JPHSR Journal of Pharmaceutical Health Services Research

Journal of Pharmaceutical Health Services Research, 2021, Vol 12, 30–34
doi:10.1093/jphsr/rmaa003
Research Paper

OXFORD

Research Paper

Pharmacist-led heart failure patient focus group using mobile apps-based intervention mix

Naira Hani[1,*], Seeba Zachariah[1], Dixon Thomas[1] and Jason C. Cooper[2]

[1]Department of Pharmacy Practice, College of Pharmacy, Gulf Medical University, Ajman, United Arab Emirates
[2]Clinical Pharmacy and Outcome Sciences, Medical University of South Carolina, Charleston, SC, USA

*Correspondence: Naira Hani, College of Pharmacy, Gulf Medical University, Ajman, United Arab Emirates. Tel: +971501351453; Email: naira2113@gmail.com

Received July 8, 2020; Accepted October 13, 2020.

Abstract

Objectives The impact of clinical pharmacists on inpatient heart failure (HF) care has been proven in many studies. Evidence regarding the use of mobile apps by pharmacists to achieve positive clinical outcomes in HF is limited. The purpose of this study is to examine the impact of a pharmacist-led HF patient focus group using mobile apps-based intervention mix.

Methods In this pre–post-exploratory study, using an intervention mix of hospital discharge counselling, MyTherapy app, WhatsApp and occasional phone calls to improve clinical outcomes in HF. Patient medication adherence, health-related quality of life (HRQoL) and 30-day all-cause hospital readmission rate were assessed. The Wilcoxon Signed-Rank Test was used to find statistical significance of improvements in medication adherence and HRQoL using SPSS software version 26.

Key findings The intervention mix of initial hospital-discharge counselling, MyTherapy app, follow-up with the WhatsApp group and occasional phone calls established an effective communication with patients. All 10 patients had improvements in their clinical outcomes. Significant improvements in medication adherence and HRQoL were found (*Z*-value –2.810 and *Z*-value –2.805, respectively; 95% confidence interval). No patients were readmitted in 30 days or within 3 months of study.

Conclusions A pharmacist-led HF patient focus group using mobile apps-based intervention mix was found to be effective in improving clinical outcomes in HF patients. Further research should be performed on long-term effects of our approach.

Keywords: heart failure; medication adherence; health-related quality of life; 30-day readmission; pharmacist; mHealth

Introduction

Heart failure (HF) patients are managed mostly in the ambulatory setting. Patients might need to be admitted to the hospital if symptoms worsen.[1] Continuing healthcare support, including inpatient and outpatient pharmaceutical care, has an impact on their health. Pharmaceutical care provided by pharmacists as part of a multidisciplinary team is known to produce beneficial outcomes for patients.[2, 3] Though not so common, pharmacist-led HF clinics are also known to produce beneficial clinical outcomes.[4, 5] Drug-related problems are decreased and overall health improves for HF patients. The pharmacist's role in the transition of care from inpatient to outpatient is also known.[6] The HF care plan includes reducing morbidity [i.e. reducing symptoms, improving health-related quality of life (HRQoL) and functional status, decreasing the rate of hospitalization], and reducing mortality. Compared with other severe common chronic disorders, patients with HF have a significantly higher physical health burden.[7]

Given the complexity of HF self-care, assisting patients to manage their care at home is a critical component of HF management. The

capacity for self-care in HF has been found to be low.[8] Technology may be a key factor in improving connectivity with patients. The popularity of the mobile phone and its rapidly increasing computing capabilities makes it an ideal tool for delivering health care. However, existing evidence is not conclusive that mobile phone-based interventions are beneficial for HF patients.[9–11]

Mobile health apps related to HF have been utilized to compile, share and analyze healthcare intervention data, including general communication, blood pressure monitoring, body mass index and adherence patterns. However, many significant barriers are reported about the utility of mobile apps in HF care.[12] In the UAE, it is uncommon for community pharmacists to conduct HF patient focus groups using such technology. Therefore, this research aimed to find the impact of a pharmacist-led HF patient focus group using mobile apps-based intervention mix. The clinical outcomes planned to be assessed in this study include medication adherence, HRQOL and 30-day all-cause hospital readmission rate.[13]

Methods

Study design

This was a pre–post-interventional exploratory study design using mobile apps (MyTherapy app and WhatsApp) based intervention mix. The intervention mix included initial hospital-discharge counselling, use of MyTherapy app, follow-ups with the WhatsApp group and occasional phone calls. MyTherapy was chosen due to its simplicity and ease of use, as well as the ability to use it off-line. MyTherapy is a personal pill reminder and medication tracker app (https://www.mytherapyapp.com/). The Heart Failure Society of America's mobile app was not available in the UAE. Patients were surveyed to measure medication adherence and HRQoL pre- and post-intervention. The 30-day hospital readmission rate was determined by calling the participants and asking whether or not they had to be admitted for hospital care within 30 days of discharge and study enrolment for any reason.

Study setting

One of the pharmacists in this research team had on-call hospital duties, as well as community pharmacy coverage of Academic Health Center in the UAE. The Academic Health Center at the time of the study had 4 major hospitals, 10+ clinics and 30+ pharmacies in the UAE. The hospital had 10 clinical pharmacists at the time of study, providing clinical pharmacy services in all wards. Inpatients were discharged by clinical pharmacists with counselling on medications, reinforced by the research pharmacist on how to take their medications, as well as how to use the mobile app. The counselling by the research pharmacist was an additional pharmaceutical care intervention to the HF patients enrolled in this study, in addition to regular clinical pharmacy services in the hospital.

Patient population and data collection

This study enrolled all consented HF patients admitted to the hospital. Most of the HF patients were admitted to the hospital when their symptoms worsened due to discontinuation of therapy or when they felt their condition was not under control. At or before the time of discharge and once the discharge medications were ready, patients were oriented to the mobile phone apps by the research pharmacist. After patient consent was obtained, the Morisky Medication Adherence Scale (MMAS-8) and Minnesota Living with Heart Failure Questionnaire (MLHFQ) tools were administered to the patient for evaluation of medication adherence and quality of life, respectively. The pharmacist researcher spent 10–15 min helping the patient install the MyTherapy app on their smartphone. Patients were helped to enter their discharge medications into the app by searching the medication's name and dosage in the app's medication database. Selection of appropriate dose frequency (e.g. once daily) and quantity of pills per dose, as well as how to set the time that the medication is usually taken (e.g. 08:00 AM) were explained. Patients also joined to a WhatsApp group for clarifying doubts/questions and for sharing tips of HF management such as measuring daily body weight, hints for fluid control and salt restrictions. Patients with any cognitive disabilities or paediatric patients were excluded.

After baseline data collection and initial intervention (in-person pharmacist assistance happened at enrolment only, followed by communication through WhatsApp and phone calls), patients were followed up for a minimum of 3 months or more. Information regarding post-intervention medication adherence and HRQoL were collected through one phone call. Additional phone calls were used to follow up with the proper use of the mobile app and/or if the patient was admitted to the hospital for any-cause after starting the study. Patient enrolment happened between October 2019 and February 2020. Those patients who were not admitted to the hospital were not included. Patients who were admitted to the hospital for other complications than HF were also excluded. Further enrolment was stopped due to the COVID-19 lockdown. The hospital soon was converted to a COVID-19 only hospital.

Data analysis and ethical considerations

Data were analyzed using Microsoft Excel software and SPSS software version 26 for *P* values and confidence intervals using a Wilcoxon Signed Ranks Test. *Z*-values greater than –1.96 were considered statistically significant.

The MMAS-8 is a valid tool to measure the adherence of the patient toward their medication by self-reporting questionnaire with eight questions (items). All items if answered by 'No' the patient will take a score of 1 each, except item 5 in which 'No' is considered as zero scores while for item 8, if a patient chooses response '0', the score is '1' and if they choose response '4', the score is '0'. Responses '1, 2, 3' are respectively rated as '0.25, 0.75, 0.75'. The patient who gets score 8 were considered to have high adherence, medium adherence (score of 6 to < 8) and low adherence (score< 6).[14, 15]

Minnesota living with HF questionnaire score interpretation comprising 21 items rated on 6-point Likert scales, representing different degrees of impact of HF on HRQoL, from 0 (none) to 5 (very much). It provides a total score (range 0–105, from best to worst HRQoL), as well as scores for two dimensions, physical (eight items, range 0–40) and emotional (five items, range 0–25). The other eight items (of the total of 21) are only considered for the calculation of the total score. A score of < 24 on the MLHFQ represents a good QoL, a score between 24 and 45 represents a moderate QoL, and a score > 45 represents a poor QoL.[16]

No ethical issues were identified, and patient confidentiality was maintained. Written patient consent was taken before their enrolment to the study. Our institutional review board approved the study.

Results

Ten enrolled patients completed all study requirements. Two participants were excluded due to not having a smartphone and/or did not consent to enrol in the study. One patient died in the first week of enrolment, so that data were excluded.

Participants ranged in age from 38 to 92, they were six male, and four females. Participants were mostly from different countries

reflecting the UAE population. Four of the participants were non-smokers, three were smokers and three were ex-smokers. Most of the HF patients, seven had reduced ejection fraction (HFrEF), two with preserved ejection fraction (HFpEF) and one did not have ejection fraction (EF) readily available. Further details are included in Table 1.

Most of the posts on the WhatsApp group were by the research pharmacist. Patients were reading the posts (observable for the group administrator), but not posting questions or comments frequently. Though patients were not posting comments through WhatsApp in the beginning, some of them started discussing their issues later. Through follow-up phone call, most of the patients indicated that they were reading two to three posts per week on information to improve HF patient self-care. Pharmacist posted reminders on how to continue using the MyTherapy app, as well as posts/comments to clarify any doubts or concerns. All were responding to phone calls and cooperated with the study activities. Improvements in medication adherence and health-related quality of life with interventions is shown in Tables 2 and 3.

Discussion

The results show promising improvements in medication adherence and HRQOL after a pharmacist-led intervention using a mobile app-based intervention mix. The initial patient counselling, the MyTherapy app, follow-ups through Whatsapp and phone calls, all may have contributed to the outcomes. Having a small group of patients and frequent pharmacist communication via WhatsApp may have resulted in short-term benefits. Additionally, a small group could have provided an individual attention while respecting patient privacy, not forcing patients to post their problems in the group

Naturally, patients show interest in mobile apps to support their self-care.[17] Mobile phone apps are integrating many variables that are useful for cardiovascular disease patients, with easy-to-follow and validated content.[18] Mobile apps by themselves are not a useful tool in achieving clinical outcomes, however. Though small group studies do not often result in strong evidence, our findings revealed that follow-up by a healthcare professional with a small group of patients produced improved results with the help of a mobile patient-care app.[19] The recent popularity of Whatsapp could be an even more convenient and informative way of communication to the patients. Regular phone calls are also found to be supportive in improving patient medication adherence.[20]

Improvement in medication adherence is associated with improvements in HRQOL, though small in HF.[21] As part of pharmaceutical care, improvements in medication adherence could lead to positive treatment outcomes when doses are being titrated, for example. Improvements in HRQOL are also associated with other morbidity and mortality benefits in HF patients. Better self-care, medication adherence, HRQoL and lower hospital readmission rates, all contribute to lower healthcare costs.[22]

No patients were re-admitted to the hospital within 30 days or even in 3 months of the follow-up period. Though the number of patients was small, it shows the impact of a pharmacist's support and care with the use of mobile apps-based intervention mix used in this study.

Limitations of the study

The patients who enrolled in the study might be more motivated and interested to have better health outcomes. As this study did not compare the health outcomes of HF patients not using the mobile

Table 1 Patient demographics and laboratory data

Sl.	Gender	Age	Nationality	Physical activity	Smoking	Mean ejection fraction (SD	Body weight (SD), kg	Mean body mass index (SD), kg/m^2	Mean systolic blood pressure (SD), mm Hg	Mean diastolic blood pressure (SD), mm Hg	Sodium (mmol\L)	Potassium (mEq/L)	Mean serum creatinine level (SD) µmol/L mg/dL
1	Male	50	Philippines	Active	Ex-Smoker	20–25	81	29.04	123	86	134	5.6 MMOL\L	1.26 MG\DL
2	Male	92	Pakistan	Not Active	No	60	86.8	30.75	150	80	130	4.2	2.36 MG\DL
3	Male	67	Syrian	Mild	Ex-Smoker	30	133	51.8 KG\M2	100	50	139	4.4	1.57 MG\DL
4	Male	41	Indian	Active	Ex-Smoker	28	69	26.5 KG\M2	115	118	132 mmol\L	4.5	0.8
5	Male	38	Nigerian	Active	Smoker	38	70	27.69 KG\M2	200	140	132 mmol\L	3.3	6.8
6	Male	46	Yemen	Active	Never	30–35	104	36.8	181	110	139	4.2	0.99 mg\dl
7	Female	40	Sri Lanka	Active	Never	25–30	49	19.88	120	70	138	5.2	1.36 mg\dl
8	Female	55	Syria	Active	Yes	35	65	23.9	150	83	130	5.1	Not mentioned
9	Female	53	Comoros	Moderate	Yes	56	91.5	36.65	130	80	137	4.1	0.58
10	Female	49	Comoros	Mild	Never	NTPRO:153 PG\ML	152	57.9	170	77	140	4.3	0.7

Medication adherence and HRQoL of the study participants before and after the intervention were collected and compared. The comparison is provided in Tables 2 and 3. There was a significant improvement in medication adherence and HRQoL with Z-value −2.810 and Z-value −2.805, respectively for 95% confidence interval.

Table 2 Medication adherence and health-related quality of life difference with interventions including Mobile App

Sl.	Medication adherence[a]		Health-related quality of life[b]	
	Before	After	Before	After
1	Low (3.75)	Medium (7)	Poor (63)	Good (19)
2	Low (3.75)	Medium (7.75)	Poor (63)	Moderate (26)
3	Low (5)	Medium (6)	Poor (70)	Moderate (45)
4	Low (5)	High (8)	Moderate (34)	Good (7)
5	Low (3.75)	High (8)	Poor (57)	Good (0)
6	Low (1.75)	Medium (7)	Poor (66)	Moderate (36)
7	Low (3.75)	Medium (7)	Poor (58)	Moderate (35)
8	Low (3.75)	Low (5.25)	Poor (70)	Moderate (43)
9	Low (1.25)	Medium (7)	Poor (50)	Moderate (29)
10	Low (1.75)	Low (5)	Poor (73)	Moderate (44)

[a]Morisky Medication Adherence Scale: Low (<6), Medium (6 to <8), High (8).
[b]Minnesota Living with Heart Failure Questionnaire: Poor (>45), Moderate (24–45), Good (<24).

Table 3 Statistical significance of the difference of medication adherence and health-related quality of life difference with intervention

	Medication adherence		Health-related quality of life	
	Before	After	Before	After
N	10	10	10	10
Minimum	1.25	5.00	34	0
Maximum	5.00	8.00	73	45
Median	3.7500	7.0000	63.00	32.00
SD	1.3	1.1	11.6	15.6
Mean	3.4	6.8	60.4	28.4
Std. Error or mean	0.42	0.34	3.7	4.9
Z	-	–2.810[b]	-	–2.805[c]
Asymptotic significance (two-tailed)[a]	-	0.005	-	0.005
95% CI	2.4–4.3	6.0–7.6	52.1–68.7	17.2–39.6

[a]Wilcoxon Signed Rank Test.
[b]Based on negative ranks.
[c]Based on positive ranks.

app, we can only conclude the benefit of the mobile app was specific to the small group of patients using the app. The study was exploratory in nature, more such studies in different health systems are recommended and a systematic review of such studies will provide solid scientific data. MyTherapy app alone might not achieve the outcomes as found in this study.

Conclusion

Pharmacist-led HF patient focus group using mobile apps-based intervention mix showed improvements in medication adherence, health-related quality of life and 30-day hospital readmission rate in a small group of HF patients. We recommend that pharmacists consider the use of such mobile apps-based intervention mix in small patient groups to improve health-related outcomes in HF. The long-term health outcomes of this model are to be studied in different countries. If this model works for a bigger group of patients should be studied as well.

Acknowledgement

We acknowledge the statistical support provided by Prof. Jayadevan Sreedharan, Gulf Medical University, UAE.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions

All authors have contributed to this study and all authors reviewed and approved the final version of the manuscript. N.H., and S.Z. participated in the study design, data collection and interpretation of results, prepared the manuscript draft, and performed all analytical testing and manuscript review. D.T., and J.C.C. participated in the interpretation of results, prepared the manuscript draft, and the final manuscript review.

Conflict of Interest

The author(s) declare(s) that they have no conflicts of interest to disclose.

References

1. Shafazand M, Patel H, Ekman I, Swedberg K *et al*. Patients with worsening chronic heart failure who present to a hospital emergency department require hospital care. *BMC Res Notes* 2012; 7: 132. https://doi.org/10.1186/1756-0500-5-132

2. Parajuli DR, Kourbelis C, Franzon J *et al*. Effectiveness of the pharmacist-involved multidisciplinary management of heart failure to improve hospitalizations and mortality rates in 4630 patients: a systematic review and meta-analysis of randomized controlled trials. *J Card Fail* 2019; 25: 744–56. https://doi.org/10.1016/j.cardfail.2019.07.455
3. Schulz M, Griese-Mammen N, Anker SD *et al*. Pharmacy-based interdisciplinary intervention for patients with chronic heart failure: results of the PHARM-CHF randomized controlled trial. *Eur J Heart Fail* 2019; 21: 1012–21. https://doi.org/10.1002/ejhf.1503
4. Yates L, Valente M, Wadsworth C. Evaluation of pharmacist medication review service in an outpatient heart failure clinic. *J Pharm Pract* 2019; 33: 820–6. https://doi.org/10.1177/0897190019842696
5. Atallah B, Sadik ZG, Osoble AA *et al*. Establishing the first pharmacist-led heart failure medication optimization clinic in the Middle East Gulf Region. *J Am Coll Clin Pharm* 2020; 3: 877–84. https://doi.org/10.1002/jac5.1219
6. Milfred-LaForest SK, Gee JA, Pugacz AM *et al*. Heart failure transitions of care: a pharmacist-led post-discharge pilot experience. *Prog Cardiovasc Dis* 2017; 60: 249–58. https://doi.org/10.1016/j.pcad.2017.08.005
7. Hobbs FDR, Kenkre JE, Roalfe AK *et al*. Impact of heart failure and left ventricular systolic dysfunction on quality of life: a cross-sectional study comparing common chronic cardiac and medical disorders and a representative adult population. *Eur Heart J* 2002; 23: 1867–76. https://doi.org/10.1053/euhj.2002.3255
8. Mlynarska A, Golba KS, Mlynarski R. Capability for self-care of patients with heart failure. *Clin Interv Aging* 2018;13:1919–27. https://doi.org/10.2147/CIA.S178393
9. Athilingam P, Jenkins B. Mobile phone apps to support heart failure self-care management: integrative review. *J Med Internet Res* 2018; 20: e10057. https://doi.org/10.2196/10057
10. Cajita MI, Gleason KT, Han HR. A systematic review of mhealth-based heart failure interventions. *J Cardiovasc Nurs* 2016; 31: E10–22. https://doi.org/10.1097/JCN.0000000000000305
11. Sharma A, Mentz RJ, Granger BB *et al*. Utilizing mobile technologies to improve physical activity and medication adherence in patients with heart failure and diabetes mellitus: rationale and design of the TARGET-HF-DM Trial. *Am Heart J* 2019; 211: 22–33. https://doi.org/10.1016/j.ahj.2019.01.007
12. Woods LS, Duff J, Roehrer E *et al*. Patients' experiences of using a consumer mhealth app for self-management of heart failure: mixed-methods study. *J Med Internet Res* 2019; 6: e13009. https://doi.org/10.2196/13009
13. Dordunoo D, Thomas SA, Friedmann E *et al*. Inpatient unit heart failure discharge volume predicts all-cause 30-day hospital readmission. *J Cardiovasc Nurs* 2017; 32: 218–25. https://doi.org/10.1097/JCN.0000000000000331
14. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986; 24: 67–74. https://doi.org/10.1097/00005650-198601000-00007
15. Okello S, Nasasira B, Muiru ANW *et al*. Validity and reliability of a self-reported measure of antihypertensive medication adherence in Uganda. *PLoS One* 2016; 11: e0158499. https://doi.org/10.1371/journal.pone.0158499
16. Behlouli H, Feldman DE, Ducharme A *et al*. Identifying relative cut-off scores with neural networks for interpretation of the Minnesota living with heart failure questionnaire. In: *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society: Engineering the Future of Biomedicine, EMBC 2009*. Vol 2009. IEEE Computer Society; 2009:6242–6246. https://doi.org/10.1109/IEMBS.2009.5334659
17. Sohn A, Speier W, Lan E *et al*. Assessment of heart failure patients' interest in mobile health apps for self-care: survey study. *JMIR Cardio* 2019; 3: e14332. https://doi.org/10.2196/14332
18. Athilingam P, Osorio RE, Kaplan H *et al*. Embedding patient education in mobile platform for patients with heart failure: theory-based development and beta testing. *Comput Informatics Nurs* 2016; 34: 92–8. https://doi.org/10.1097/CIN.0000000000000216
19. Wongvibulsin S, Martin SS, Steinhubl SR *et al*. Connected health technology for cardiovascular disease prevention and management. *Curr Treat Options Cardiovasc Med* 2019; 21: 29. https://doi.org/10.1007/s11936-019-0729-0
20. Ware P, Dorai M, Ross HJ *et al*. Patient adherence to a mobile phone–based heart failure telemonitoring program: a longitudinal mixed-methods study. *J Med Internet Res* 2019; 7: e13259. https://doi.org/10.2196/13259
21. Silavanich V, Nathisuwan S, Phrommintikul A *et al*. Relationship of medication adherence and quality of life among heart failure patients. *Hear Lung* 2019; 48: 105–10. https://doi.org/10.1016/j.hrtlng.2018.09.009
22. Toback M, Clark N. Strategies to improve self-management in heart failure patients. *Contemp Nurse* 2017; 53: 105–20. https://doi.org/10.1080/10376178.2017.1290537
23. McKay C, Park C, Chang J *et al*. Systematic review and meta-analysis of pharmacist-led transitions of care services on the 30-day all-cause readmission rate of patients with congestive heart failure. *Clin Drug Investig* 2019; 39: 703–12. https://doi.org/10.1007/s40261-019-00797-2
24. O'Connor M, Asdornwised U, Dempsey ML *et al*. Using telehealth to reduce all-cause 30-day hospital readmissions among heart failure patients receiving skilled home health services. *Appl Clin Inform* 2016; 7: 238–47. https://doi.org/10.4338/ACI-2015-11-SOA-0157