

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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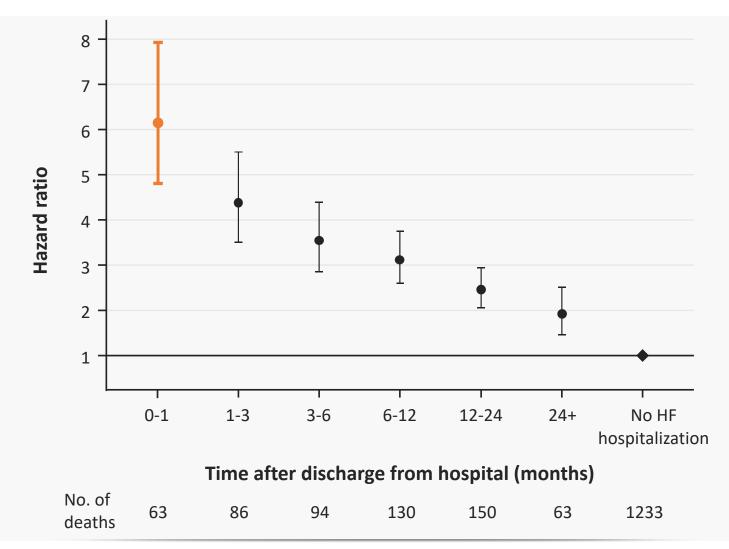
#### **Objectives**

• Review evidence-informed transitional care services in HF

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

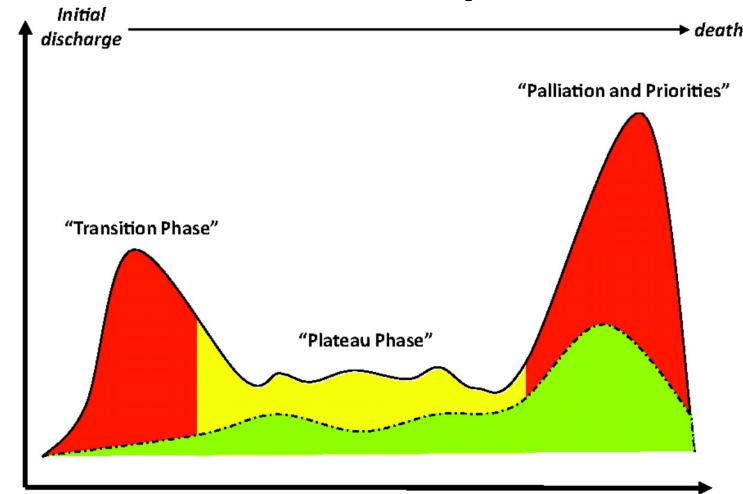


#### **Hospitalization for HF is high-risk**



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



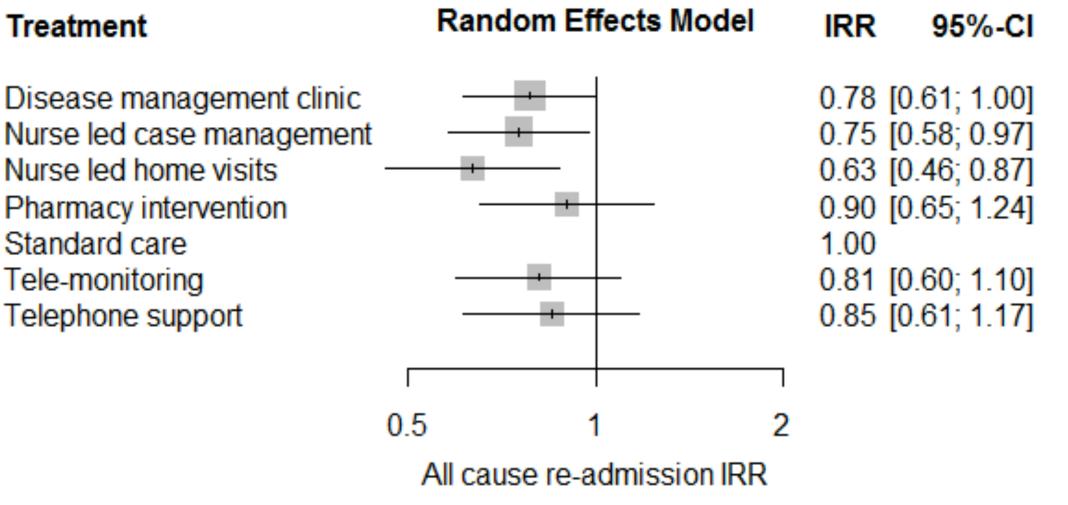
#### Transitional care services in HF (n=54 RCTs): all-cause mortality

#### 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.



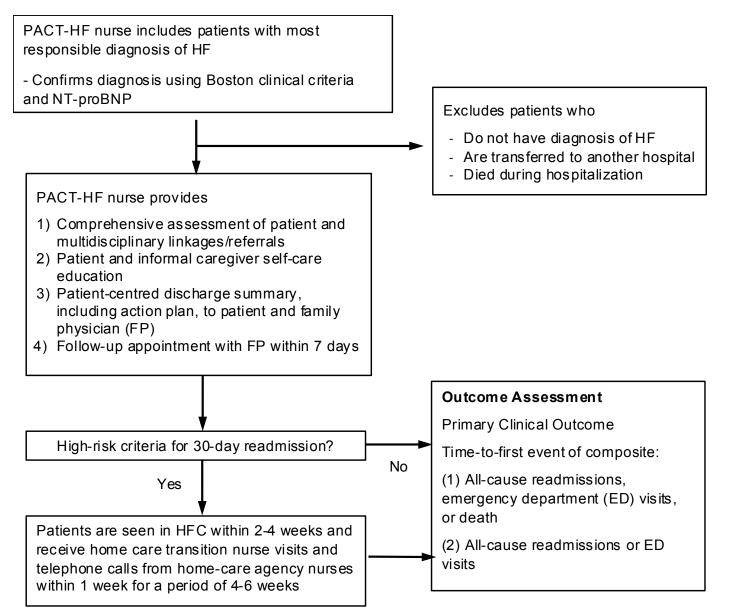
#### **Stepped Wedge Cluster RCT**

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



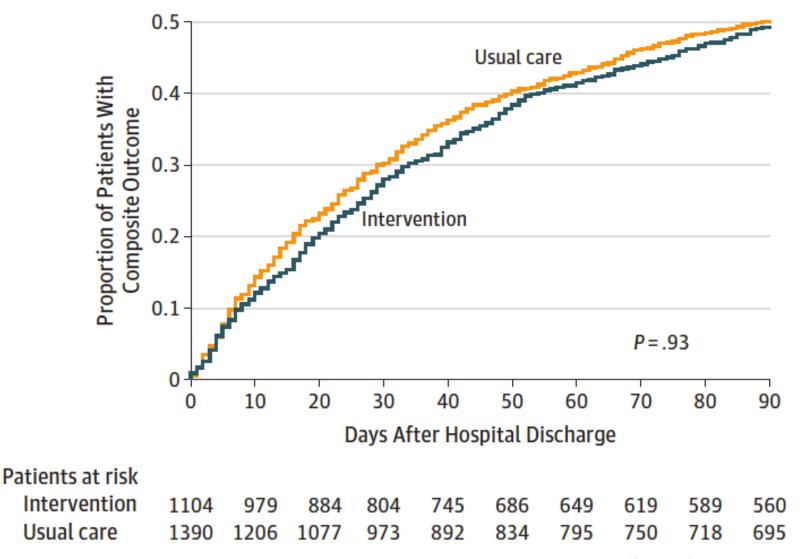
#### **Study protocol**



F			
<b>Baseline Characteristics of Patients</b>	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

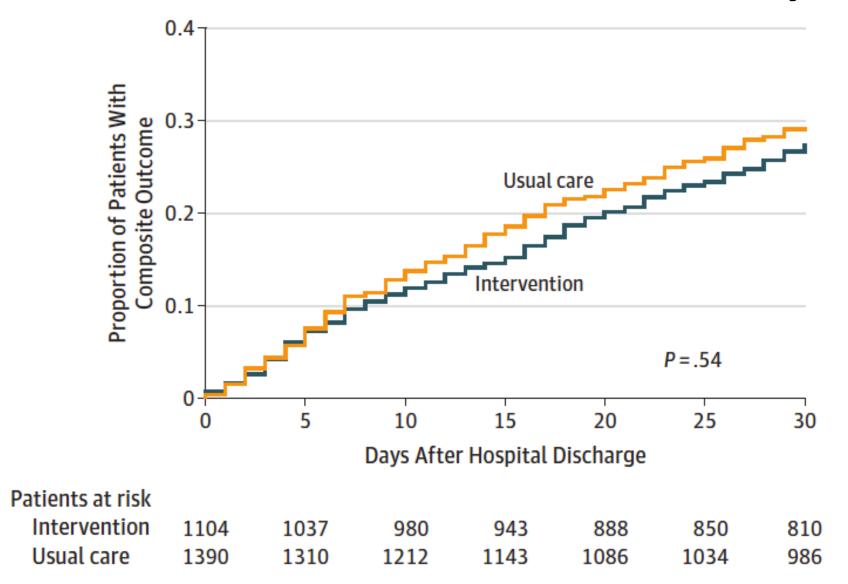


## Primary outcome (N=2494): Composite all-cause death, readmission, ED visit at 3 months





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



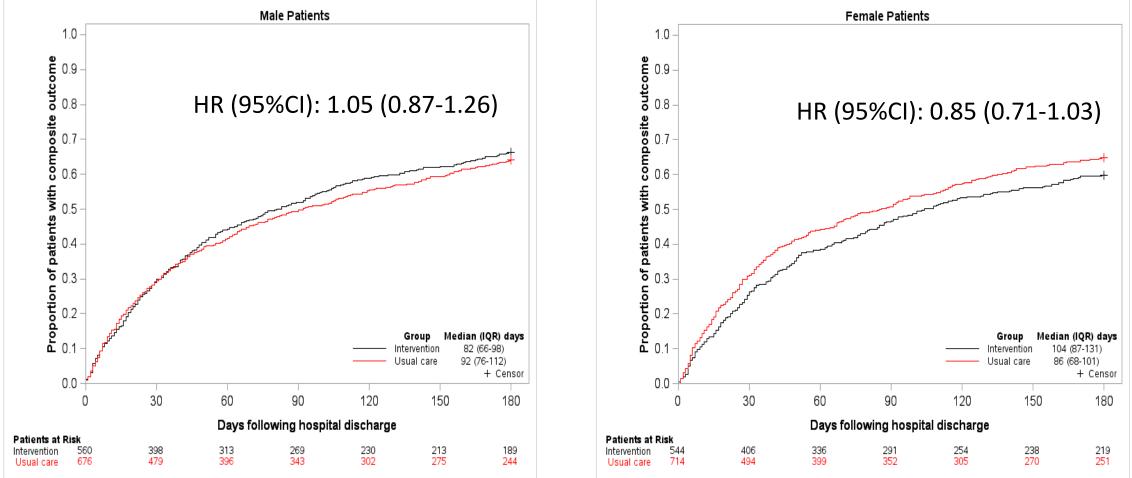


#### **Clinical outcomes**

	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>&lt;</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>&lt;</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

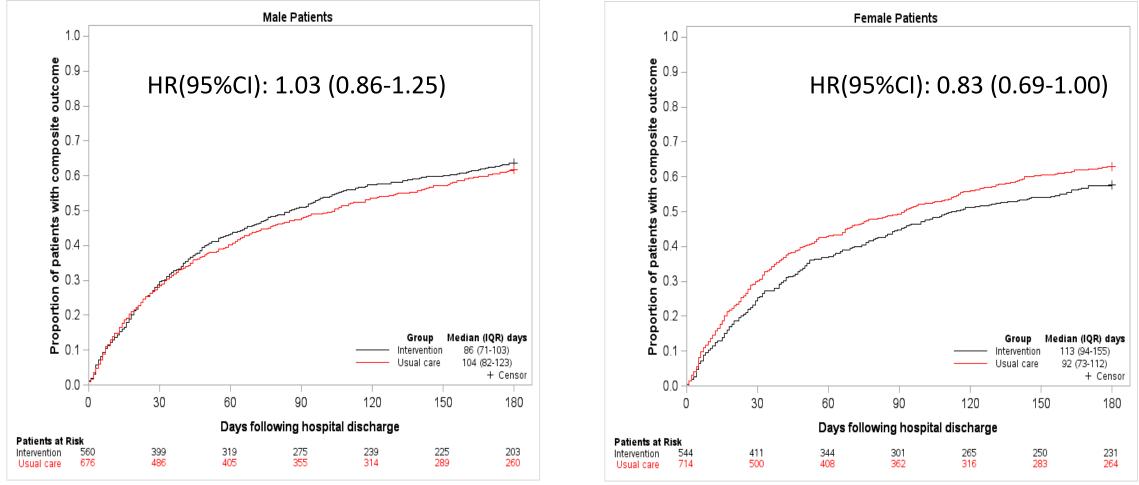


P-value for sex interaction: 0.043

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

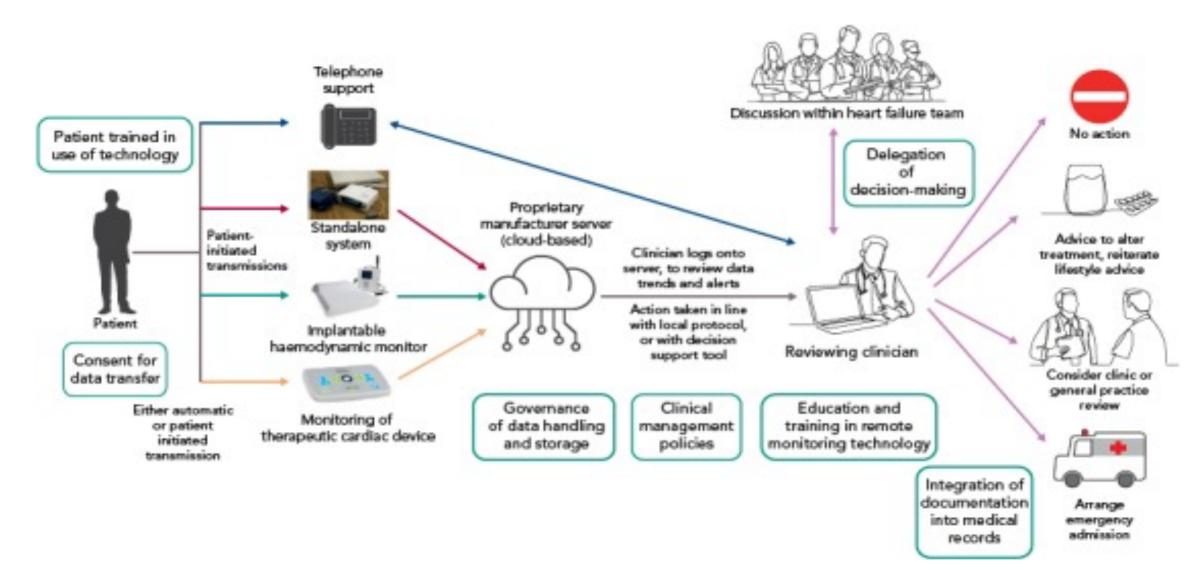


#### **Sex-specific outcomes**

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

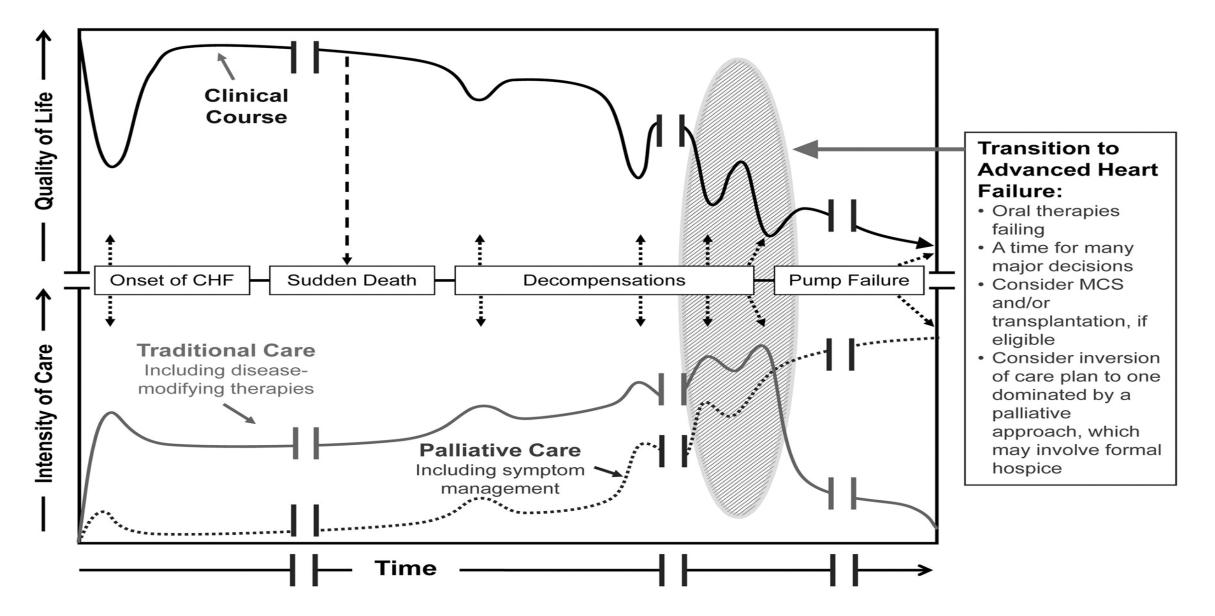


### **Remote monitoring / telemedicine**



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)	<b>—</b>	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	

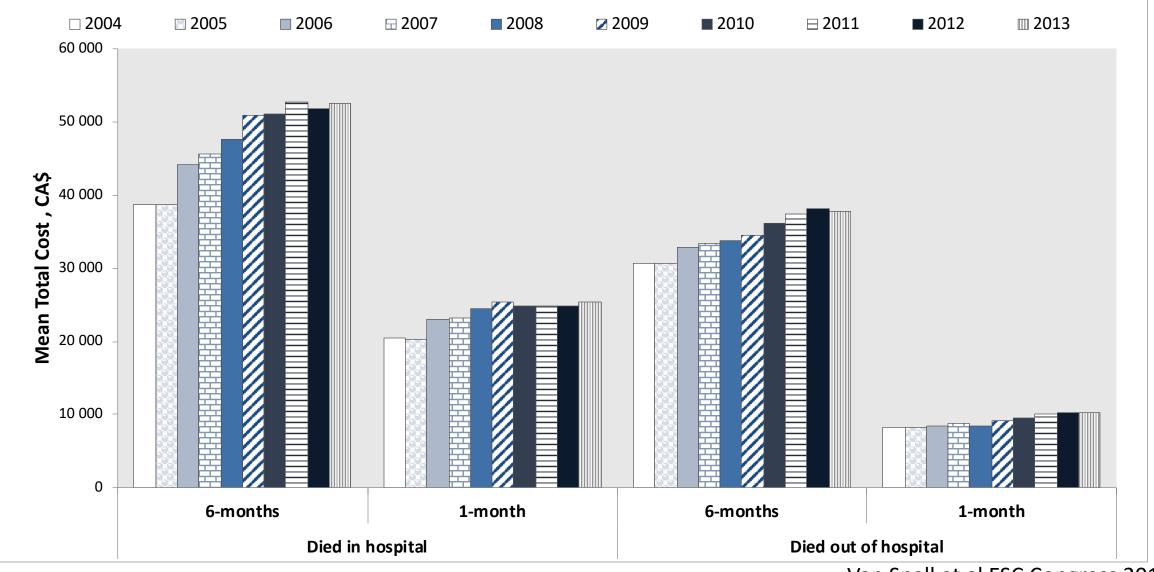
Qaddoura, Van Spall PLoS ONE 2015; 10(6): e0129282

## 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)

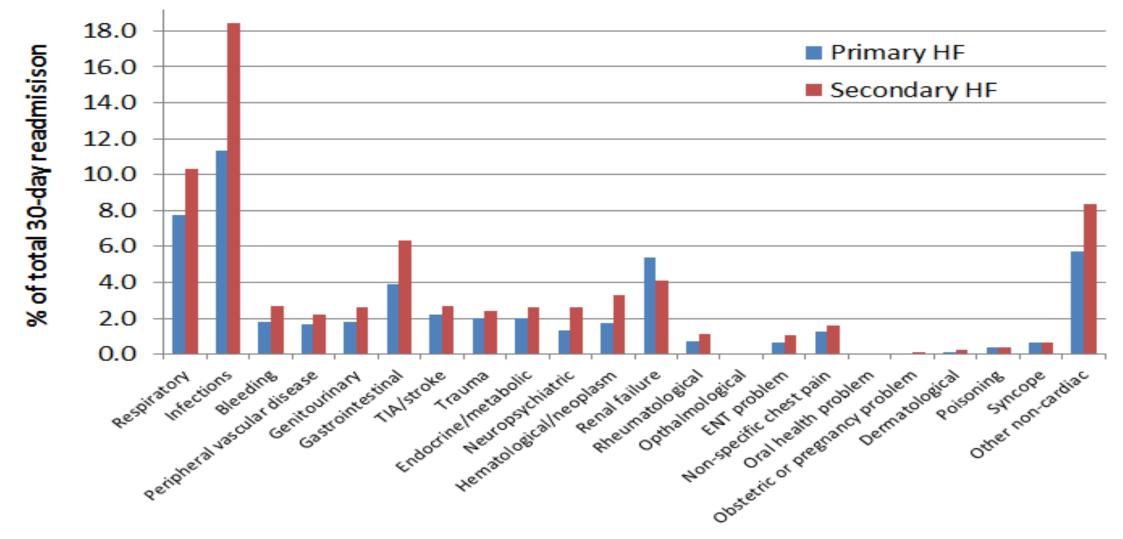


Van Spall et al ESC Congress 2019

#### 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