

Inspiring Innovation and Discovery

Novel paradigms for managing hospital transitions in heart failure

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- Canadian Institutes of Health Research
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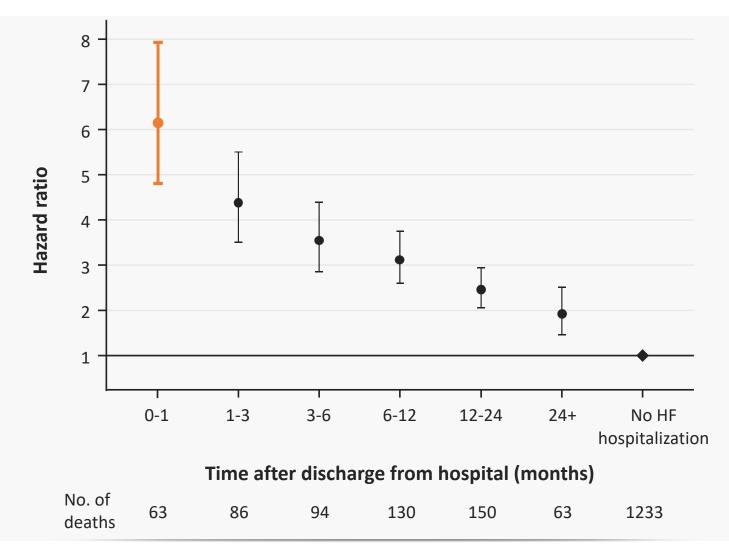
Objectives

• Review evidence-informed transitional care services in HF

• Discuss the use of patient-centered care models that may facilitate avoidance of emergency department use

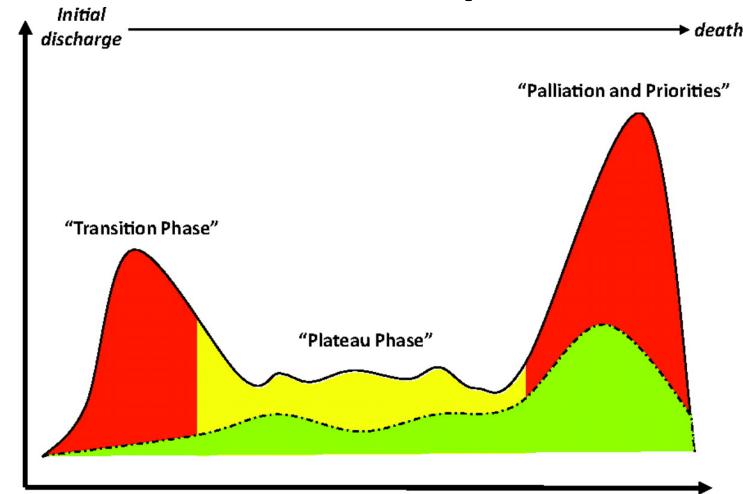


Hospitalization for HF is high-risk



Solomon et al. Circulation 2007;116:1482-87.

3-phase lifetime readmission risk after HF hospitalization



Innovation and Disco

Readmission Rate

Red indicates period of highest risk for readmission 1) Immediately after discharge 2) Just before death

Median Time from hospital discharge



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



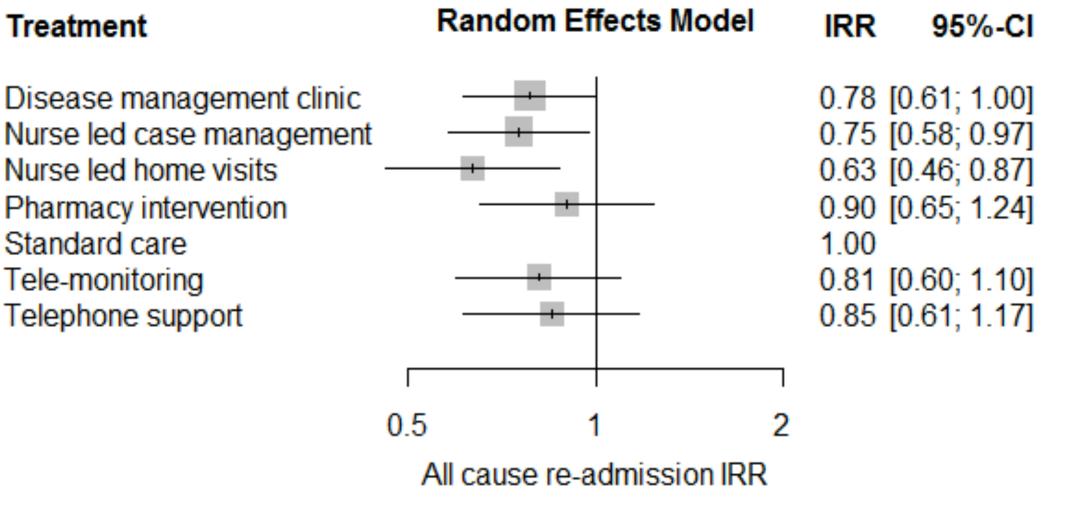
Transitional care services in HF (n=54 RCTs): all-cause mortality

Random Effects Model Treatment RR 95%-CI Disease management clinic 0.77 [0.63; 0.95] 0.99 [0.40; 2.46] Education alone 0.81 [0.64; 1.01] Nurse led case management 0.77 [0.61; 0.97] Nurse led home visits Pharmacy intervention 0.82 [0.56; 1.20] Standard care 1.00 Tele-monitoring 0.90 [0.68; 1.19] Telephone support 0.81 [0.62; 1.08] 0.5 2 All cause mortality RR

Van Spall et al, Eur J Heart Fail 2017; 19(11): 1427-1443.



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



Van Spall et al. Eur J HF 2017; 19(11):1427-43.



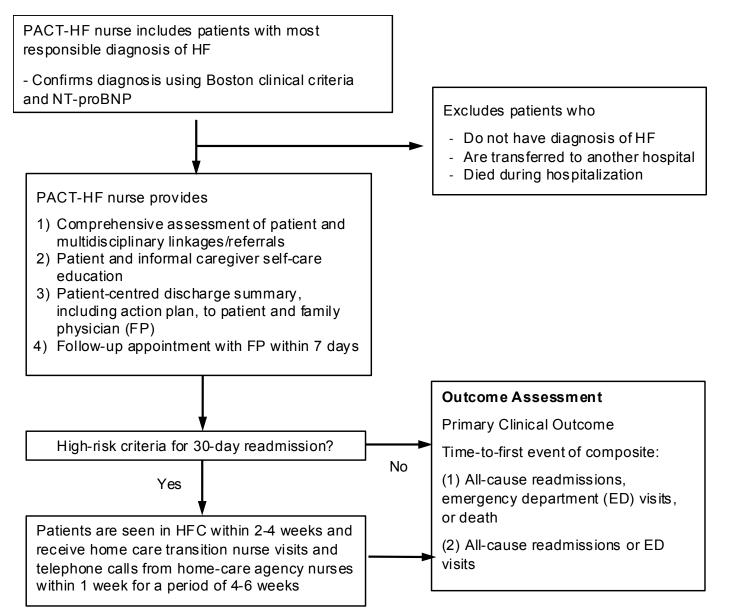
Stepped Wedge Cluster RCT

Hospital		Step (Month)									
nospitai	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



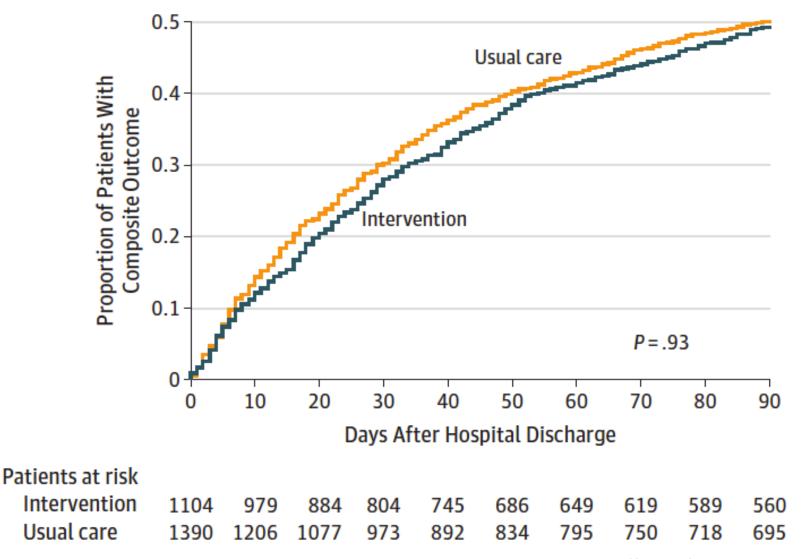
Study protocol



F			
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

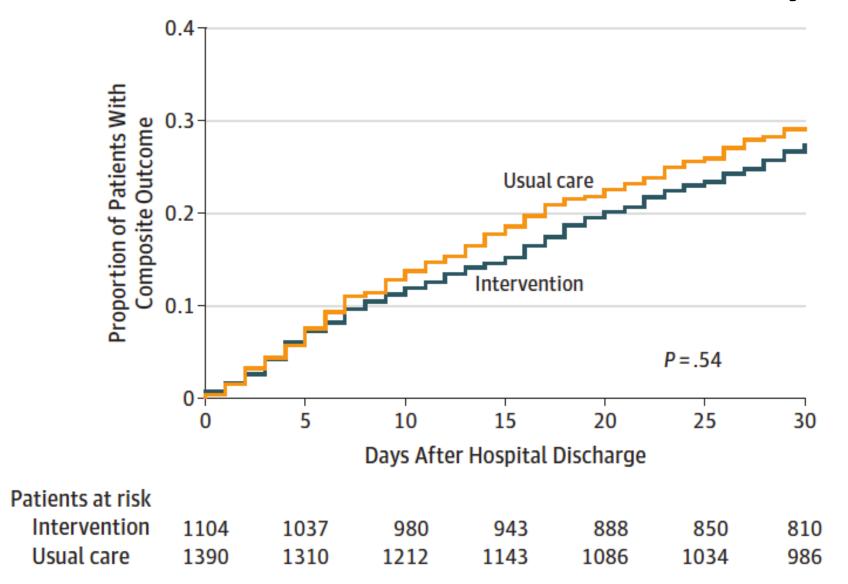


Primary outcome (N=2494): Composite all-cause death, readmission, ED visit at 3 months





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



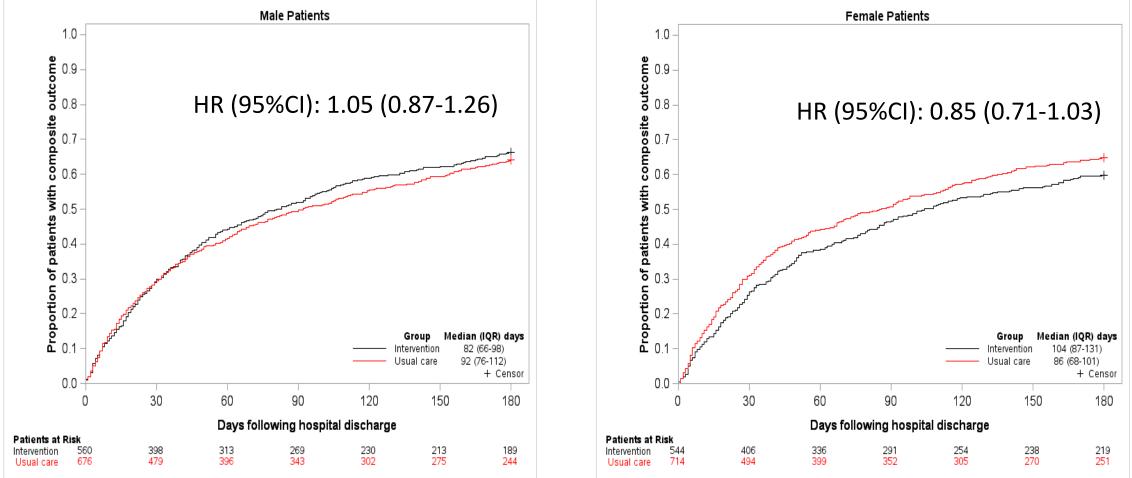


Clinical outcomes

	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 < 3 months	111 (10.1%)	136 (9.8%)	1.18 (0.83, 1.68)	0.36
Readmission < 3 months	400 (36.2%)	500 (36.0%)	1.10 (0.91, 1.34)	0.32
ED visit* <u><</u> 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 < 30 days	225 (20.4%)	265 (19.1%)	1.23 (0.95 <i>,</i> 1.59)	0.12
ED visit* <u><</u> 30 days	113 (10.2%)	190 (13.7%)	0.65 (0.45, 0.95)	0.03
*without hospitalization				

*without hospitalization

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

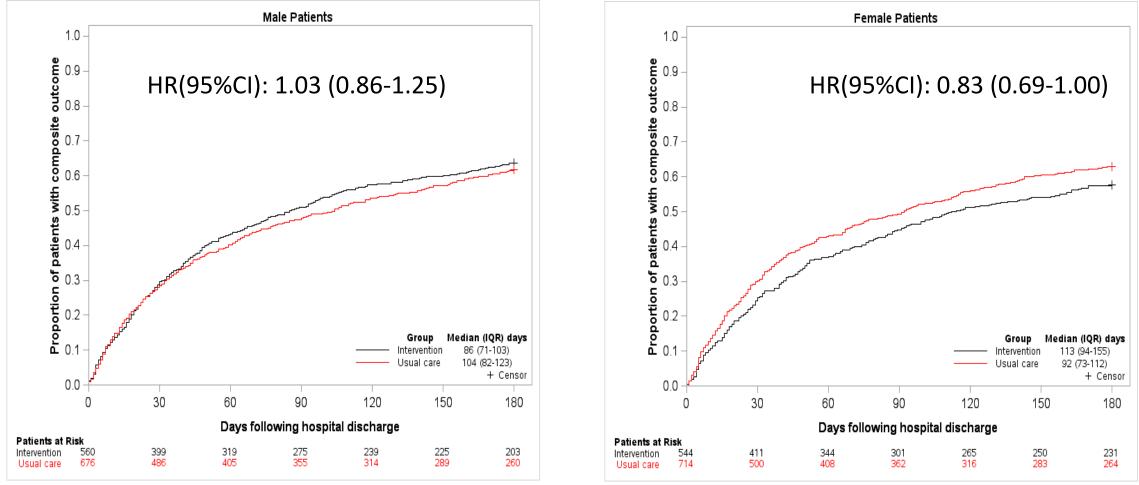


P-value for sex interaction: 0.043

Van Spall et al. AHA 2019.



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



P-value for sex interaction : 0.034

Van Spall et al. AHA 2019.



Patient reported outcomes

	PACT-HF LS Mean (95%CI) (N=606)	Usual Care LS Mean (95%CI) (N=380)	Mean Difference (95% Cl)	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 <i>,</i> 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 ≠ Effectiveness in realworld settings
- Pitfalls in titrating services to risk
 - Floor effect

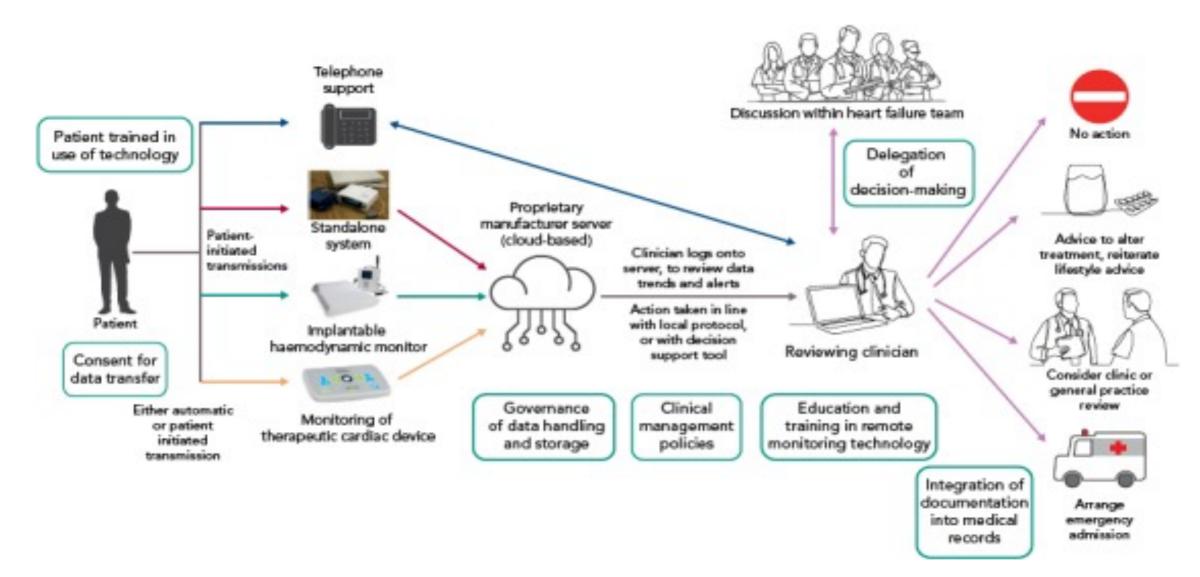


Sex-specific outcomes

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

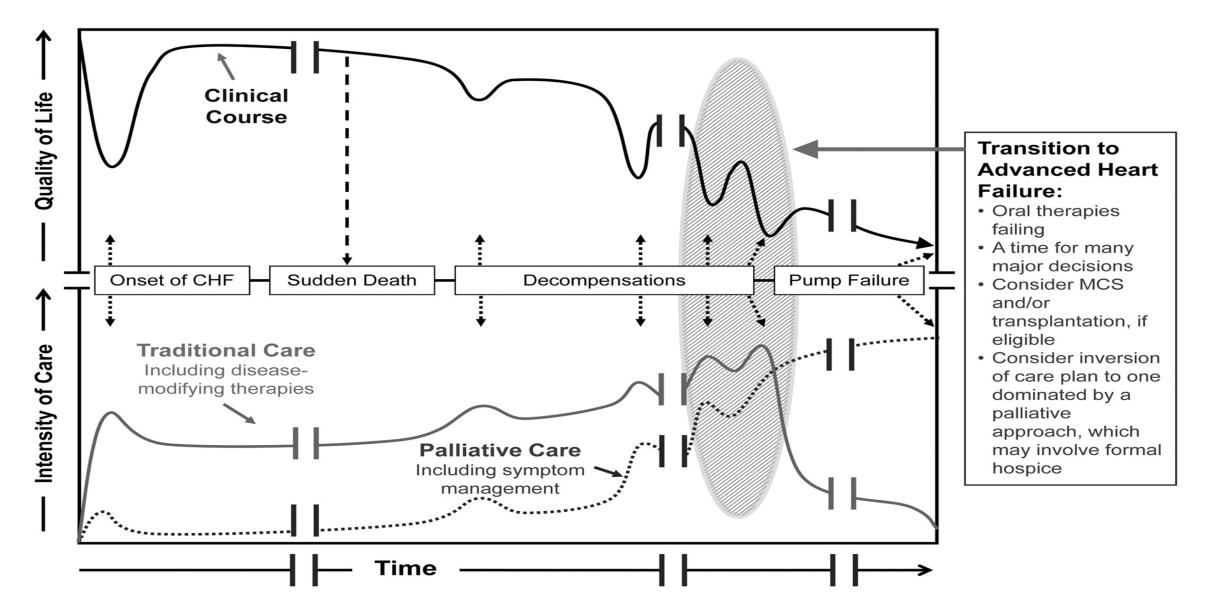


Remote monitoring / telemedicine



Brahmbhatt and Cowie. Card Fail Rev 2019;5(2):86-92.

Clinical course of HF: progression to advanced HF



Larry A. Allen et al. Circulation. 2012;125:1928-1952



Hospital-at-home model of care

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

Author(s) and Year	HAH # events/total	Inpatien # events/t		P-value	Risk ratio [95% CI]
			:		
Readmission					
Tibaldi et al (2009)	8/48	18/53	-	0.058	0.49 [0.24 , 1.02]
Mendoza et al (2009)	15/37	17/34	-	0.42	0.81 [0.48 , 1.36]
Pooled risk ratio for readmission			•	0.34	0.68 [0.42 , 1.09]
Mortality					
Patel et al (2008)	2/13	2/18	H	0.73	1.38 [0.22 , 8.59]
Tibaldi et al (2009)	7/48	8/53		0.94	0.97 [0.38 , 2.46]
Mendoza et al (2009)	2/37	3/34	H	0.58	0.61 [0.11 , 3.45]
Pooled risk ratio for mortality			+	0.176	0.94 [0.67 , 1.32]
	<	Favors HAH		Favors inpatient	
			<u> </u>		
			0 2.5	5 7.5 10	
			Risk	ratio	

Qaddoura, Van Spall. PLoS ONE 2015; 10(6): e0129282



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

Author(s) and Year	Index	HAH Mean (SD)	Inpatient Mean (SD)		SMD P-value	SMD [95% CI]
				:		
Quality of Life (6 months)				1		
Tibaldi et al (2009)	Barthel index	-2.0 (9.61)	-0.3 (10.12)	H	0.40	-0.17 [-0.56 , 0.22]
Garcia-Soleto et al (2013)	Barthel index	-5.5 (12.96)	-2.7 (14.80)	i-	0.41	-0.20 [-0.68 , 0.28]
Garcia-Soleto et al (2013)	SF-36 mental	-3.8 (11.21)	-2.4 (11.94)	-÷-i	0.62	-0.12 [-0.60 , 0.36]
Garcia-Soleto et al (2013)	SF-36 physical	-5.4 (8.87)	-0.9 (10.45)	—	0.060	-0.46 [-0.94 , 0.02]
Garcia-Soleto et al (2013)	MLHF Score	-10.3 (16.92)	-1.0 (17.17)	ь i	0.028	-0.54 [-1.02 , -0.06]
Tibaldi et al (2009)	Nottingham	-1.09 (2.57)	-0.18 (1.94)	HE-i	0.046	-0.40 [-0.79 , -0.01]
Pooled estimate				•	0.023	-0.31 [-0.45 , -0.18]
			\leftarrow			
			Favors HAH	1	Favors inhos	pital
				<u> </u>	_	
			-2	-1 0 1	2	

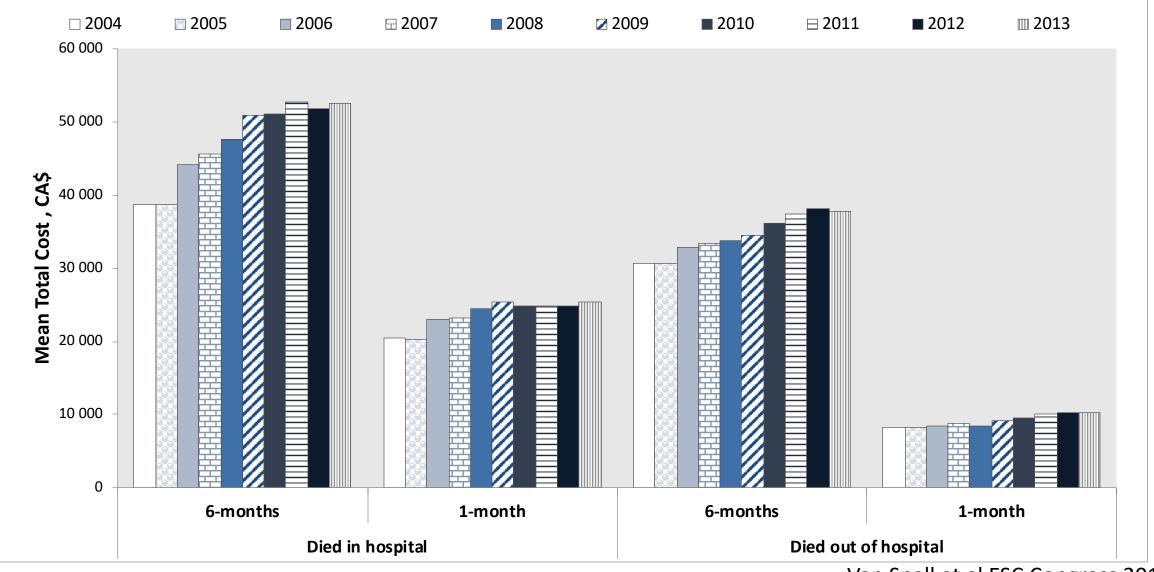
Qaddoura, Van Spall PLoS ONE 2015; 10(6): e0129282

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)

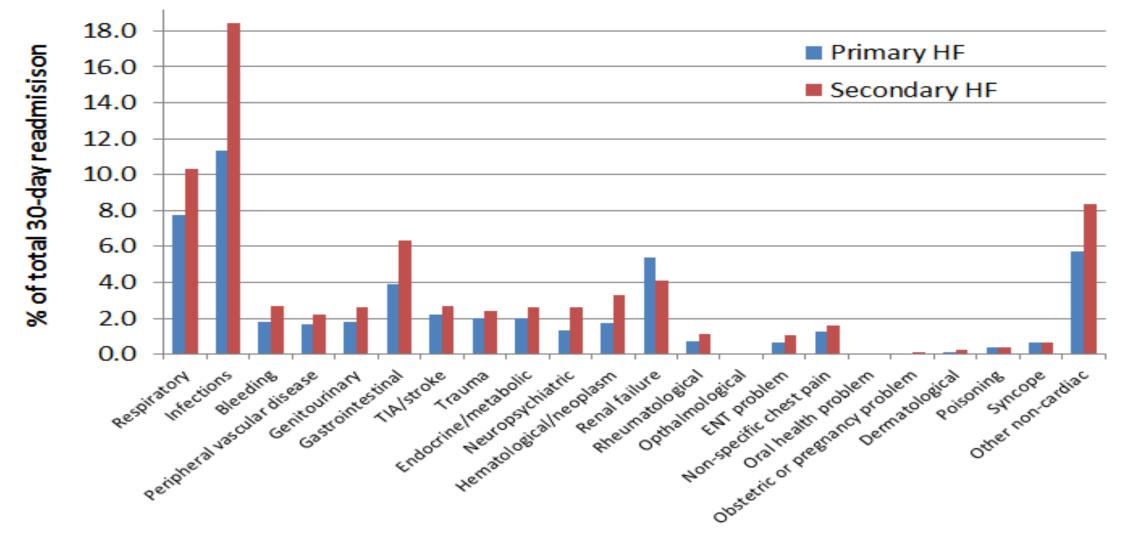


Van Spall et al ESC Congress 2019

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 <i>,</i> 11.79)
Age per 10 year increase	0.74 (0.73, 0.74)
Female sex	0.88 (0.86, 0.89)
Charlson score (0)	
1	3.28 (3.15, 3.42)
2	4.38 (4.21, 4.56)
≥3	6.95 (6.70, 7.20)
Income quintile (lowest quintile)	
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)
Outpatient Palliative care: 6-months (none)	0.69 (0.67, 0.70)
More recent year of death (per year)	0.98 (0.98, 0.98)

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



Kwok et al, 2019; Am J Cardiology 124(5): 736-45



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