Tanzania Journal of Health Research
Volume 19, Number 2, April 2017
Doi: http://dx.doi.org/10.4314/thrb.v19i2.8

Applicability of structured telephone monitoring to follow up heart failure patients discharged from Muhimbili National Hospital, Tanzania

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Abstract
Background: Studies from developed countries have shown that home monitoring and follow up of heart failure (HF) patients by use of phone calls is cost-effective as it reduces re-admission and improves patients' clinical status. This intervention has however not been tested in resource poor countries including Tanzania, and there are questions as to whether it is applicable in such situations. This study was carried out to determine the applicability of structured telephone monitoring of HF patients discharged from Muhimbili National Hospital in Dar es Salaam, Tanzania.
Methods: All heart failure patients admitted at the hospital's Cardiovascular Medicine Department between August and December 2014 were consecutively recruited. Information on their clinical and demographic characteristics was collected and their mobile phone numbers recorded. Patients were then contacted through their phones on day 7, 14 and 30 post discharge and inquiry on their clinical status was made.
Results: A total of 164 HF patients were admitted during the study period, of these 4 declined to participate, 3 could not establish a phone number and 26 died before discharge leaving 131 (79.9%) for follow-up. The mean age was 45±19 years and 56.5% were women. The proportion of patients that could be contacted through mobile phones were 96.2%, 94.7% and 93.9% on day 7, 14 and 30 post discharge, respectively. Over 90% of the contacted patients gave valuable information regarding their clinical status.
Conclusion: Majority of HF patients can be contacted and provide valuable clinical information through mobile phones within a month post discharge from the national hospital in Tanzania. Structured telephone monitoring could be used as a tool to follow up HF patients in a resource-poor country like Tanzania.

Keywords: heart failure, structured telephone, home monitoring, Tanzania

Introduction

Heart failure (HF) affects more than 23 million people worldwide (Liu & Eisen, 2014). When compared to other cardiovascular diseases, its incidence, prevalence as well as cost is on the increase while prognosis remains poor (Bogner *et al.,* 2010; Liu and Eisen, 2014). Hospital readmission is one of the factors that significantly increases the cost of HF management. Readmission of HF patients is mostly multi-factorial. It may be related to medical, environmental, behavioural or to factors related to discharge planning, which emphasizes on medication review and adherence, dietary counselling, daily weight measurement and recording of symptoms of worsening of HF (Opasich *et al.,* 1996; Phillips *et al.,* 2004). The highest risk period for readmission is the first few weeks after discharge with 20–30% of patients being readmitted within the first month (Kociol *et al.,* 2013).

Previous studies in Europe and North America have shown that use of structured telephone monitoring in combination with usual standard care is effective in reducing all-cause mortality, all cause re-hospitalization and HF related re-hospitalization (Rich *et al.,* 1995; Inglis *et al.,* 2010). The intervention is also cost saving due to reduced health care utilization following reduction in number of HF and all cause hospitalizations. Improved outcome at 6 months among HF patients under telephone-based monitoring has been reported in a study by Angermann (2007) who observed that mortality was reduced by 40% and morbidity improved.

Worldwide, the incidence of HF is expected to rise significantly from 10.7 million cases in 2010 to 11.83 million cases in 2020 as a result of population growth, urbanization, improved life expectancy and improved survival of cardiovascular patients (Ambrosy *et al.,* 2014). This will result

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in a parallel increase in HF admissions and a major impact on health care systems. No other region of the world will the cost of caring for HF patients have the biggest impact on the available health resources than the Sub-Saharan Africa. Interventions such as use of structured telephone monitoring that aim at reducing re-hospitalization rates for patients discharged with HF are therefore of utmost importance and should be part of the management of HF patients. This intervention has however not been tested in resource poor countries like Tanzania, and there are questions as to whether it is applicable in such situations. This study was therefore carried out to determine the applicability of structured telephone monitoring to follow up HF patients discharged from the Muhimbili National Hospital (MNH) in Tanzania.

Materials and Methods

Study area and population

This was a hospital based prospective cohort study conducted at the Cardiovascular Medicine Department, MNH in Dar es Salaam, Tanzania. MNH is the top referral hospital in the country and the main teaching hospital for Muhimbili University of Health and Allied Sciences. The Cardiovascular Medicine Department has a bed capacity of 100 and discharges about 30 to 40 HF patients in a month.

A total of 130 discharged HF patients were needed to determine the proportion of HF that will be reached through mobile phones at 95% confidence interval and 0.05 error margin, considering previous mobile phone reachability of 90%. All patients admitted with a diagnosis of HF from 1st August to 30th November 2014 were enrolled in the study. The inclusion criteria were all patients with a diagnosis of HF as per attending medical team. The exclusion criteria were HF patients that denied being included in the study, those who did not have a phone or could not establish a phone number of next of kin as well as those who died before discharge from the hospital were excluded.

Data collection

The Cardiovascular Medicine Department was visited on a daily basis and patients with a diagnosis of HF were identified (as determined by the attending medical team). Both new and re-admitted patients were approached. A structured questionnaire was used to record demographic information, including age, gender, as well as history of cardiovascular risk factors like hypertension, diabetes mellitus and cigarette smoking. HF symptoms and signs, and the New York Heart Association (NYHA) functional class were assessed and recorded. The mobile telephone numbers of the patient plus two close relatives were recorded.

At the time of discharge, patients were re-assessed in terms of their clinical status including their NYHA functional state, symptoms and signs of HF as well as their general wellbeing. Discharged patients were also given health education on symptoms of worsening HF and were asked to note for development or worsening of lower limbs swelling, abdominal distension, shortness of breath, cough or dyspnoea on lying flat. Adherence to medications and how to take their HF and other medications was also discussed with the patient and assisting relatives or guardians. During this time, patients were asked as to what time of the day they would prefer to be contacted by the investigator when at home. Patients were also given the investigator's phone number and advised to call in an event that they felt their symptoms are worsening or they needed any assistance regarding their clinical condition.

Follow up calls to the discharged patients were made on day 7, day 14 and day 30 after the day of discharge. Questions about the current status of the patient in terms of presence or absence as well as worsening or improvement of symptoms were inquired. Patient's opinion on his or her current status (improving, getting worse or the same) since discharge were asked. Worsening patients who had not yet been attended were advised to come to MNH for re-assessment. Patients who were outside Dar es Salaam were advised to attend a nearby health facility. Three phone call

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attempts were made in case the patient or relatives were not reached in the first attempted call. Patients or relatives who could not be reached by mobile phone in all three attempts on day 7, 14 or 30 were declared not reached.

Data analysis

Data was entered in Statistical Package for Social Sciences (SPSS) version 20 software for analysis. Frequency distribution and two-way tables were used to summarize the data. Data is presented as mean ±SD for continuous variables and as percentages for categorical variables. Groups of patients were compared using student's *t*-test. A *p*-value of <0.05 was considered to indicate a statistical difference.

Ethical considerations

Ethical clearance to conduct the study was obtained from the Directorate of Research and Publications of Muhimbili University of Health and Allied Sciences. All patients were informed about the study and asked to participate. Agreeing patients were asked to sign an informed consent form before any data was collected.

Results

A total of 164 HF patients were admitted at the MNH Cardiovascular Medicine Department during the study period. Of these, 43.3% were new admissions and 56.7% re-admissions. Four (2.4%) patients declined to participate, 3 (1.8%) could not establish a phone contact and 26 (15.8%) patients died before discharge. The remaining 131 (79.9%) patients were followed up after being discharged and constitute the present study population.

Table 1: Demographic and baseline characteristics of patients discharged with heart failure (N=131)

Characteristic	Response	Frequency (n)	Percentage (%)
Sex	Male	57	43.5
	Female	74	56.5
Age group (years)	<20	9	6.9
	20-35	46	35.1
	36-50	24	18.3
	51-65	28	21.4
	>65	24	18.3
Level of education	None	18	13.7
	Primary	74	56.5
	Post-primary	39	29.8
Marital status	Single	29	22.1
	Married	90	68.7
	Divorced/separate/widowed	12	9.2
Occupation	Student	8	6.1
	Unemployed/peasant	61	46.6
	Employed/Business	62	47.3
CV risk factors	Hypertension	47	35.9
	Diabetes mellitus	9	6.9
	Ever smoked	12	9.2

The mean ± SD age was 45.3 ± 19.3 years, (range 11–90 years) and 74 (56.5%) were females. The age group 20–35 years comprised the largest proportion (35.1%) of patients. History of hypertension was reported in 35.9% of the patients and 6.9% had diabetes mellitus. Smoking was reported among 12 (9.2%) patients (all men) (Table 1).

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On admission, majority of patients 118/131 (90.1%) were symptomatic with NYHA functional class IV, 8.4% in class III and 1.5% in class II symptoms. Upon discharge majority of the patients 107/131 (81.7%) were in NYHA class II, 17.6% in class III and 0.7% were discharged while in NYHA class IV symptoms. The most common signs on admission were lower limbs oedema (78.6%), basal crepitation (78.6%), tender hepatomegaly (55%) and raised jugular venous pressure (53.4%). At the time of discharge only 1.5% had basal crepitation, 3.1% had tender hepatomegaly, 1.5% had raised jugular venous pressure and 8.4% still had tachycardia. Of note, lower limbs oedema and ascites remained in more than half of the patients who presented with these signs at admission (Figure 1).

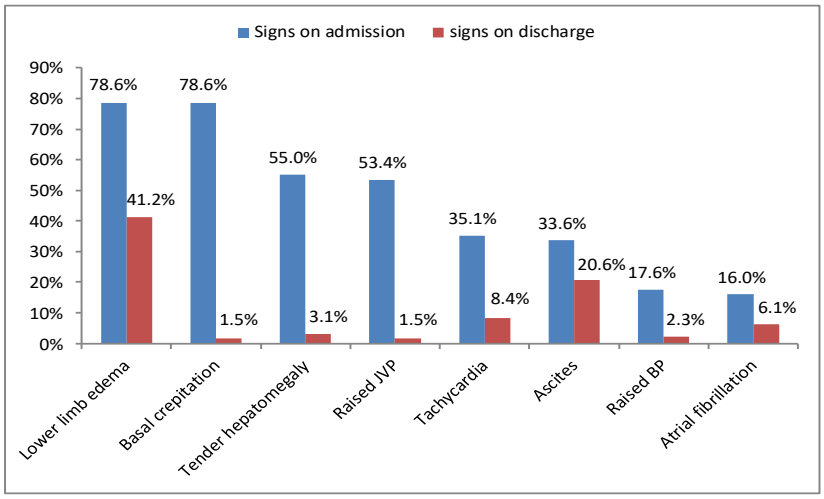

Figure 1: Signs of heart failure on admission and at the time of discharge

The most common underlying HF aetiology (as determined by the attending medical team) was hypertensive heart disease, present in 37.4% of the total population, followed by dilated cardiomyopathy in 32.8% and rheumatic heart disease in 21.4%. Congenital heart disease was an underlying HF aetiology in 3.8% of the patients. Six patients (4.6%) had other diagnoses (constrictive pericarditis = 2, cor-pulmonale = 1, endomyocardial fibrosis = 1 and hyperthyroidism = 2) (Figure 2).

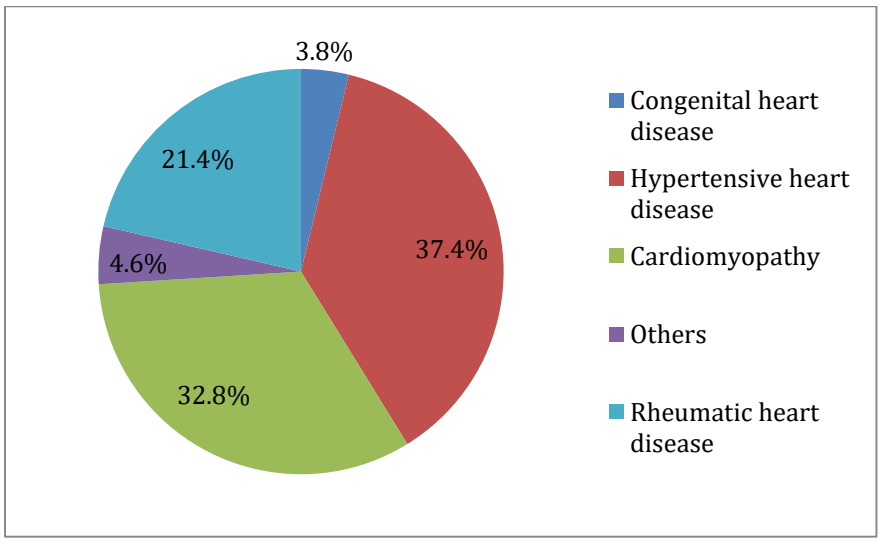

Figure 2: Aetiology of heart failure among patients discharged from Muhimbili Hospital

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On follow-up majority of the patients could be contacted through their own phone numbers (in 79.4% of the patients) or through mobile phones of their next of kin (in 21.6% of the patients). Overall, over 90% of the patients could be reached in all the 3 occasions of phone calls (Figure 3).

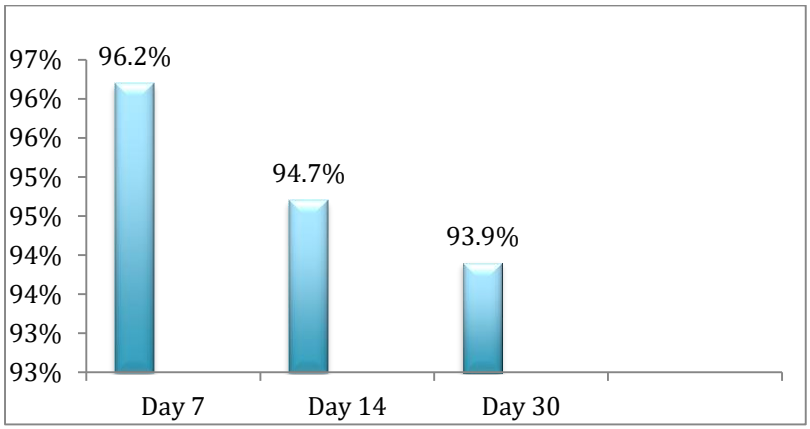

Figure 3: Proportion of HF patients reached via mobile phones on day 7, day 14 and day 30 post discharge

A total of 10 (7.6%) HF patients could not be reached through mobile phones during the follow up period. Five of these could not be reached during all 3 phone calls attempts. Patients who could not be reached were mostly females (8 out of 10), and were significantly older (mean ± SD age 55.8 ± 13.1 years) than the total studied population (45.3 ± 19.3 years) (p = 0.03). Otherwise, the rest of demographic and clinical characteristics were similar to that of the total population.

During phone call follow up, >90% of the contacted patients gave valuable clinical information in terms of their current symptoms, status of their prescription and a re-call of their next appointments. Figure 4 shows HF symptoms reported by discharged HF patients during one month of follow up.

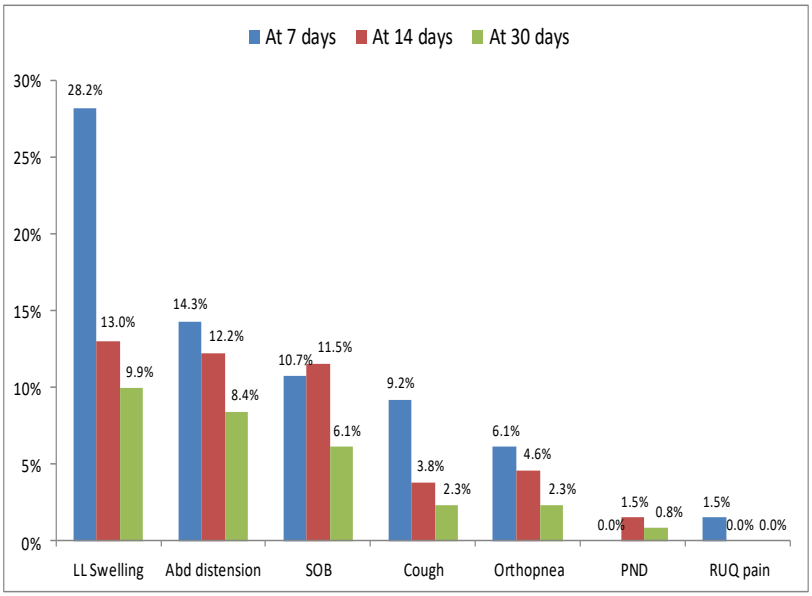

Figure 4: Heart failure symptoms during the one month follow up period

When asked if they were improving or worsening in their clinical status, about half of the patients reported improvement on day 7 post discharge, this progressed to be around two thirds in day 14- and day 30-post discharge. On the other hand, 11% of the patients felt their conditions were worsening 7-day post discharge and this increased to 18.1% on day 30-post discharge (Figure 5). The rest of the patients neither felt improvement nor worsening of their symptoms during the 30-day phone call follow up.

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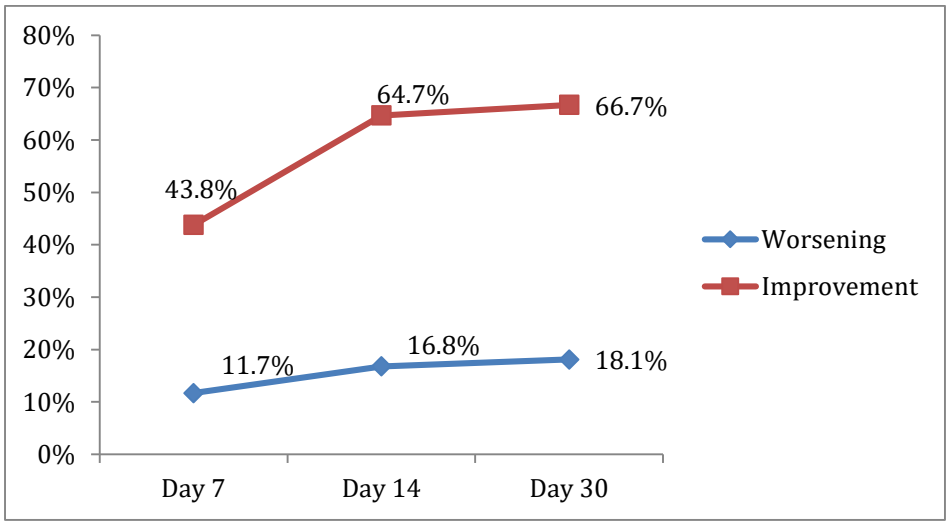

Figure 5: Proportion of heart failure patients reporting worsening or improvement of symptoms

During the study period 27 (20.6%) discharged patients initiated a call to the investigator mainly to report on worsening of their symptoms. Patients could clearly report on the HF symptoms and the most reported symptoms were shortness of breath (in 19/27), abdominal distension (in 7/27) and lower limb swelling (in 6/27). During the follow-up period, 25 (19.1%) patients were re-admitted back to MNH Cardiovascular Medicine Department and 11 (8.4%) patients died.

Discussion

The present study is the first in the East African region to report on the applicability and use of structured telephone monitoring to follow up HF patients after being discharged from a tertiary care hospital. Our finding that majority of discharged HF patients could be reached via mobile phones within a month post-discharge is similar to that reported in Argentina among patients with chronic HF (Grancelli *et al.,* 2003). Although the study populations between our study and that of Argentina are quite different socio-economically, a similarity is seen mainly because of the marked mobile phone penetration rate (MobileMonday, 2011) and ownership in Tanzania (InterMedia, 2013). In East Africa, several studies have reported the use of mobile phones to track on anti-retroviral drug use (Lester, *et al.,* 2010; Chang *et al.,* 2011), maternal and childhood follow up (Lund *et al.,* 2012), and the reported contact rates ranged from 65% to 97%, in accord with the present findings. The high reachability rate in the East African region offers a unique opportunity for follow up of chronic diseases, including HF.

The main reason for use of structured phone call monitoring is to ascertain whether patients are doing well or their conditions are deteriorating so that interventions can be done, possibly at home to avoid the costly re-admissions. This study demonstrated very well that majority of the patients were able to give information about their HF status that was found reliable by the clinician and therefore specific advice could be given. Our finding that 11.7% - 18.1% of discharged HF patients reported worsening within a month post discharge is in agreement with a previous study in Scotland (Blue *et al.,* 2001), but slightly different from another study in Australia (Stewart *et al.,* 1999). The difference between ours and the study by the Australian investigators could mainly be explained by the differences in methodology whereby the latter used both symptoms and clinical signs of worsening HF while our patients just reported on the symptoms.

With the increasing cost of HF management, newer ways of communicating with patients need to be applied whereby patients can contact a health care provider when they have questions regarding their clinical condition instead of coming back to the hospital. This study found that a quarter of HF patients initiated calls to the health care provider to seek for attention. This finding

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is very important, meaning that within a month about a proportion of the discharged HF patients avoided a re-visit or a re-admission to the cardiac unit because patients had access to call the care provider and their questions and problems were solved through conversation with the care provider.

This study had many similar findings with previous studies in Tanzania and other Sub Saharan African countries regarding the demography and aetiology of HF. We found the mean age of the HF patients to be 45.3 years, slightly lower than that found by Makubi *et al.* (2014) in a population of in- and out-patients presenting with HF at Muhimbili National Hospital. The reason for the difference is mainly due to the slightly higher proportion of patients with rheumatic heart disease and dilated cardiomyopathy in our cohort. Both rheumatic heart disease and dilated cardiomyopathy occur generally among young adults in Sub Saharan Africa (Ntusi & Mayosi, 2009). The mean age of the present study is however similar to that reported in a study in Nigeria (Karaye *et al.*, 2008). The aetiological pattern of HF in the present study is also remarkably similar to previous studies in the Sub Saharan Africa (Oyoo & Ogola, 1999; Karaye & Sani, 2008; Makubi *et al.,* 2014).

The 30-days re-admission rate of about one-fifth of the patient in the present study is slightly higher than that reported in a study in Nigeria (Ogah *et al.,* 2014) and slightly lower than the 30-day re-admission rate reported in the United States (Krumholz *et al.,* 2013). A study in the United States has reported a much higher 30-day re-admission rates (Zai *et al.,* 2013). The differences between ours and other studies could most likely be explained by differences in age patterns as well as co-morbid conditions in the different study cohorts. All in all, the present study adds to the general concern that HF patients experience a high hospital re-admission rate, especially in the first 30 days. Likewise, the 30-day mortality rate of 8.4% found in the present study lies between that reported in Nigeria (Ogah *et al.,* 2014) and in the USA (Krumholz *et al.,* 2013) which were 4.2% and 11.2% respectively. This variability of 30-day mortality outcomes between hospitals has been reported even in a large review of hospitals in the USA, indicating differences in between hospitals (Mulvey *et al.,* 2009).

Our study gives a very good snap-shot of what happens to HF patients during admission and within a month post discharge in terms of progression of signs and symptoms of HF. From the present findings, most patients are admitted with very severe symptoms. This can partly be due to the fact that Muhimbili National Hospital is a tertiary care hospital and that patients who come to this facility are mainly those who have either been not able to improve in other peripheral hospitals or with advanced disease. The advance disease state at presentation has also been reported in Nigeria (Ogah, *et al.* 2014). However, generally the response to medications seems very successful with most of patients improving and discharged at NYHA class 2.

Being from a single centre, findings from this study may not be generalizable to other study centres, especially in rural Tanzania where at the moment, mobile phone coverage is not as wide as in urban centres like Dar es Salaam where this study was conducted.

In conclusion, majority of HF patients can be contacted and provide valuable clinical information through mobile phones within a month post discharge from Muhimbili National Hospital. Structured telephone monitoring could be used as a tool to follow up HF patients in a resource-poor country like Tanzania. Further studies are needed to compare usual standard care of patients with HF versus standard care plus home monitoring with mobile phones to determine the differences in the re-admission rates in our region.

Conflict of interest

The authors declare no conflicts of interest.

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