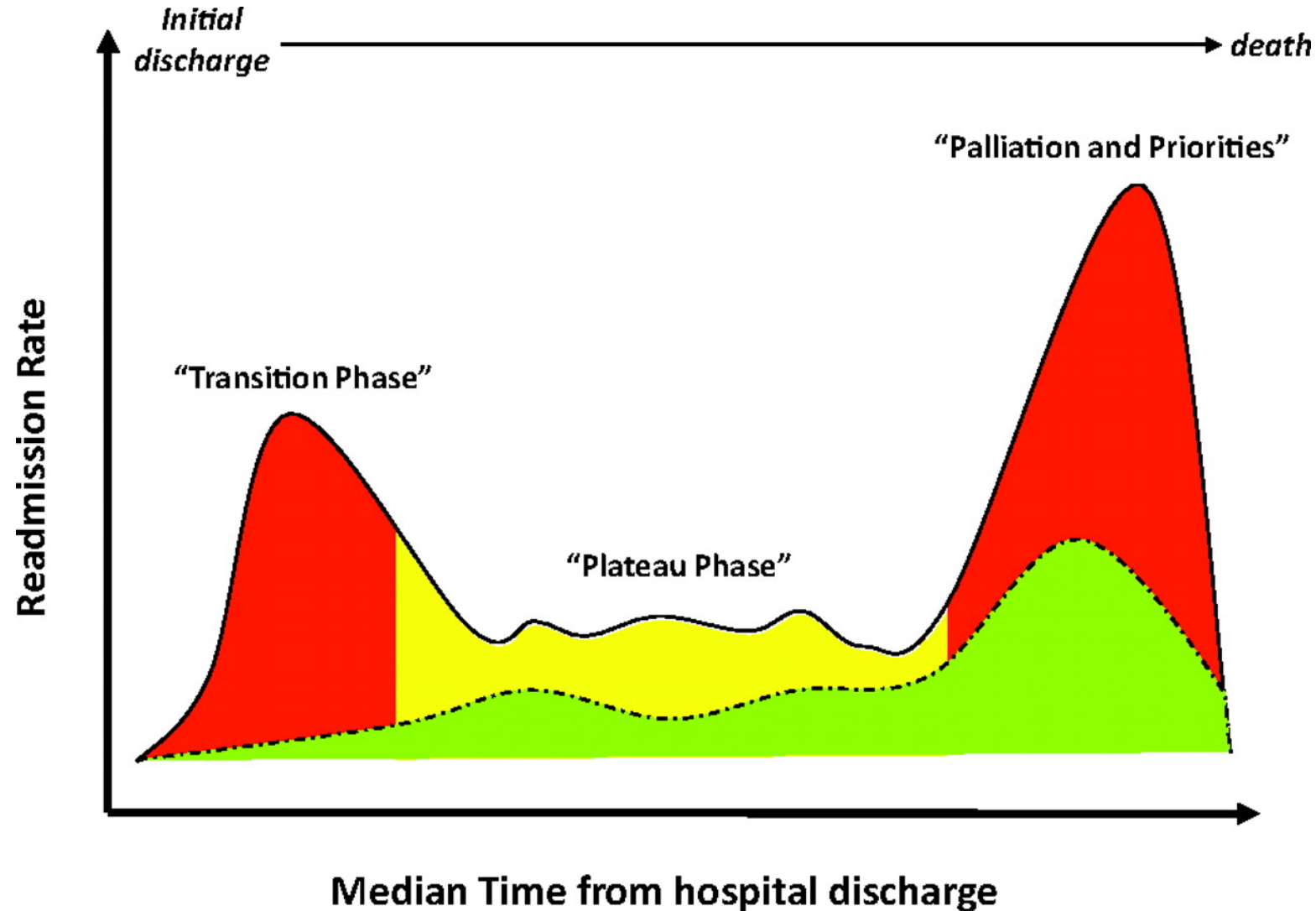
Objectives

- Review evidence-informed transitional care services in HF
- Discuss the use of patient-centered care models that may facilitate avoidance of emergency department use

Hospitalization for HF is high-risk



3-phase lifetime readmission risk after HF hospitalization



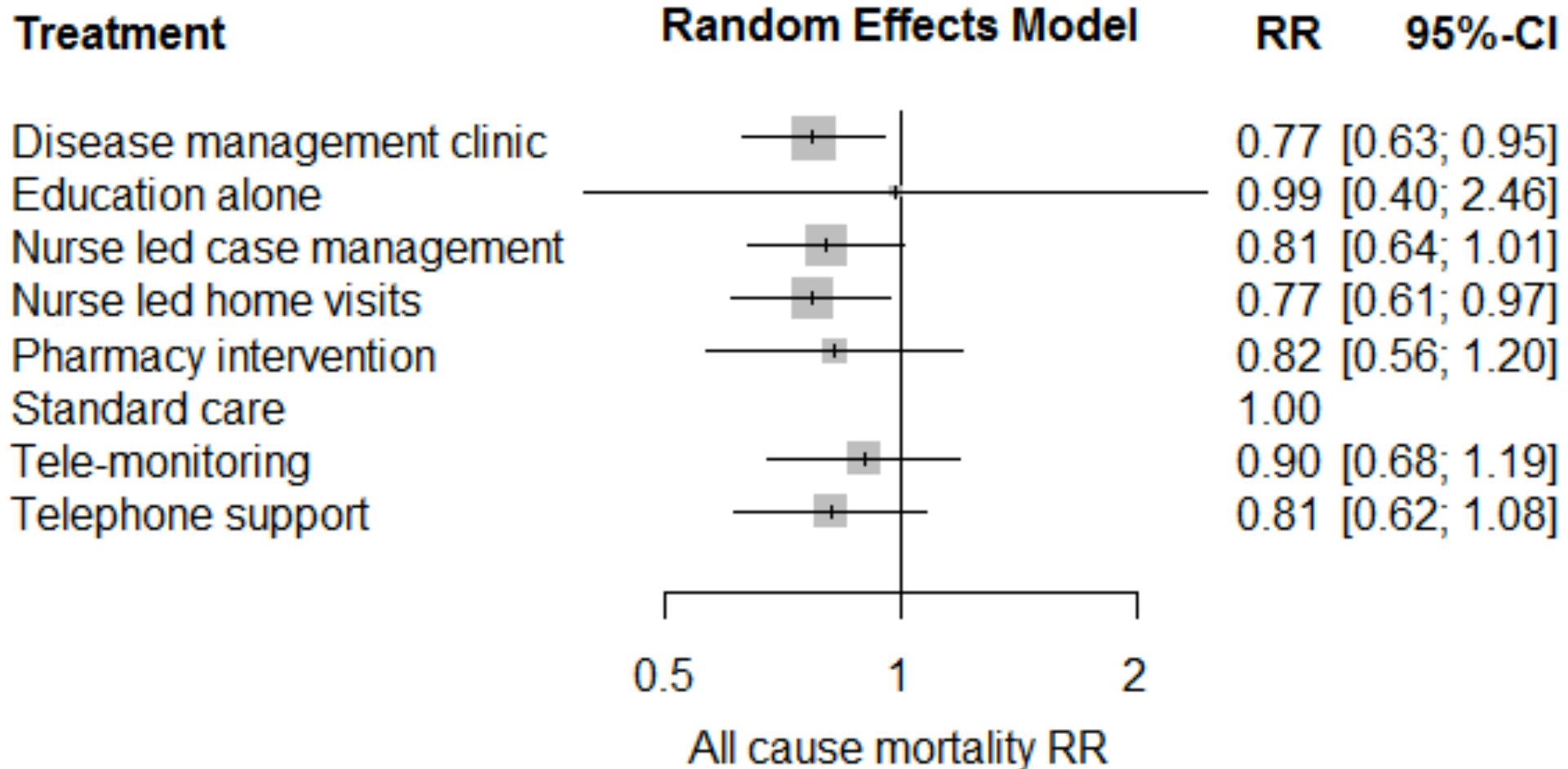
Red indicates period of highest risk for readmission

1) Immediately after discharge
2) Just before death

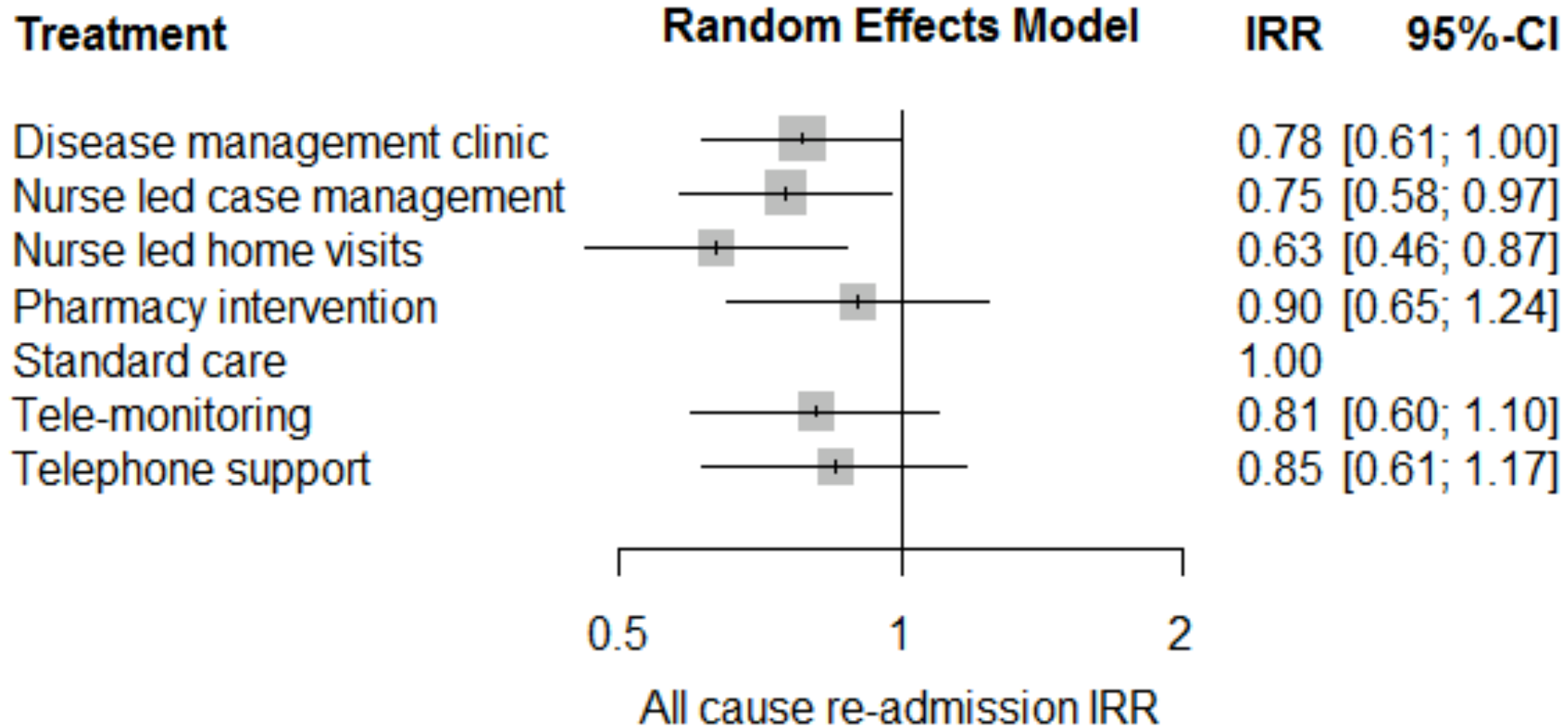
Improving outcomes following hospitalization

1. Address the *underlying cause*
2. Optimize ***GDMT***
3. Ensure adequate *treatment response*
4. Refer for *transitional care services*
5. Assess the patient's *care needs / preferences*
 - Telemedicine
 - Palliative care

Transitional care services in HF (n=54 RCTs): all-cause mortality



Transitional care services in HF (n=54 RCTs): all-cause readmissions



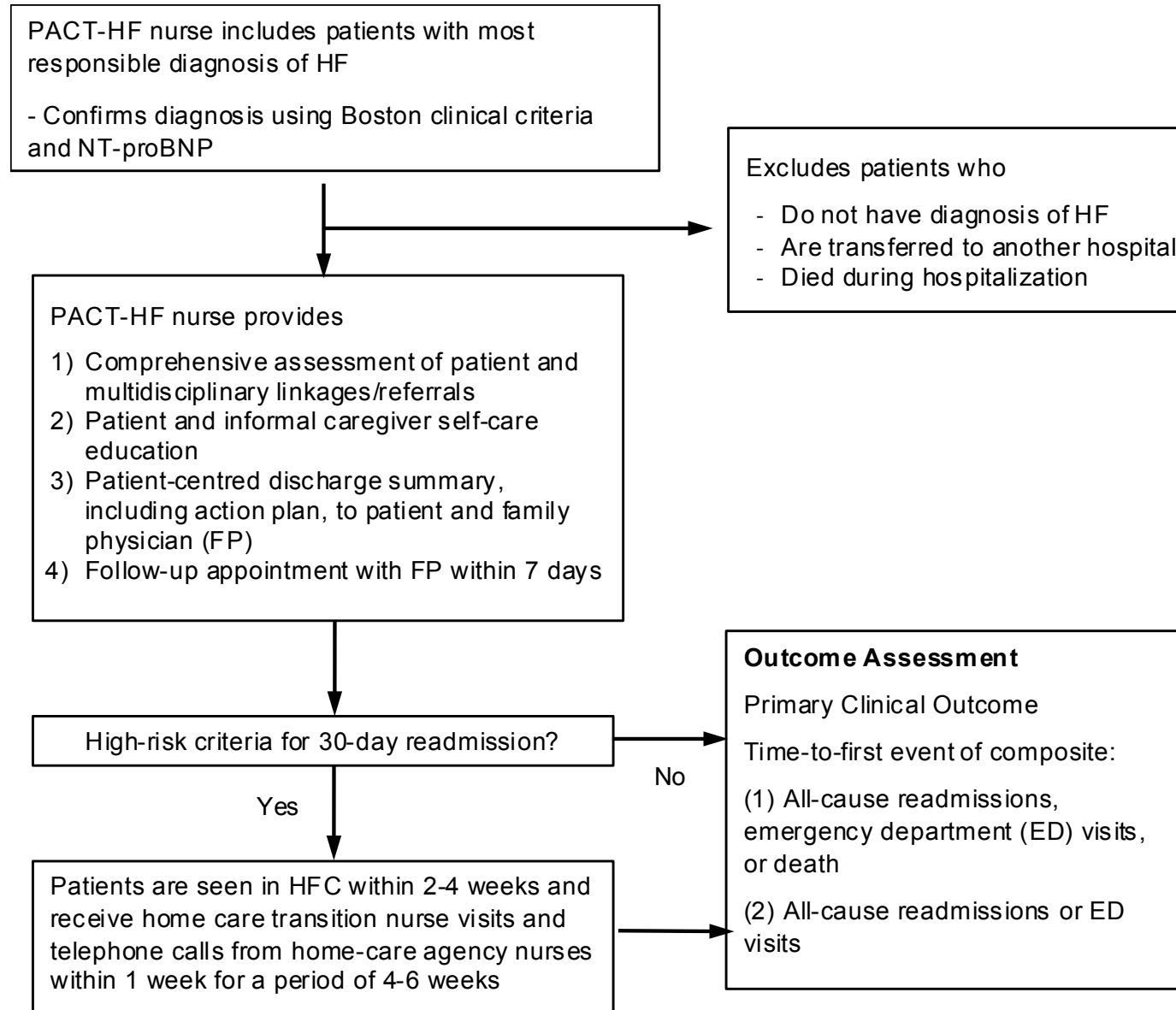
Stepped Wedge Cluster RCT

Hospital	Step (Month)										
	1	2	3	4	5	6	7	8	9	10	11
1	0	1	1	1	1	1	1	1	1	1	1
2	0	0	1	1	1	1	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1	1
4	0	0	0	0	1	1	1	1	1	1	1
5	0	0	0	0	0	1	1	1	1	1	1
6	0	0	0	0	0	0	1	1	1	1	1
7	0	0	0	0	0	0	0	1	1	1	1
8	0	0	0	0	0	0	0	0	1	1	1
9	0	0	0	0	0	0	0	0	0	1	1
10	0	0	0	0	0	0	0	0	0	0	1

Van Spall et al. Am Heart J 2018; 199:75-82

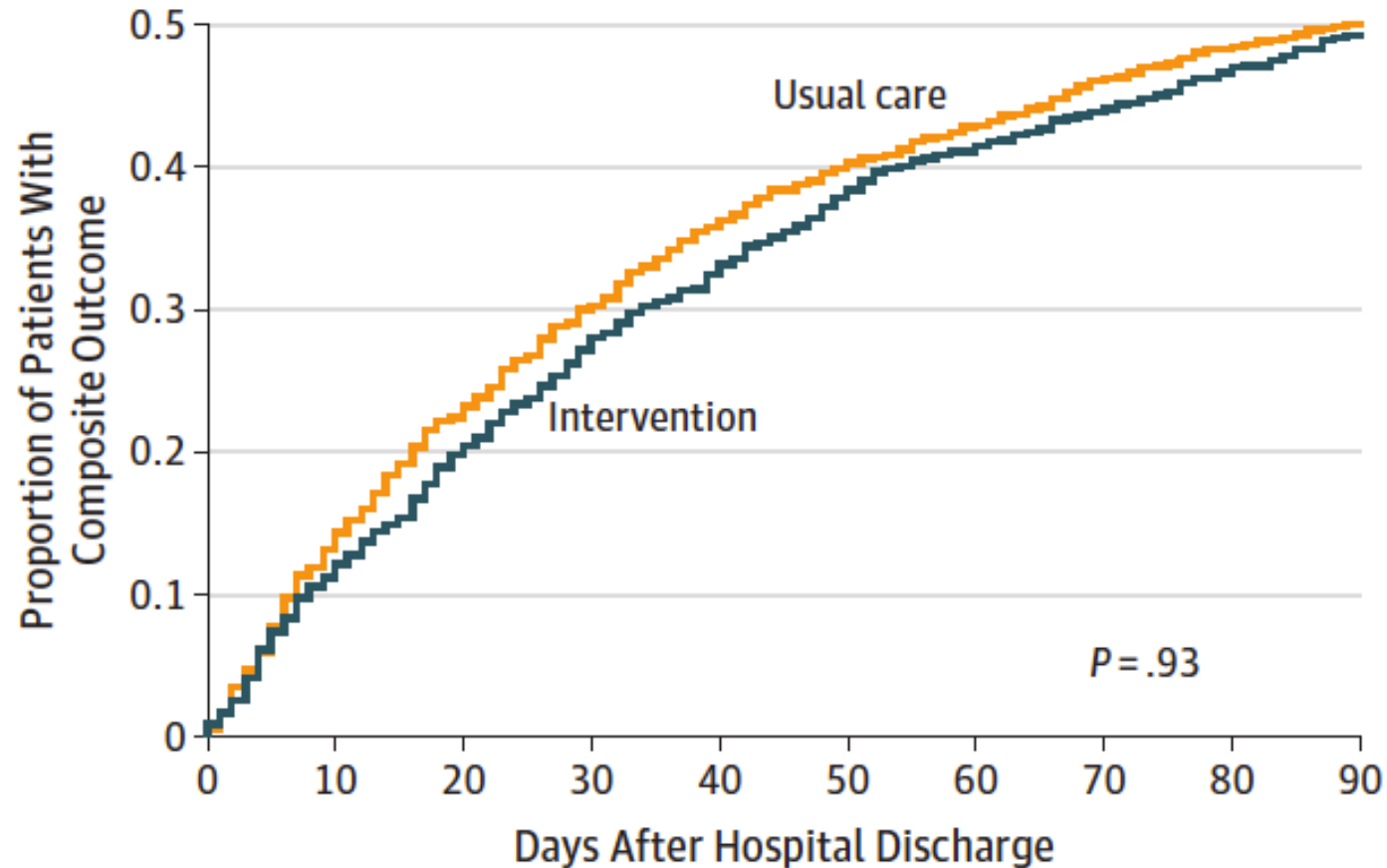
Van Spall et al. JAMA 2019; 321(8):753-761

Study protocol



Baseline Characteristics of Patients	PACT-HF (N=1104)	Usual Care (N=1390)	P-value
Demographics			
Age, mean (SD)	77.8 (12.4)	77.6 (11.9)	0.71
Female, n (%)	544 (49.3%)	714 (51.4%)	0.30
Resides in long-term care, n (%)	164 (14.9%)	222 (16.0%)	0.44
Self-reported Quality of Life			
EQ-Visual Acuity Score (1-100), mean (SD)	52.6 (22.7)	53.7 (22.2)	0.20
Comorbidities			
Hypertension, n (%)	844 (76.5%)	1,084 (78.0%)	0.66
Atrial Fibrillation, n (%)	583 (52.8%)	684 (49.2%)	0.07
Myocardial Infarction, n (%)	240 (21.7%)	295 (21.2%)	0.76
Diabetes with complications, n (%)	524 (47.5%)	704 (50.6%)	0.11
Chronic Kidney Disease, n (%)	242 (21.9%)	316 (22.7%)	0.63
Chronic Pulmonary Disease, n (%)	235 (21.3%)	334 (24.0%)	0.11
Cerebrovascular Disease, n (%)	101 (9.1%)	129 (9.3%)	0.91
Dementia, n (%)	98 (8.9%)	123 (8.8%)	0.98

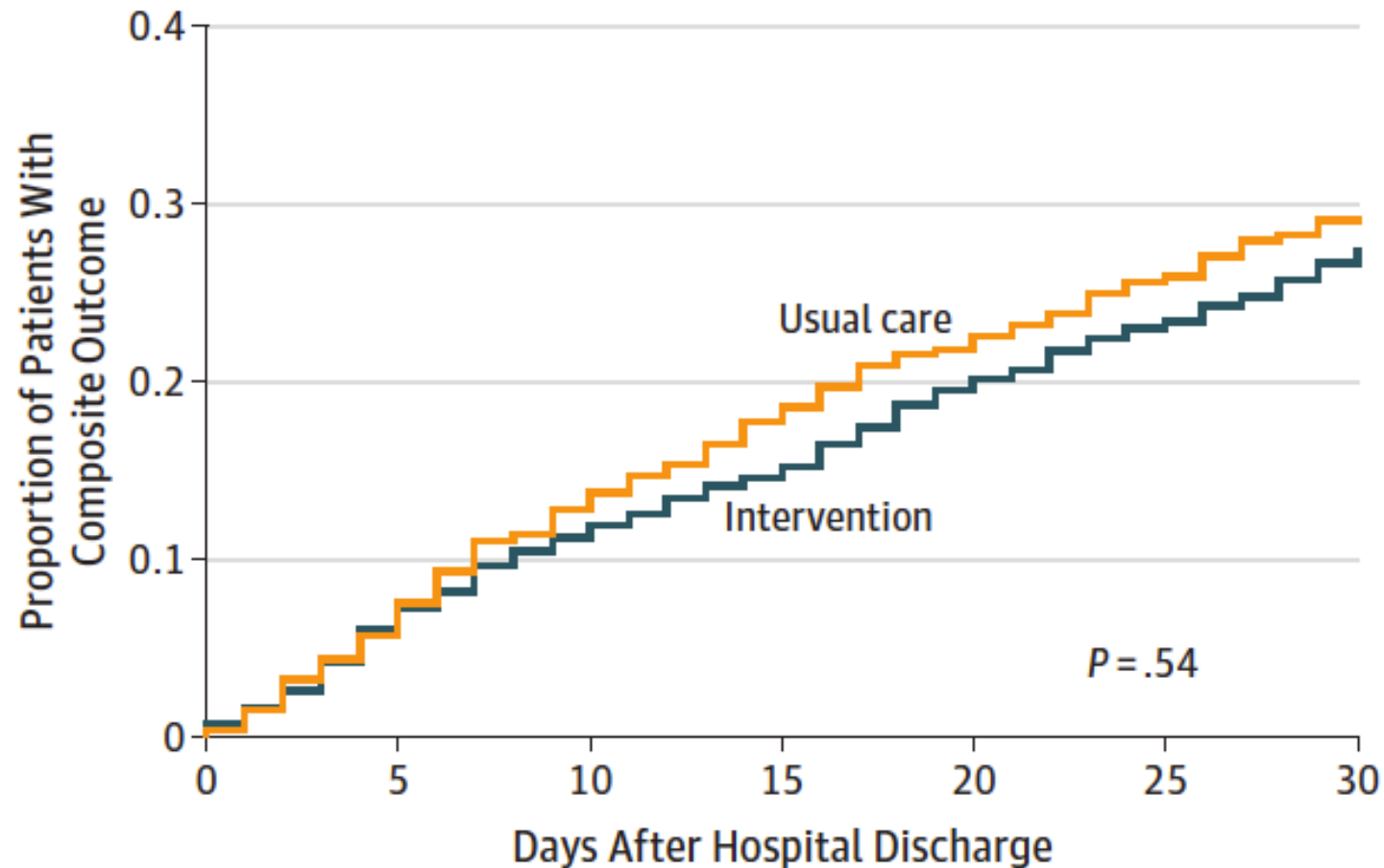
Primary outcome (N=2494): Composite all-cause death, readmission, ED visit at 3 months



Patients at risk

Intervention	1104	979	884	804	745	686	649	619	589	560
Usual care	1390	1206	1077	973	892	834	795	750	718	695

Co-primary outcome: Composite all-cause readmission or ED visit at 30 days



Patients at risk

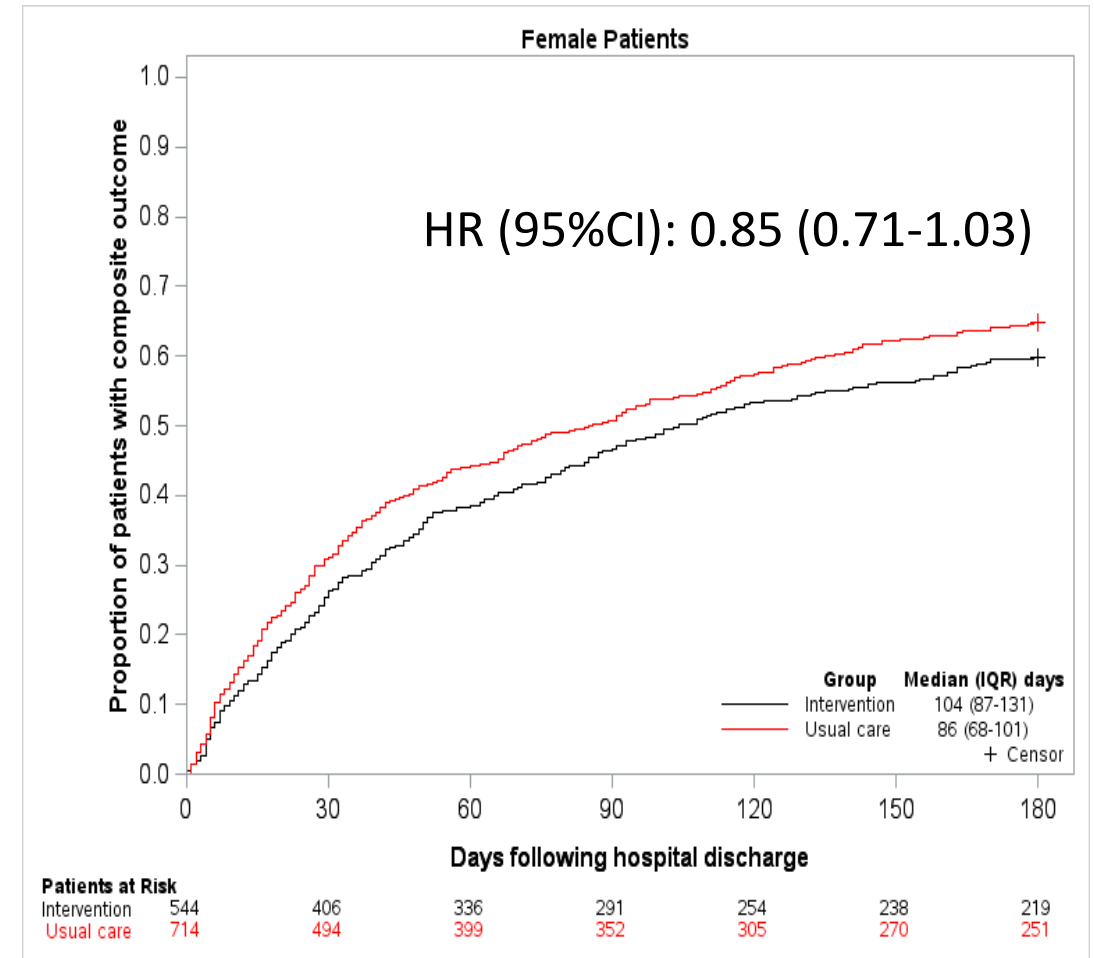
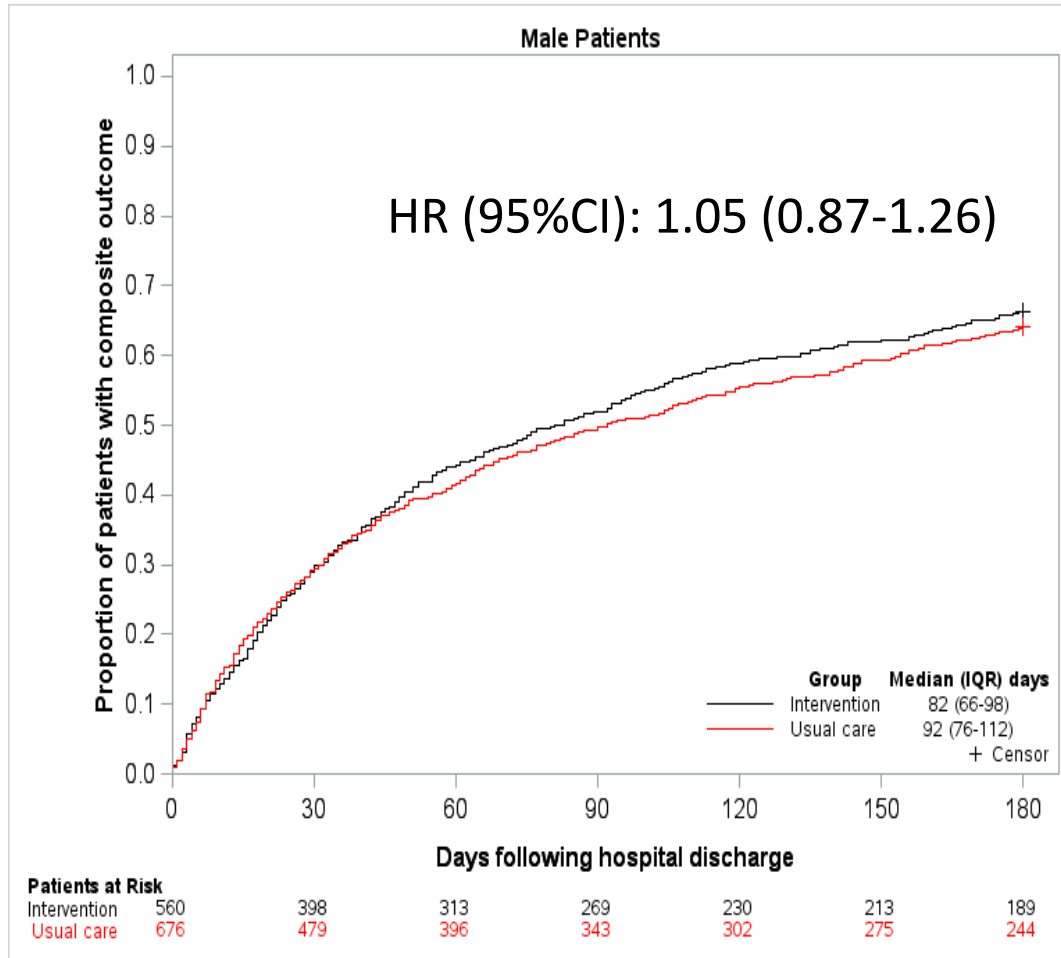
Intervention	1104	1037	980	943	888	850	810
Usual care	1390	1310	1212	1143	1086	1034	986

Clinical outcomes

	PACT-HF (N=1104)	Usual Care (N=1390)	Hazards Ratio (95% CI)	P-value
3-month composite all-cause death, readmission, or ED visit	545 (49.5%)	698 (50.3%)	0.99 (0.83, 1.19)	0.93
Death \leq 3 months	111 (10.1%)	136 (9.8%)	1.18 (0.83, 1.68)	0.36
Readmission \leq 3 months	400 (36.2%)	500 (36.0%)	1.10 (0.91, 1.34)	0.32
ED visit* \leq 3 months	248 (22.4%)	334 (24.0%)	0.88 (0.68, 1.15)	0.36
30-day composite all-cause readmission or ED visit	304 (27.5%)	409 (29.4%)	0.93 (0.73, 1.18)	0.54
Readmission \leq 30 days	225 (20.4%)	265 (19.1%)	1.23 (0.95, 1.59)	0.12
ED visit* \leq 30 days	113 (10.2%)	190 (13.7%)	0.65 (0.45, 0.95)	0.03

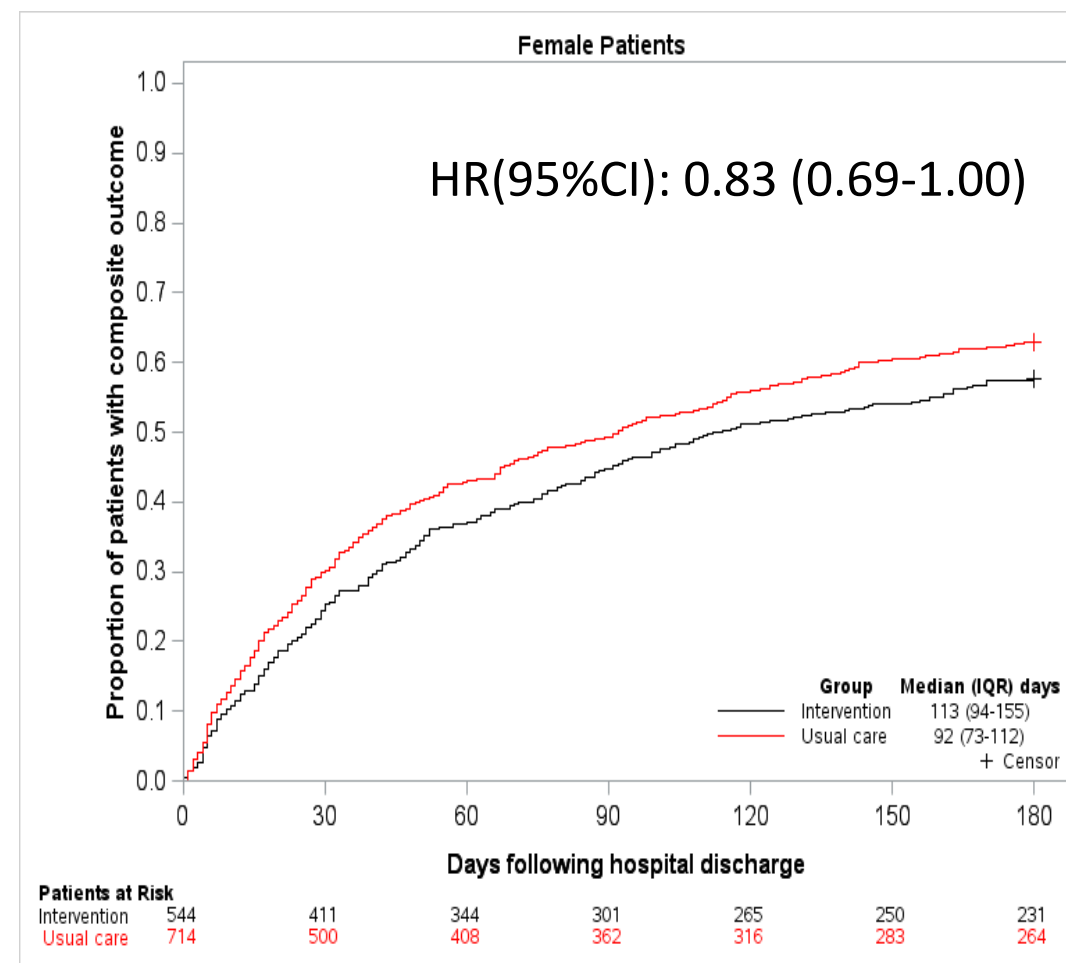
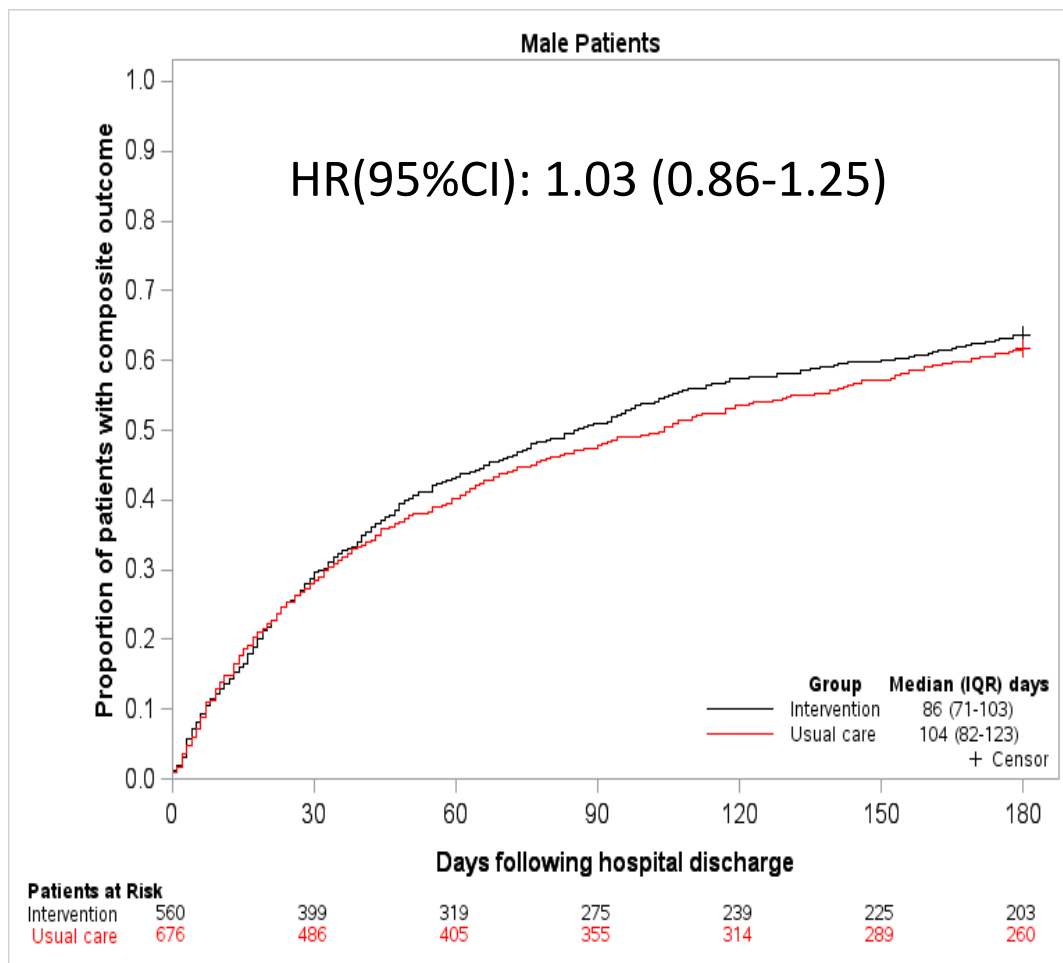
*without hospitalization

Sex-specific composite all-cause death, readmission or ED visit at 6 months



P-value for sex interaction: 0.043

Sex-specific composite all-cause readmission or ED visit at 6 months



P-value for sex interaction : 0.034

Patient reported outcomes

	PACT-HF LS Mean (95%CI) (N=606)	Usual Care LS Mean (95%CI) (N=380)	Mean Difference (95% CI)	P-Value
B-PREPARED Score (0-22)	16.52 (15.47, 17.57)	13.96 (12.92, 15.00)	2.64 (1.37, 3.92)	<0.01
CTM-3 score (0-100)	76.49 (72.00, 80.98)	70.99 (66.53, 75.46)	6.10 (0.83, 11.36)	0.02
EQ-5D-5L score (0-1)				
At discharge	0.73 (0.70, 0.76)	0.55 (0.52, 0.58)	0.18 (0.14, 0.23)	<0.01
6 weeks	0.73 (0.70, 0.76)	0.67 (0.64, 0.70)	0.06 (0.01, 0.11)	0.02
6 months	0.71 (0.67, 0.74)	0.64 (0.61, 0.68)	0.06 (0.01, 0.12)	0.02
Quality Adjusted Life Years (6 months)	0.34 (0.33, 0.36)	0.34 (0.33, 0.35)	0.00 (-0.02, 0.02)	0.98

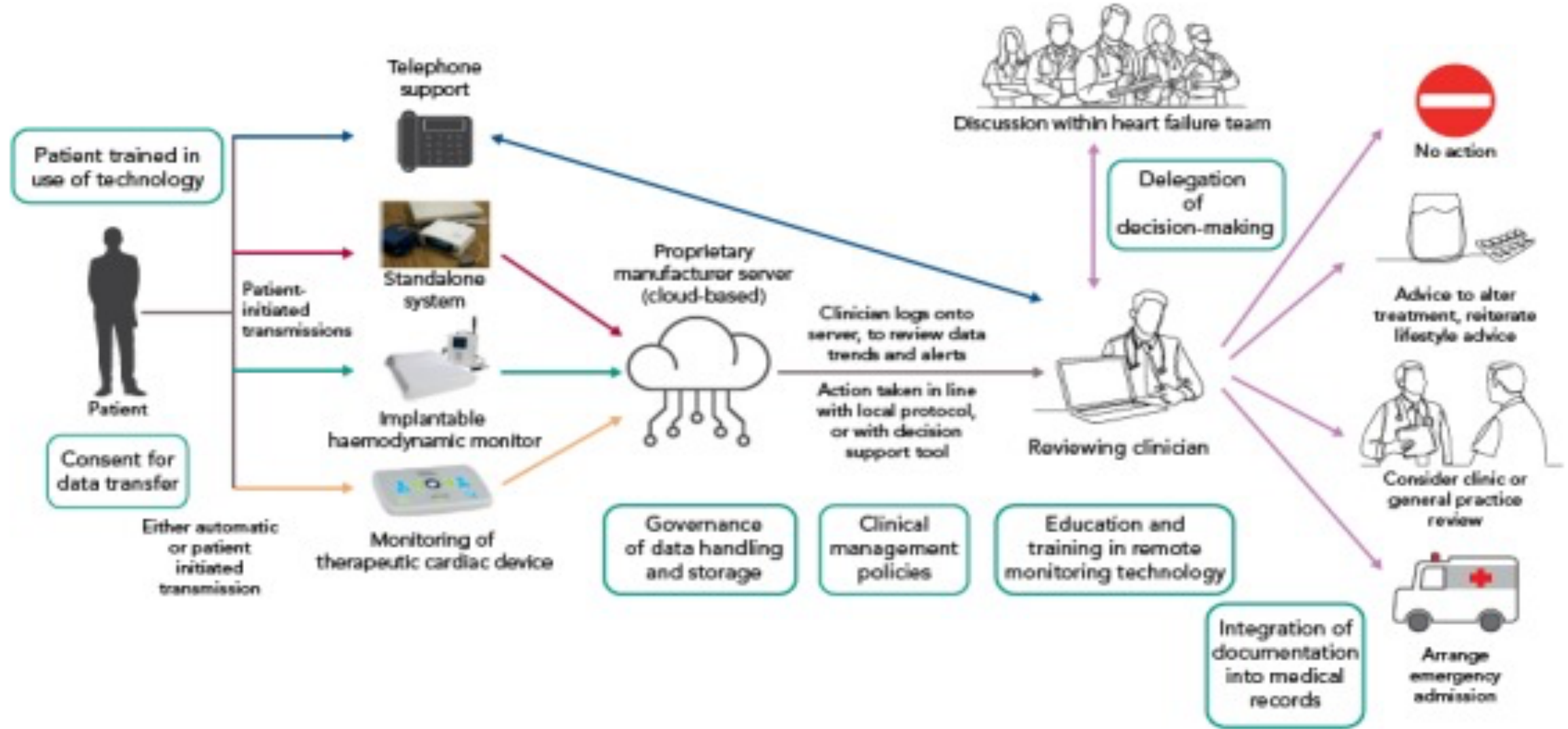
Clinical outcomes

- PACT-HF did not improve:
 - Composite all-cause death, readmission, or ED visit
 - Composite all-cause readmission or ED visit
- Efficacy in explanatory RCTs \neq Effectiveness in real-world settings
- Pitfalls in titrating services to risk
 - Floor effect

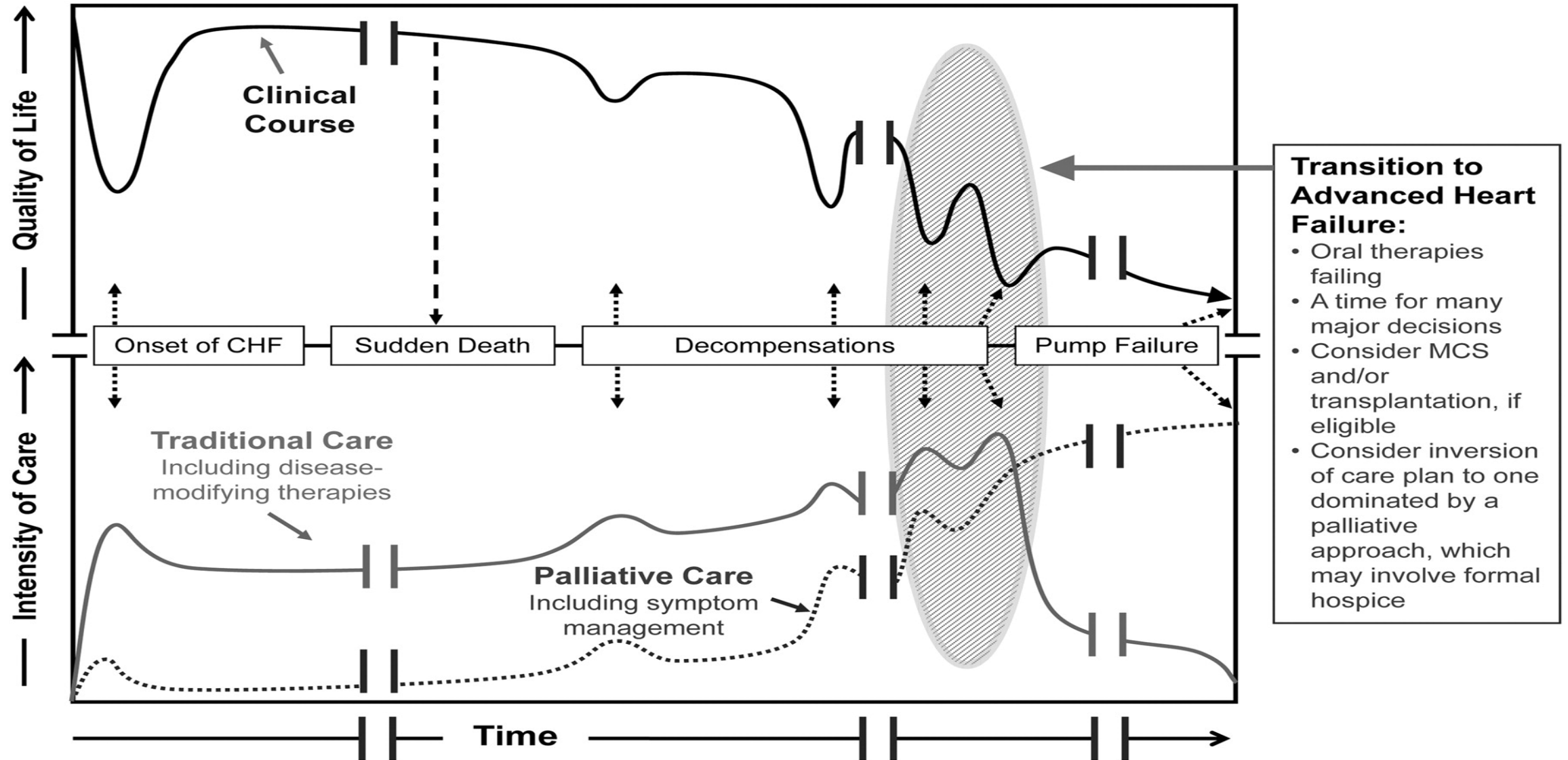
Sex-specific outcomes

- PACT-HF was more effective in improving 6 month clinical outcomes in females than in males
 - ? self-care, self-efficacy, adherence

Remote monitoring / telemedicine



Clinical course of HF: progression to advanced HF

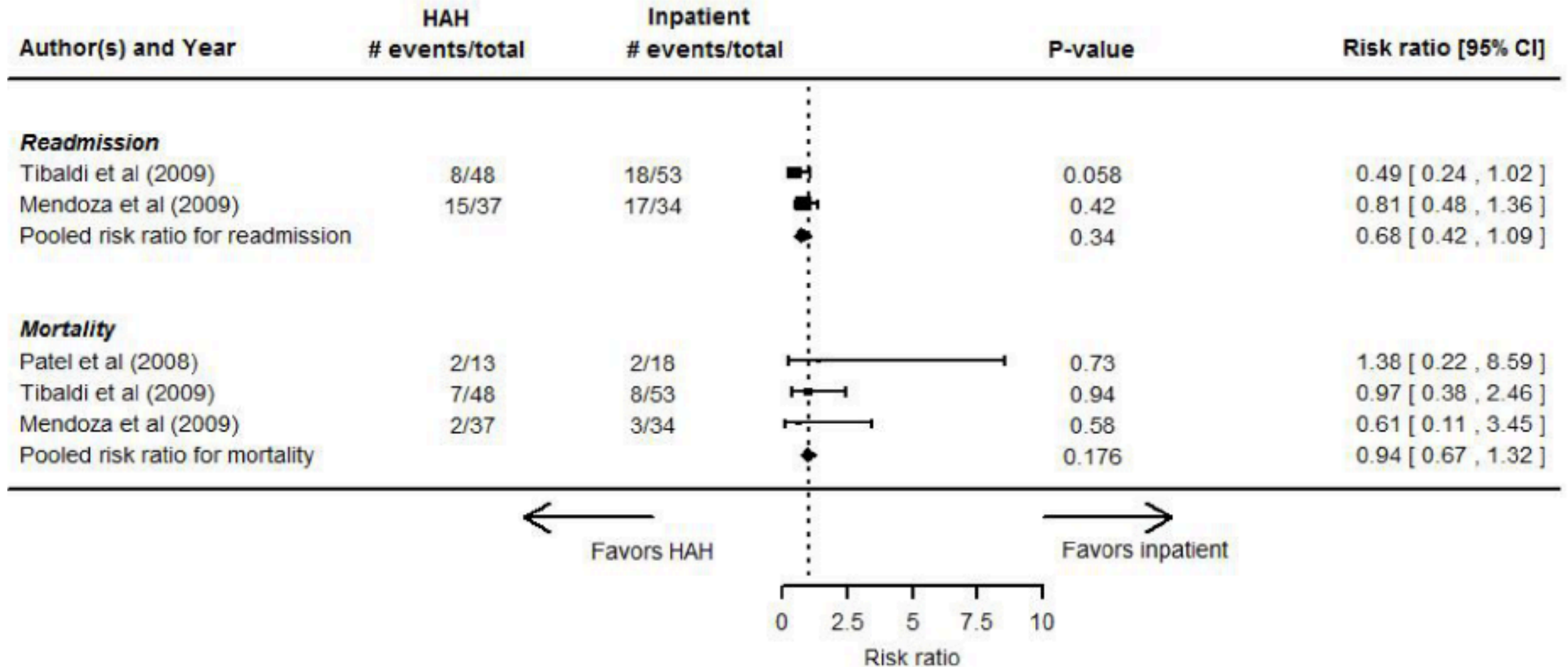


Hospital-at-home model of care

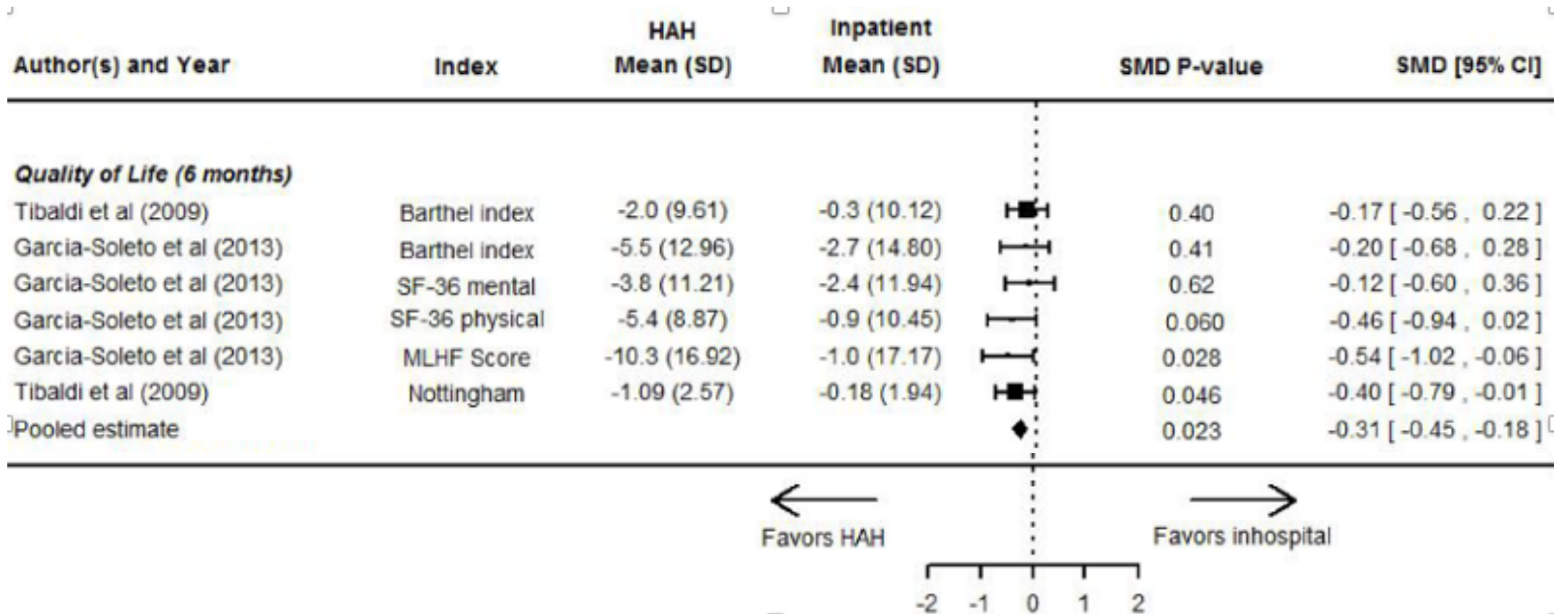
1. Admission avoidance schemes that offer hospital ward-level care
 - in the patient's home
 - in an ambulatory day hospital

1. Early discharge schemes that facilitate early discharge from the hospital with ward-level treatment in the patient's home

Meta-analysis: Hospital-at-home does not improve readmission or death



Meta-analysis: Hospital-at-home improves health-related quality of life



Health care utilization among HF decedents in Ontario in last month of life (N=396,024)

Variable	Total	Females	Males	Absolute Difference (95% CI)
ED visits (%)	61.1	58.7	63.6	4.9 (4.6, 5.2)
Hospital admission (%)	57.2	54.9	59.7	4.8(4.5, 5.1)
ICU admission (%)	18.0	15.5	20.6	5.1 (4.8, 5.3
Mechanical ventilation (%)	15.1	12.9	17.4	4.5 (4.3, 4.8)
Cardiac catheterization (%)	1.6	1.2	2.1	0.8 (0.7, 0.9)
Coronary revascularization (%)	1.0	0.8	1.3	0.5 (0.5, 0.6)
Dialysis (%)	5.7	4.4	7.1	2.7 (2.6, 2.8)
Community palliative care (%)	26.0	26.6	26.3	0.6 (0.3,0.8)
10 ≥ different physicians (%)	21.8	28.1	24.9	6.3 (6.0,6.6)
Hospital days (Mean [SD])	5.3 (7.3)	4.9 (7.0)	5.7 (7.6)	0.8 (0.7, 0.9)

ED: emergency department; ICU: intensive care unit; AD: absolute difference; CI: confidence interval; SD: standard deviation

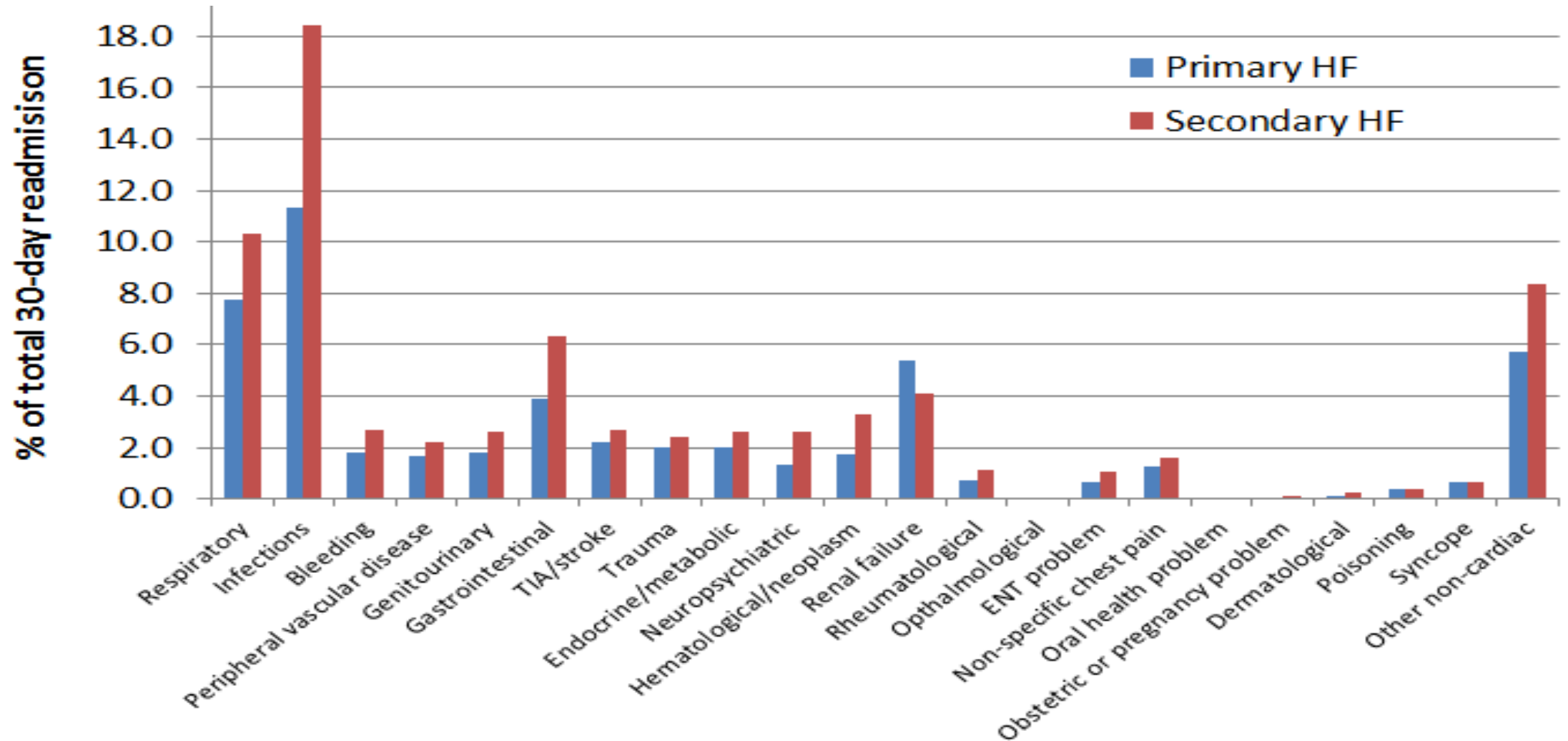
Healthcare system costs at end of life in HF: death in hospital vs home (N=396,024)



Predictors of death in hospital vs home (N=396,024)

Variable (comparator group)	OR (95% CI)
ED visit within 15 days of death (reference: No)	9.69 (7.96, 11.79)
<i>Age per 10 year increase</i>	0.74 (0.73, 0.74)
<i>Female sex</i>	0.88 (0.86, 0.89)
<i>Charlson score (0)</i>	
1	3.28 (3.15, 3.42)
2	4.38 (4.21, 4.56)
≥3	6.95 (6.70, 7.20)
<i>Income quintile (lowest quintile)</i>	
2	1.09 (1.06, 1.12)
3	0.95 (0.93, 0.98)
4	0.96 (0.93, 0.99)
5 (Highest)	0.91 (0.89, 0.94)
<i>Outpatient Palliative care: 6-months (none)</i>	0.69 (0.67, 0.70)
<i>More recent year of death (per year)</i>	0.98 (0.98, 0.98)

Non-cardiac causes of readmission following HF hospitalization (N=10,978,900)



Summary: hospital to home transitions

1. Address the underlying cause
2. Optimize medical therapies
3. Refer for transitional in select patients
 - Nurse home visits
 - Case management
 - Heart function clinics
4. Consider patient centered models of care
 - Remote monitoring / telemedicine
 - Hospital at home
 - Palliative care