Remote monitoring strategies for patients with stable heart failure: A systematic review and network meta-analysis

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Background

Heart failure (HF) is a chronic cardiovascular illness associated with high levels of mortality, morbidity, and compromised quality-of-life. Remote monitoring (RM) of prognostic indicators for HF e.g. weight, blood pressure, heart rate etc. may facilitate early detection of clinically significant changes, prevent emergency admissions and avoid complications.

Objectives

To evaluate whether RM improves outcomes for adults with stable HF (defined as having no acute event or deterioration in the past 28 days) who are managed in the community (ambulatory or outpatient care setting).

Methods

Fourteen electronic databases were searched. As the current review updated two previous systematic reviews,[1;2] searches were limited by date from 2008 (last search date from earlier reviews) to November 2013. All randomised controlled trials (RCTs) were included. RM interventions included home telemonitoring (TM) with medical support provided during office hours or 24/7 and structured telephone support (STS) programmes delivered via human-to-human contact (HH) or human-to-machine (voice-activated) interface (HM). These intervention strategies were compared with standard usual care in adults with stable HF. A random-effects network meta-analysis (NMA) was conducted using Bayesian Markov chain Monte Carlo methods (implemented using WinBUGS).[3]

Results

A network of 18 studies comparing different pairs or triplets of treatments is shown in **Figure 1**.

Figure 1: Network of evidence
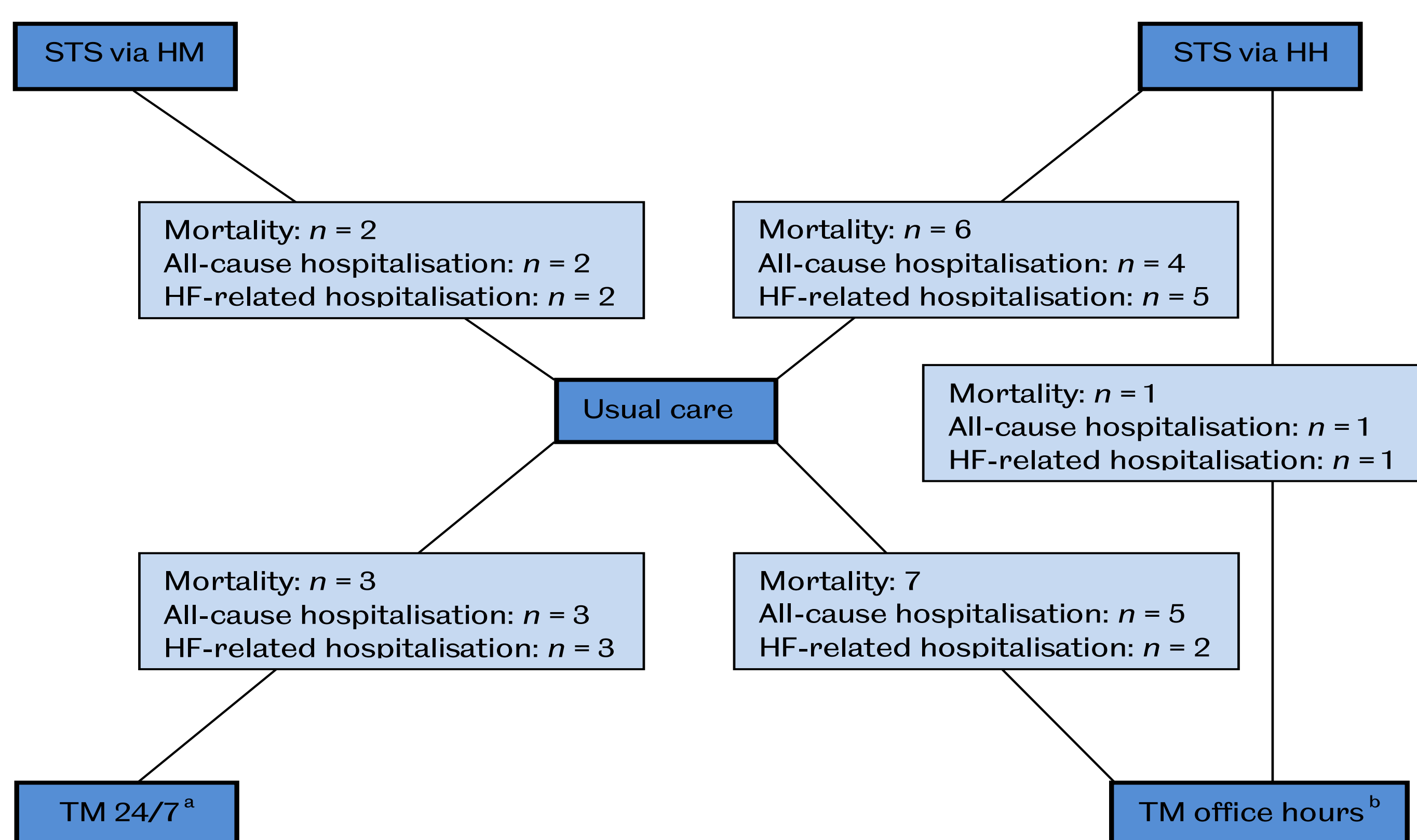
The nodes are the interventions. The numbers against each outcome represent the number of times that each pair of interventions has been compared. There was one multi-arm study comparing STS via HH, TM during office hours and usual care. [a] Transmitted data reviewed by medical staff (or medical support provided) 24 hours per day, 7 days per week. [b] Transmitted data reviewed by medical staff (or medical support provided) during office hours

Table 1: NMA results of RM versus usual care

Outcome	No. of studies	Hazard ratio and credible interval			Predictive interval	
		Median	2.5%	97.5%	2.5%	97.5%
All-cause mortality[a]						
STS HM	2	1.31	0.75	2.27	0.68	2.56
STS HH	6	0.87	0.66	1.15	0.53	1.38
TM office hours	7	0.81	0.57	1.16	0.48	1.35
TM 24/7	3	0.85	0.57	1.26	0.49	1.44
All-cause hospitalisation[b]						
STS HM	2	0.87	0.54	1.44	0.40	1.94
STS HH	4	0.84	0.59	1.19	0.41	1.70
TM office hours	5	1.09	0.79	1.50	0.53	2.22
TM 24/7	3	0.82	0.53	1.20	0.39	1.70
HF-related hospitalisation[c]						
STS HM	2	0.70	0.34	1.42	0.21	2.25
STS HH	5	0.67	0.39	1.03	0.23	1.71
TM office hours	2	0.68	0.32	1.29	0.21	1.96
TM 24/7	3	0.64	0.36	1.14	0.22	1.90

[a] All-cause mortality between-study standard deviation (log hazard ratio scale): 0.12 (95% CrI:0.01, 0.41)
[b] All-cause hospitalisation between-study standard deviation (log hazard ratio scale): 0.26 (95% CrI: 0.09, 0.55)
[c] HF-related hospitalisation between-study standard deviation (log hazard ratio scale): 0.30 (95% CrI: 0.02, 0.96)

Compared with usual care, the NMA showed that RM was beneficial in reducing all-cause mortality for STS HH (Hazard Ratio, HR: 0.87, 95% Credible Interval, CrI: 0.66, 1.15), TM during office hours (HR: 0.81, 95% CrI: 0.57, 1.16) and TM 24/7 (HR: 0.85, 95% CrI: 0.57, 1.26); however, these were statistically inconclusive (**Table 1**). No favourable effect on mortality was observed with STS HM. Similarly, trends in reducing HF-related hospitalisations were also observed for all RM interventions.

Conclusions

The RM strategies examined in this review showed beneficial trends in reducing mortality and morbidity in people with stable HF. However, due to the complex nature of RM interventions (including between study heterogeneity within each category), further research should seek to examine the 'active ingredients' of RM strategies including suitability of different systems and qualitative research (patient, partners or carers' experiences) to understand the processes by which RM works.[4]

References

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