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Randomised pilot study comparing a coach to SMARTPhone reminders to aid the management of heart failure (HF) patients: humans or machines

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ABSTRACT

Ambulatory management of congestive heart failure (HF) continues to be a challenging clinical problem. Recent studies have focused on the role of HF clinics, nurse practitioners and disease management programmes to reduce HF readmissions. This pilot study is a pragmatic factorial study comparing a coach intervention, a SMARTPHONE REMINDER system intervention and BOTH interventions combined to Treatment as USUAL (TAU). We determined that both modalities were acceptable to patients prior to randomisation. Fifty-four patients were randomised to the four groups. The COACH group had no readmissions for HF 6 months after enrolment compared with 18% for the SMARTPHONE REMINDER Group, 8% for the BOTH intervention group and 13% for TAU. Medium-to-high medication adherence was maintained in all four groups although sodium consumption was lower at 3 months for the COACH and combined (BOTH) groups. This pilot study suggests a beneficial effect on rehospitalisation with the use of support measures including coaches and telephone reminders that needs confirmation in a larger trial.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There has been great interest in transtelephonic and virtual care in recent years for the management of chronic diseases including heart failure (HF). Coaching models for chronic disease management also appear beneficial. More recently, interest has increased for virtual or remote monitoring care. This is a pilot study with a pragmatic factorial design that compares a coaching intervention with a SMARTPHONE Reminders intervention to determine if one or the other or both have any advantage over treatment as usual. Each of the interventions had a structured curriculum that is specifically designed for HF.

WHAT THIS STUDY ADDS

⇒ This randomised pilot study demonstrates a dramatic benefit on rehospitalisation and salt restriction using a support strategy consisting of structured coaching intervention The smartphone reminder intervention further improved dietary compliance with salt intake. An additional benefit of this study is to provide a sample size estimate for larger more definite trials.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This pilot study demonstrates potential value of novel interventions that are not primarily provider based that have the potential of more cost-effective care when integrated into the clinical delivery system.

INTRODUCTION

Heart failure (HF) remains a critical challenge for government, healthcare providers and patients. It is the most common medical discharge diagnosis, having high mortality, morbidity and readmission rates as well as ever-growing financial costs. It has been estimated that 0.4%–2.2% of populations in industrialised countries suffer from HF, with 500 000–600 000 incident cases diagnosed annually.[1 2] Finally, the cost of HF is driven most tangibly by hospitalisation, frequent ER visits and long hospital stays. These events constitute an enormous economic burden for the healthcare system, costing more than $C2.8 billion per year in direct costs compared with other disorders.

While many causes have been identified for readmission, poor patient compliance is the leading cause and a major target for cost reduction. Supporting and educating patients to optimise patient compliance are thought to be the most effective way to reduce readmission. The challenge remains, however, to determine the best way to deliver these supports and educational aids to patients. Recent studies have demonstrated that focusing solely on single factors such as patient or physician education is insufficient to improve either patient adherence or readmission rates.[3] However, several models of care have been tested previously including introduction of novel providers such as nurse practitioners (NPs) and physician assistants and introduction of specialised HF clinics. Indeed, a recent review by the Agency for Healthcare Research and Quality (AHRQ) demonstrated that home visiting programmes may reduce 30-day readmissions while multicomponent programmes such as home visits and HF clinics were effective at reducing all-cause readmissions and mortality. However, the manpower to deliver this care is expensive. AHRQ reviewed both telemedicine and telemonitoring and found conflicting results. Also, coaching models have been tested and shown to reduce rehospitalisation, but this is difficult if patients are not in proximity to the coach. More recently, the use of SMARTPHONE REMINDER communication has been proposed as a means of improving the quality of care for the chronic care patient.

This pilot study was designed to first determine the feasibility of comparing a coach model to a Smartphone reminder system or combining both interventions to improve the adherence to evidence-based care such as medication adherence and dietary salt reduction compared with usual care. Second, the design would also provide some estimate of outcomes, such as readmission rate, that could be used as a target of a larger more definitive clinical trial. Third, by combining strategies in this study, we could determine if they might be synergistic.

METHODS

This pilot study compared two potential interventions to an attention control group, to reduce 6-month rehospitalisation rates in a pragmatic factorial randomised control trial. The study consisted of two development phases prior to randomisation. In the first phase, the previously published education curriculum[4] for coaches and subjects was edited and finalised. Coaches were then recruited, trained and tested. In the second development phase, the SMARTPHONE portal was developed and the acceptability of the SMARTPHONE REMINDER intervention was tested after developing a list of text messages for the smart phone intervention, testing the portal for sending SMARTPHONE REMINDER reminders, messages and alerts accurately and developing the digital version of the patient education curriculum as part of the web-based patient portal (see online supplemental appendix 1 for further details).

After these developmental phases, we conducted a pilot randomised pragmatic trial to assess the impact of two novel intervention modalities, either alone or combined, against a usual care group on the following clinically significant outcomes: (1) adherence to prescribed drug therapy and dietary consumption of sodium; and (2) 6 month readmission rates of both interventions singly or in combination compared with a usual care group. If both endpoints were met, a direct link between process and outcome would be met. The latter outcome would also help to design future trials of sufficient power to yield meaningful conclusions for future design of disease management systems.

Patients were recruited into the pilot study between January 2016 and December 2017 and randomised into four intervention groups: COACH, SMARTPHONE REMINDER, BOTH Interventions or TREATMENT AS USUAL CARE (TAU) groups using a parallel group design.

Inclusion criteria for this phase were as follows:

1. LACE score >10 on last or current hospitalisation; the LACE index (score 0–19) uses 4 variables to predict the risk of death or urgent readmission within 30 days after hospital discharge: length of stay (L), acuity of admission (A), comorbidity (C) and emergency department (ED) visits in previous 6 months (E). The LACE was developed using Ontario-derived data and has been shown to be accurate in predicting acute care readmissions, notably 30-day readmissions[5] especially scores >10.
2. ED visit or hospitalisation within the previous 3 months for acute, decompensated HF, based on: being admitted for symptoms of HF (ie, peripheral oedema, shortness of breath, fatigue) and responding to antifailure therapy such as diuretics and other antifailure therapy such as ACE-inhibitors, angiotensin receptor blockers (ARBs), or beta blockers. Both patients with reduced and preserved ejection fraction were included.
3. Patient engagement
   a. Currently residing in Southwestern Ontario.
   b. Ability to speak English (all interventions are in English).
   c. Competent to give informed consent.
   d. 18–85 years of age.

Excluded from the study were patients for whom *any* of the following applied:

1. The 12-month prognosis was uncertain.
2. Who were listed for imminent cardiac transplant.
3. Had an advance directive of 'Do Not Resuscitate'.
4. Were referred to a chronic care facility.
5. Suffered from cognitive impairment and had a short blessed score >10.
6. Were diagnosed with psychological comorbidity, defined as alcohol or drug abuse or active suicidal ideation.
7. Were inaccessible for intervention sessions or 3-month phone calls by virtue of having plans to move residence or lack of a fixed address.
8. Were unwilling and/or lacked interest in making behavioural changes now or in the next 6 months.
9. Had a medical contraindication to participation in study.

Patients were recruited from either a single cardiologist's rapid response clinic or a specialised HF outpatient clinic. Physicians, NPs and Clinical Teaching Unit (CTU) attending physicians in each of these clinics were told in advance of the trial at faculty meetings, through presentations by the local cardiologist leader and trial faculty, and a trial brochure. They were asked to approach potential patients about their interest in consenting for the research study. Patients were randomised after signing the consent form.

Interventions

The COACH intervention was a 1 on 1 engagement between coach and subject that was structured through the use of a previously published patient manual[4] which consisted of:

1. The 8 Ticker Talk coaching sessions, to optimise adherence to CHF treatment using the patient manual, were delivered face-to-face or one-on-one. Sessions were approximately 60 min long and delivered over a period of 3 months. In the first month, the sessions were delivered once a week for a total of four sessions and in months 2 and 3 the sessions were delivered biweekly for a total of four sessions. Sessions were accompanied by homework assignments. Topics covered included:
2. Explanation of HF.
3. Medication adherence.
4. Salt avoidance.
5. Fluid monitoring.
6. Exercising with HF.
7. Daily check-up of weight and oedema.
8. Healthy eating.
9. When to call the HF treatment team.

SMARTPHONE REMINDER intervention

The SMARTPHONE REMINDER intervention was a text message-based approach intervention. This group received health tips, medication and appointment reminders through text messaging on a schedule that was parallel to the schedule of the COACH group. Patients who had consented received a Smartphone device paid for by the study and training on its use, post randomisation. Participants who had their own smart phone devices were able to choose to use it. Participants were able to initiate telephone calls and send text messages, or emails on their devices. A limited (typical consumer plan standards) basic voice and data plan for the smart phone device was paid by the study for the study duration. At the end of the study, participants were able to keep the smart phone devices. Text messages were initiated by the research coordinator. The text messages (SMS) were delivered for a period of 3 months. Participants received 2–3 text messages per day between 11:00 and 17:00. The text messages included direct content (eg, information, tips, advice, instructions) and reminders (eg, to take medication).

The following are examples of text messages or reminders the patients received:

- Have you taken your beta-blocker today?
- Have you taken your stress blocker pill today?/Have you taken your carvedilol/…… today?
- Have you taken your water pill today?/Have you taken your Lasix/……today?
- Please weigh yourself every day. If your weight increases by 3 lbs. in a day or 5 lbs. in 2 days, please call your doctor.
- Please avoid high sodium containing foods such as prepared meats, breads, tomatoes, popcorn, French fries, and pizza.

Additionally, reminders about upcoming appointments were scheduled as required.

BOTH interventions

The BOTH-group received a combination of both interventions. Participants received the COACH intervention for 3 months concomitant with receiving the text message-based intervention. The COACH INTERVENTION consisted of the same 1 on 1 sessions based on the same curriculum. The SMARTPHONE REMINDER INTERVENTION was the same as outlined above.

Treatment as usual

The usual standard of care was provided either by a primary care physician or cardiologist or both. In that group, the most responsible physician-prescribed therapy and provided education to the best of their abilities. Follow-up scheduling was left to the discretion of the provider. Participants randomised to the TAU group depended on their physicians to provide teaching, a care plan and any education or navigational services.

Primary end points

The *primary end point* was all-cause hospital readmission within 6 months and adherence to evidence-based medication[6–8] and salt restriction.[9] The primary end point of 6-month readmission was assessed by direct follow-up visits with the subject and an audit of the electronic medical record. Adherence to evidence based therapy was assessed by The Morisky Medication Adherence Scale (MMAS-8) which is a patient self-report measure of medication adherence consisting of 8 questions aggregating a score between 0 (not adherent) and 8 (mostly adherent).[8] The medications chosen for monitoring by the MMAS-8 scale were beta blockers, ACE inhibitors or ARBs. The score for each patient was assessed as low (0–2), medium[3–5] or high.[6–8] The medications were all front-line therapies at the time of the design of the study and were widely accepted.[6] Mineralocorticoid receptor antagonists (MRAs) were recommended in 2016[6] to be added if titration of the other classes were insufficient but were not specifically included as an end-point in this study although they were counted as a diuretic. The Charlton Salt Intake Questionnaire (CSIQ) assesses sodium intake. It is a 42-item food-frequency questionnaire used to assess habitual dietary salt intake over the previous week. The questionnaire has been shown to have content-related, construct-related and criterion-related validity, as well as internal consistency.[9] It is a valid score without units but correlates with nutritional salt intake.

Data analysis

Data were analysed using SPSS software, V.24 (SPSS). Descriptive statistics for demographic and study variables were summarised as means and SDs (continuous variables) or frequencies and percentages (categorical variables). Group comparisons of continuous variables were computed using analysis of variance with Bonferroni post-hoc comparisons. Categorical variables were analysed using χ^2 statistics when cell sizes were sufficient. All reported p values are two tailed, with alpha set at 0.05. Patients who were lost to follow-up or who withdrew consent were not included in the analysis.

We used the Consolidated Standards of Reporting Trials checklist when writing our report.[10]

RESULTS

A total of 126 eligible patients were approached at two HF clinics (Victoria and Saint Joseph's Hospitals) regarding participation in the study. Of those approached, 60 (48%) declined participation, 2 (2%) patients did not meet study criteria due to psychological comorbidity, and 63 (50%) patients consented and enrolled into phase 3 of the study. The most common reason for declining participation was lack of interest. Participants were initially randomised and assigned to one of the four study interventions, as follows: COACH n=19; SMARTPHONE REMINDER n=17; BOTH n=17 and TAU n=15 randomisation was computer generated. Nine participants withdrew from the study shortly after consenting and no baseline data were ever collected. Of the participants that withdrew, six were from the COACH intervention and three from the SMARTPHONE REMINDER intervention. One of the active participants from the COACH intervention was lost to follow-up. During the study period, two participants died (one from SMARTPHONE REMINDER and one from TAU) and were included as clinical endpoints.

The baseline characteristics of study participants are shown in table 1. Participants age ranged from 47 to 84 years with a mean age of 69.7±9.1 years; 70.4% were men. The LACE scores were calculated from the participant's electronic medical record. The mean LACE score was 12.8±5.8. Both patients with impaired left ventricular ejection fraction (LVEF <50%) by echography and those with preserved LVEF (LVEF>50%) were recruited to the study. The data revealed that overall participants recruited displayed a wide distribution of LVEF values: 40% had ≤30% and 21% had a preserved LVEF ≥50%. The mean LVEF was 37%. In addition to CHF, many participants (76%) had multiple comorbidities (≥ 3). At baseline, most participants were on multiple medications to manage their HF: beta blockers (91%), diuretics (96%), ACE inhibitors (44%) and ARBs (41%). A small number of participants were prescribed psychotropic medications (eg, antidepressants, anti-anxiety).

Table 1 Baseline characteristics of subjects for entire study

Characteristic	
Age, years, mean (SD)	69.7 (9.1)
Sex, n (%)	
Male	38 (70.4)
Female	16 (29.6)
LACE score, mean (SD)	12.8 (5.8)
LV ejection fractions mean (SD)	37.1 (16.1)
Comorbidity, n (%)	
None	3 (5.6)
≤2	10 (18.5)
≥3	41 (75.9)
Medications n (%)	
ACE Inhibitor	24 (44.4)
Beta-blockers	49 (90.7)
Diuretics	52 (96.3)
Angiotensin II receptor blockers (ARBs)	22 (40.7)
Antidepressant	9 (16.7)
Anti-anxiety	8 (15.1)

LV, left ventricular.

Primary outcomes

Readmissions to ED and hospital

During the study period, there were a total of 28 visits to the ED by 16 (29.6%) participants (table 2). Over a third (6/16, 37.5%) of those visiting the ED had multiple visits (2–5 visits). Nearly two-thirds of participants visiting the ED (10/16, 62.5%) presented with HF exacerbation. However, there were no ED visits related to HF exacerbation or HF admissions among the participants assigned to the COACH intervention. HF admissions at 6 months were observed in 14% of the SMARTPHONE REMINDER group, 8% in the BOTH group and 13% in the TAU group ($p < 0.01$ for all three intervention groups combined vs TAU). Other primary causes for ED visits were exacerbation of comorbid conditions (25%) and injuries from falls and other accidental injuries (25%). Over a third of ED visits (39.3%) resulted in hospital admission. Among the ED visits due to HF exacerbation, 58.3% led to hospital admission.

Medication adherence and salt restriction

Use of diuretics and beta-blockers was high (90% or greater) at baseline, 3 months and 6 months (table 3). Use of ACE inhibitors or ARBs varied between 85.1% at baseline, 82.4% at 3 months and 75% at 6 months. The baseline MMAS was moderate to high (figure 1) in all four groups of the study: 83%, 85.7%, 92.3% and 92.8% (COACH, SMARTPHONE REMINDER, BOTH, TAU, respectively).

High or medium adherence at 3 months was similar for all groups. However, MMAS score increased at 3 months to high adherence for COACH compared with baseline while high adherence fell at 3 months in the SMARTPHONE REMINDER and the TAU groups and was unchanged in the BOTH group.

There was little difference among the groups for baseline sodium consumption as measured by CSIQ (table 4).

Table 2 Clinical events

Emergency department (ED) visits	All (n=54)	Coaching (n=13)	SMARTPHONE REMINDER (n=14)	Both (n=12)	TAU (n=15)
Total ED visits, n (%)	28 (52)	3 (23)	6 (43)	8 (67)	11 (73)
Total ED visits due to HF, n (%)	9 (17)	**0** (**0**)	2 (15)	4 (33)	3 (20)
Patients with at least one ED visit for HF, n (%)	10 (19)	**0** (**0**)	4 (29)	4 (33)	2 (13)
Hospitalisation					
Participants with any hospitalisation (n%)	19 (35)	4 (31)	6 (43)	3 (25)	6 (40)
Participants with HF hospitalisation, n (%)	5 (9)	**0** (**0**)	2 (14)	1 (8)	2 (13)

HF, heart failure; TAU, treatment as usual care.

However, SMARTPHONE (from 24.1 to 20.8) and BOTH groups from (29.7 to 22.7) observed significantly lower sodium consumption scores from baseline at 3 months with the SMARTPHONE REMINDER group having a statistically significant decrease compared with the TAU group (20.8 vs 26.6, p=0.042) at 3 months. Unfortunately, many of these gains were lost at 6 months. All scores recorded in this study correlate with daily sodium intake range of 1259–1931 mg/day.

Sample size estimates for a future trial

Hypothetical sample sizes were estimated from our trial results and an assumed baseline readmission rate of 20% which approximates our current readmissions rate. Sensitivity analysis for power estimates was performed for reductions in readmission rates from 10% to 30% due to the coaching intervention. Even with a 30% reduction in readmission rate, we would need 1400 patients to have a power exceeding 70% necessitating large multicentre trials in the future. Hopefully, new trials using a combination of SMARTPHONE REMINDER and COACH interventions and up-to-date HF treatment regimens would significantly reduce the sample size required to demonstrate an intervention benefit.

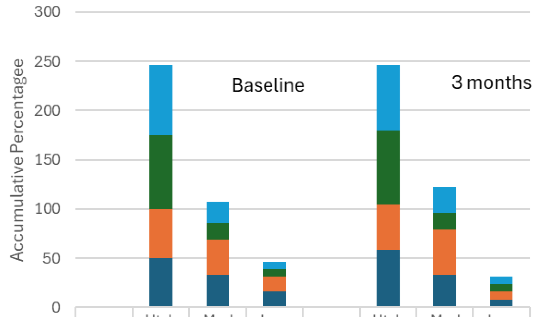
DISCUSSION

We conclude from this study that both the COACH and the SMARTPHONE REMINDER intervention were acceptable to patients and feasible to be applied to HF patients at risk of rehospitalisation, and combined, are associated with a synergistic reduction in salt. Due to the nature of it being a pilot study, we do not address the generalisability to other populations at this point. Importantly, we observed that the COACH group had a profound reduction in the primary endpoint, rehospitalisation at 6 months, compared with other groups. Despite high LACE scores predicting significant rates of rehospitalisation,[4] rehospitalisation for HF was extremely low in this study, as was mortality. However, the sample size was small. Therefore, both COACH and SMARTPHONE REMINDER interventions, as applied in this study, may be beneficial and have synergistic effects in improving patient lifestyle and outcome in HF, but our results need confirmation in a more generalisable and larger study.

Treatment interventions in this study were well accepted by patients. Our results, while not showing any improvements in patient medication compliance, did not show significant reduction in patient compliance out to 6 months which differs from other findings.[11] It is important to note that high adherence rates observed in this study at baseline were in patients followed by a single cardiologist and specialised HF clinic. If future studies

Table 3 Medication adherence

Medication adherence for all patients, N (%)			
	Baseline (n=54)	3-month follow-up (n=53)	6-month follow-up (n=52)
Medications, n (%)			
ACE inhibitors	24 (44.4)	19 (37.3)	16 (33.3)
Beta-blockers	49 (90.7)	47 (92.2)	44 (91.7)
Diuretics	52 (96.3)	47 (92.2)	43 (89.6)
ARBs	22 (40.7)	23 (45.1)	20 (41.7)
CC blockers	4 (7.4)	4 (7.8)	4 (8.3)
Vasodilators	1 (1.9)	3 (5.9)	3 (6.3)
Antidepressants	9 (16.7)	9 (17.6)	9 (18.8)
Anti-anxiety	8 (15.1)	7 (13.7)	7 (14.6)



	High	Med	Low	High	Med	Low
TAU	71.4	21.4	7.1	66.7	26.7	6.7
BOTH	75	16.6	8.3	75	16.6	8.3
SMARTPHONE REMINDER	50	35.7	14.3	46.2	46.2	7.7
COACH	50	33.3	16.7	58.3	33.3	8.3

Level of Medication Adherence

TAU BOTH SMARTPHONE REMINDER COACH

Figure 1 Morisky medication adherence score at baseline and 3 months. Height of bars indicates the accumulative per cent of three levels of adherence for each group at both time periods. By 3 months, fewer patients had low scores. TAU, treatment as usual care.

were undertaken, our results suggest the need for a larger sample size with an even higher risk group (high event rate) and powerful intervention to reduce readmission by more than 30%. This would require a multicentre study or a large network to accomplish.

A systematic approach, with emphasis on optimising HF care to reduce HF readmissions, has the potential to provide significant cost savings to the healthcare system. HF care strategies designed to improve and reinforce education, identify and address early signs and symptoms of HF exacerbation which have shown promise were included in the curriculum of this study. Further support is provided by a study of Medicare patients' using home healthcare found, regardless of clinical severity of HF, there were 21%–46% fewer readmissions in patients with home health intervention. Depending on the severity, the cost savings to Medicare was between $C4588 and $C8010 per patient.[12] We did not conduct a formal cost-benefit analysis. However, this study cost $C175 000. In 2022–2023, we had 918 admissions with a 20% readmission rate. Each admission cost on the average $C15 431. A 50% reduction in readmissions would reduce the present negative net margin of ($C5.9M) by $C1.4M.

Other modalities, such as telemonitoring (using transmitted weight, blood pressure and pulse rate) and telemedicine, especially using an NP who can prescribe evidence-based therapy, have also successfully reduced readmissions.[13–15] Moreover, telemedicine, using structured interviewing by a trained provider, has had variable success recently and is expensive. Two recent telemonitoring studies have failed to show benefit; they did not employ NPs and required patients-activated monitoring.[13 14] Often these programmes keep patients in a passive role and, as such, raise questions about optimum duration and cost-effectiveness. Recent small studies have focused on improved monitoring devices with better reporting capability including technical and educational support to medical staff and patients.[16 17] These recent studies have demonstrated better satisfaction by both patients and providers. The present study is one of the first to demonstrate a large effect on HF rehospitalisation, however, mediated by sustaining medication adherence and dietary reduction is salt. These processes of care were not delivered by healthcare providers but by lay coaches and electronic providers. In summary, telemonitoring and telemedicine studies are improving. However, telemonitoring and telemedicine methodologies have failed to show large and consistent reductions in readmission rates at 6 months or 30 days in order to be recommended in current clinical practice guidelines.[18–20]

In this study, each intervention was a patient enabler. Providers were not part of the intervention. Our SMARTPHONE REMINDER intervention enabled patients by reminding them of appointments, medication schedules and salt restriction. Patient activation was the primary form of the SMARTPHONE REMINDER intervention. The COACH strategy was a face-to-face strategy employed over time, providing intense education about how patients can manage their condition. While we observed synergy between telemedicine and a coach to reduce salt intake, the COACH strategy had superior impact on rehospitalisation.

In this study, we did not test HF clinics and utilisation of HF NPs as physician extenders,[20–26] which has been the intervention widely tested in other studies. In general, these measures have met with modest success in reducing readmission. Systematic reviews of NP-led HF clinics suggest that 6-month all-cause readmission rates can be reduced by as much as 18%. However, the

Table 4 Charlton salt intake questionnaire score (units) for all groups at baseline, 3 and 6 months

	COACH	SMARTPHONE REMINDER	BOTH	TAU
Baseline, mean (SD)	30.0 (9.3)	24.1 (6.5)	29.7 (8.9)	29.6 (1.1)
3 months	25.0 (11.2)	20.8 (4.7)*†	22.7 (7.8)†	26.6 (8.7)
6 months	26.5 (7.1)	25.1 (0.1)	24.2 (6.3)	24.5 (9.5)

*P<0.05 compared to TAU at 3 months.
†P<0.02 compared to baseline.
TAU, treatment as usual care.

range of improvement was large. Our results suggest that while acknowledging there is strong evidence favouring benefits of NPs in improving outcomes in the management of HF patients, improvement in readmission rates remains highly variable and could be improved by either more effective coaching, or telephonic interactions, as described here.

Disease management programmes[11 24–28] propose the integration of multidisciplinary, multilevel and high-tech approaches to create close connections between patients and needed medical care. Our results align with the chronic care model proposed by Wagner[27 28] which has as its ultimate goal an informed, activated patient interacting with a prepared proactive practice team, resulting in high quality and satisfying encounters with improved outcomes. Both interventions, COACH or SMARTPHONE REMINDER, used at least four of six pillars recommended by Wagner *et al*: patient education, enhanced delivery system, evidence-based treatment and use of enhanced information systems. In this study, we focused primarily on patient education and support. The prescribing cardiologist had excellent access to both clinical decision support and an electronic medical record. Prescribing adherence to beta blockers, ACE inhibitors and ARBs was high and patient adherence at 3 months improved from baseline in all three interventions. Clinic notes sent to family doctors, each visit, was the standard of care.

Other studies have demonstrated that patients, actively involved in their own care and adhering to treatment regimens, are more likely to have improved survival, fewer readmissions and experience better quality of life.[29 30] Disease management programmes include enhancing adherence for patients with HF included medication education, disease education, self-monitoring and other strategic interventions. These known interventions were the basis of both the COACH and SMARTPHONE interventions of this study.[27 29–36]

There are some caveats to our results. First, these results are not generalisable. Patients were managed by a single cardiologist, experienced in HF and chronic disease management. Second, patients had frequent follow-ups with medication reconciliation each visit. Adherence was high at baseline and, more importantly, little evidence of attrition in patient adherence to evidence-based therapy, over time. Larger studies free of selection bias and which use up-to-date information tools allowing better coordination between patient and provider are necessary. This was a pilot study meant to inform future more definitive studies. It is possible that frequent follow-up by an experienced cardiologist influenced this result and not research interventions. Third, telephonic reminders are a less-invasive patient intervention. While it was acceptable by patients in our preliminary studies, this intervention could be more interactive, especially introducing a nurse available to interact with patients and to answer questions in a timely fashion. However, one advantage of a telephone intervention lies in its use with patients living far away who find it difficult to have frequent one-on-one contact with a coach. Hence, the two interventions can be combined in a way to be more effective in these remote patients. Our final caveat is that these results were obtained before the COVID pandemic. Optimal therapy for HF has expanded beyond beta blockers + ACE inhibitors or ARBs + MRAs to now include sodium-glucose Cotransporter-2 inhibitors and sacubitril/valsartan. Future studies will need to include all evidence-based therapies in educational materials and curricula for coaches and patients, alike.

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Patient consent for publication Not applicable.

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